GROUNDWATER TECHNOLOGY

Groundwater Technology, Inc.

2501 Yale Boulevard, SE, Suite 204, Albuquerque, NM 87106
Tel: (505) 242-3113, Fax: (505) 242-1103

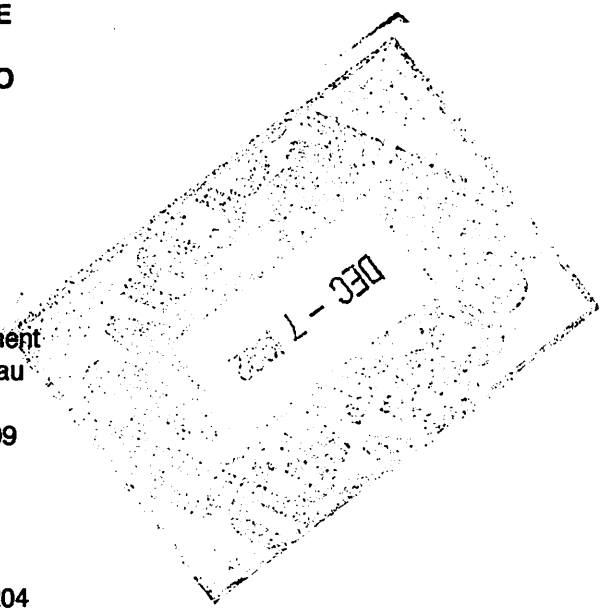
RECLAMATION PROPOSAL
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

PROJECT NO. 023352875

December 4, 1992

Submitted to:

New Mexico Environment Department
Underground Storage Tank Bureau
4131 Montgomery Blvd. N.E.
Albuquerque, New Mexico 87109



Prepared by:

Groundwater Technology, Inc.
2501 Yale Boulevard S.E., Suite 204
Albuquerque, New Mexico 87106
(505) 242-3113

Groundwater Technology, Inc.
Written/Submitted by

Teresa J. Bennett
Hydrogeologist

Groundwater Technology, Inc.
Review/Approved by

Sara C. Brothers
Operations Manager, New Mexico

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1.0 INTRODUCTION

Groundwater Technology, Inc. (Groundwater Technology) has prepared a Reclamation Proposal for the Barelas Bridge Groundwater Protection Act (GWPA) site located at 800 Bridge Boulevard, S.W., Albuquerque, New Mexico. The plan has been prepared in accordance with New Mexico Environmental Improvement Board (NMEIB) Underground Storage Tank Regulations (USTR) Part XII, Section 1212 and presents a description, schematic designs, and monitoring and maintenance procedures for a remediation system at the site incorporating a combined air sparge/vapor extraction (ASVE) system and *insitu* bioremediation. The objectives of the remediation system are two-fold:

1. To remove adsorbed and dissolved-phase gasoline hydrocarbons from the subsurface at the site in the vicinity of the initial leak using ASVE techniques; and

2. Attenuation of dissolved-phase hydrocarbons in the downgradient portion of the plume by actively remediating the upgradient source, and by the introduction of oxygen into the aquifer (via the ASVE system) to promote natural biodegradation of hydrocarbons.

The remainder of this document addresses the following elements regarding the proposed remediation program:

- Section 2.0 presents site background information and a description of previous investigations at the former station;

- Section 3.0 describes the subsurface conditions at the site including the local hydrogeology and the soil and water quality as based on previous and current investigations;

- Section 4.0 describes the installation of five wells at the site for use in the ASVE pilot tests and the results of soil sampling and analysis;

- Section 5.0 provides a data summary and analysis of the ASVE pilot tests conducted at the site;

- Section 6.0 describes the proposed ASVE system including the system layout and specifications for remediation equipment;

- Section 7.0 provides a schedule for installation of the remediation system, and operation, maintenance, and monitoring commitments;

- Section 8.0 presents the contingency measures to be used in case of system failure and the reclamation closure criteria; and

- Section 9.0 discusses the regulatory agencies governing remediation at the site and applicable permits, ordinances, and inspections pertaining to system construction and operation.

2.0 SITE BACKGROUND

2.1 Site Location and History

The Barelas Bridge site is located at 800 Bridge Boulevard, S.W., Albuquerque (Bernalillo County), New Mexico, on the southwest corner of the intersection of Bridge Boulevard, S.W., and La Vega Drive (Figure 1). An operating Fina gasoline station and carwash facility are currently located at the property (Figure 2). Adjacent properties include an auto-parts store and several other small businesses to the north, a farm produce market to the east (formerly a Circle K gasoline station), and single family residential homes to the south and southwest. Utilities in the area include aerial telephone and electric lines and buried water, sewer, and natural gas lines. The approximate locations of the utilities at the site are included in Figure 2.

A gasoline service station has been in operation at 800 Bridge Street, S.W. since the 1940's. There are no records from the station at 800 Bridge, S.W. for the kinds or quantities of petroleum products previously stored there. The past owner, Mr. Herman Van Steenis, acquired the station in 1951 and installed new tanks in November-December of 1971. He operated the station until December 1978 and then leased the service station from 1979 to 1989. Mr. Robert Pargin bought the service station in December 1989 and is the present owner (Leggette, Brashears and Graham, Inc. (LBG), December 1990).

On August 3, 1989, four steel underground storage tanks (USTs) were excavated from an area located on the northwestern part of the property under the supervision of the Albuquerque Environmental Health Department (AEHD). The approximate area of excavation is shown in Figure 2. During removal of the tanks, petroleum hydrocarbons were discovered in the soil and groundwater in the tank pit. The former station building area was excavated in October of 1989 to a depth of approximately 11 feet below the surface, according to the current owner (personal communication between Robert Pargin and LBG, December 7, 1990). An old waste-oil tank, formerly located south of the present station building (estimated capacity 100 to 150 gallons), was removed on October 16, 1989. In January of 1990, new double-lined USTs were installed in a new tank pit located south of the building (LBG, December 1990).

2.2 Previous Investigations

Following removal of the old USTs, the AEHD performed an initial site investigation during the period August 1989 to August 1990. During this investigation, a total of 19 auger holes were drilled at the site and on surrounding properties (A-1 to A-9, A-11 to A-16, and auger holes NE, NW, SE, SW), four monitor wells were installed (MW-1 through MW-4), and groundwater and soil samples were collected for laboratory analysis from these borings and nearby private wells (LBG, December 1990). The results of the AEHD investigation are incorporated into this report.

LBG conducted a Hydrogeologic Investigation at the Barelas Bridge site in October - December 1990. The objectives of the investigation were to define the extent and rate of contaminant migration, define the direction and rate of groundwater flow, and to determine the hydraulic characteristics of the aquifer in the vicinity of 800 Bridge Blvd, S.W. The assessment included the drilling of five auger holes (AH-1 through AH-5), the installation of four additional monitor wells (MW-5 through MW-8), collection of soil samples for laboratory analysis, and groundwater monitoring and sampling in eight wells (MW-1 through MW-8) (LBG, December 1990).

Following completion of the Hydrogeologic Investigation, the AEHD collected water samples from select monitor wells in March 1991 (MW-1 and MW-3), August 1991 (private well located at 174 La Vega Drive, S.W.), and November 1991 (153 La Vega Drive, S.W.). The results of the Hydrogeologic Investigation and subsequent water sampling by the AEHD are incorporated into this report.

3.0 SUBSURFACE CONDITIONS

3.1 Regional Hydrogeology

The Barelas Bridge site is located on Quaternary alluvium in the inner valley of the Albuquerque Basin. The Albuquerque Basin is one of several grabens in the Rio Grande rift system, a north-south trending structural basin that extends from southern Colorado to southern New Mexico, and through which the Rio Grande flows (Kelly, 1977). Albuquerque Basin deposits consist of up to 3,700 meters (12,140 feet) of the Miocene-Pliocene Santa Fe Formation, which is typified by unconsolidated to loosely consolidated fluvial sediments (sandstone, mudstone, and conglomerate) interbedded with volcaniclastic and debris flow deposits (Bjorklund and Maxwell, 1961). Overlying the Santa Fe Group are 25 to 45 meters (80-130 feet) of Quaternary alluvial fan deposits shed from the nearby Sandia and Manzano Mountains. The alluvial fan material is composed of angular granitic material up to several inches in diameter. Recent floodplain alluvial sediments consist of clay, silt, sand, and fine gravel deposited by the Rio Grande (Kelley, 1977; U.S. Geological Survey, 1986). Interbedded with the alluvium are reworked Tertiary and Quaternary volcanic deposits throughout the Albuquerque Basin (Bjorklund and Maxwell, 1961).

The Barelas Bridge site is underlain by the Albuquerque Basin Aquifer. The aquifer ranges in thickness between 600 and 900 meters (1,970 to 2,950 feet) with saline waters occurring at depths greater than 900 meters (U.S. Geological Survey, 1972). Depth to shallow groundwater and groundwater flow direction in the inner valley of the Albuquerque Basin is controlled by the Rio Grande, riverside and interior drains, irrigation, and groundwater withdrawals at municipal well fields. Regional groundwater flow is approximately west to east on the east side of the river and from north to south, parallel to the course of the Rio Grande, on the west side of the river (U.S. Geological Survey, 1986; 1987). Numerous private water supply wells exist in the vicinity of the Barelas Bridge site and are primarily used for domestic supply and limited irrigation (Figure 1).

3.2 Site Hydrogeology

Based on the results of previous investigations and the installation of wells AS-1, VP-1, MW-9, PR-2, and PR-3 by Groundwater Technology during this investigation, the Barelas Bridge site and adjacent properties are underlain by a generally coarsening downward sequence of alluvial deposits. Immediately below the asphalt and coarse gravel-cobble base at the site, approximately 1 to 3 feet of clayey, sandy soil (often fill material) is present. A brown clay layer, variable in thickness from a few inches to 3 feet, occurs at approximately 3 to 6 feet beneath the site. Below the clay layer, a fine to medium-grained, very well sorted, quartz sand is present. At and below the water table (which occurs at approximately 9 feet below the site), this sand unit grades to a coarse to very coarse-grained sand with traces of gravel.

Based on off-site wells installed south of the site along La Vega Drive, S.W., the same general subsurface geology is present as below the station though the upper clay layer appears to occur closer to the surface (1 to 6 feet below grade) in a progressively southward direction. A cross-section illustrating the geology beneath the area is provided in Figure 3. Detailed geologic logs of all soil borings and monitor wells installed at the site to date are provided in Appendix A.

Depth-to-water typically ranges from 7.5 to 9.5 feet beneath the site and adjacent property to the south, and the potentiometric surface indicates a southerly gradient of approximately 0.003 ft/ft. A groundwater contour map, based on June 24, 1992 fluid-level measurements, is presented in Figure 4. Groundwater monitoring during previous investigations indicates a minimum groundwater fluctuation of at least 0.5 to 1 foot beneath the area, though fluid levels were collected only over a 1.5 month period and are inadequate to document seasonal changes.

Based on two aquifer tests conducted by LBG in November 1990, the transmissivity and storativy were estimated to be 80,000 gallons per day per foot (gpd/ft) and 0.1, respectively. The hydraulic conductivity and aquifer thickness were estimated to be 240 feet per day (ft/day) and approximately 50 feet, respectively (LBG, December 1990).

3.3 Water Quality

The current lateral distribution of dissolved-phase hydrocarbons, as based on the June 24, August 20, and August 24, 1992 sampling events conducted by Groundwater Technology, is illustrated in Figure 5. Maximum dissolved benzene, toluene, ethylbenzene, and total xylene (BTEX) concentrations (860 to 4,500 micrograms per liter (ug/l)) were detected in monitor wells MW-4, MW-8, MW-9, and VP-1 at the service station. Benzene concentrations in these same wells ranged from 230 to 880 ug/l, while TPH-as-gasoline concentrations ranged from 3,100 to 17,000 ug/l. Benzene and BTEX concentrations in monitor wells MW-5 through MW-7, located off-site to the south of the station, were 4 to 30 ug/l (benzene) and 5 to 260 ug/l (BTEX), respectively. The southernmost, downgradient wells, MW-1 through MW-3, contained from 1.6 to 4.1 ug/l benzene and from 1.6 to 14 ug/l total BTEX. Total petroleum hydrocarbon (TPH)-as-gasoline concentrations in wells MW-1 through MW-3 ranged from not detected (detection limit 100 ug/l) to 370 ug/l. No BTEX or TPH-as-gasoline concentrations were detected in any of the three private wells sampled. No phase separated hydrocarbon (PSH) was detected in the wells at the site, though hydrocarbon sheens were observed during purging in wells MW-4, MW-8, and MW-9, and all wells (except for the private wells) contained a hydrocarbon odor. Analytical results for the June and August 1992 sampling events are summarized in Table 1, and Laboratory Certificates of Analysis and Chain-of-Custody documentation are provided in Appendix B.

The monitor wells at the site have been sampled for water quality analysis periodically since 1990. Available historical groundwater analytical results for the monitor and private wells are summarized in Appendix C. Based on the June and August 1992 sampling results, benzene and BTEX concentrations in most on and off-site wells have increased since the last complete sampling event conducted on October 30, 1990. Most notably, levels increased in off-site wells MW-5 through MW-7 from not-detected (MW-5) to 10.7 ug/l benzene in 1990, to 4 to 30 ug/l benzene in 1992. Benzene concentrations ranging from not detected to 2.6 ug/l were detected in wells MW-1 through MW-3 in 1990, compared to 1.6 to 4.1 ug/l benzene detected in these same wells in 1992.

In addition to monitor well sampling, 19 auger holes drilled by the AEHD in 1989 (NW, NE, SW, SE, and A-1 to A-9, A-11 to A-16) and 5 auger holes drilled by LBG in October 1990 (AH-1 through AH-5) were sampled for groundwater analysis. The analytical results are illustrated in Figure 6 and are tabulated in Appendix C. Because the dissolved-hydrocarbon plume is not adequately delineated by the existing monitor well network at the site, the auger hole groundwater data was used to aid in

defining the horizontal extent of hydrocarbons in groundwater, particularly to the north, east, and west of the gas station site. Figures 5 and 6 illustrate that the main portion of the hydrocarbon plume is located beneath the southeastern half of the gas station (based on analytical results from MW-4, MW-8, MW-9, and VP-1). Hydrocarbons in groundwater in excess of 10 ug/l benzene have been detected off-site as far east as auger hole A-9, on-site as far northeast as auger hole NE, and the westward extent of the plume is assumed to be the approximate area of the carwash, based on the location of the former UST area (suspected source) and the lack of significant hydrocarbon concentrations in auger holes AH-3, NW, and SW. The hydrocarbon plume extends off site approximately 300 feet to the south, based on hydrocarbon concentrations in excess of 10 ug/l benzene detected in wells MW-6 and MW-7, and in excess of 500 feet based on TPH-as-gasoline concentrations detected in wells MW-1 through MW-3.

No hydrocarbon concentrations have ever been detected in surrounding private wells since sampling began in 1989. Analysis for methyl tertiary butyl ether (MTBE) in groundwater was performed only on samples collected from auger holes AH-1 through AH-5 in October 1990. No MTBE concentrations were detected in the samples. Metal concentrations were analyzed in water samples from 11 of the auger holes drilled by the AEHD in 1989. Iron, manganese, and lead concentrations ranged from not-detected to 12.5 parts per million (ppm), from 0.36 to 1.78 ppm, and from not-detected to 0.029 ppm, respectively (no information stating whether reported metals concentrations are for dissolved or total metals or regarding sampling/analysis methods is available).

3.4 Soil Quality

Soil samples collected during the drilling of five auger holes (AH-1 through AH-5) and monitor wells MW-5 through MW-8 by LBG in October 1990, were submitted for laboratory analysis for BTEX and total volatile hydrocarbons (TVH) in accordance with EPA methods 5030/8020/8015 (Appendix C). Soil samples collected during the installation of wells PR-3, VP-1, and MW-9 in August 1992 by Groundwater Technology were also analyzed for BTEX and TPH-as-gasoline in accordance with EPA methods 5030/8015/8020 (detailed in Section 4.2). The distribution of adsorbed-phase hydrocarbons, based on these sampling events, is presented in Figure 7.

Total BTEX concentrations for soil samples collected from on-site boreholes ranged from 0.215 milligrams per kilogram (mg/kg) (AH-3, from a depth of 8 to 10 feet) to 35 mg/kg (MW-9, from a depth of 9 feet). TPH-as-gasoline (or TVH) concentrations for the on-site boreholes ranged from

not-detected (AH-3, 8 to 10 feet) to 995 mg/kg (AH-4, from a depth of 8 to 10 feet). Maximum hydrocarbon concentrations were detected in those boreholes drilled in the southeastern and eastern portion of the site (AH-4, MW-8, MW-9) (Figure 7).

Relative concentrations of volatile organic vapors (PID or HNU readings) for borings installed in the southeastern corner of the site (AH-4, PR-2, PR-3, VP-1, AS-1, and MW-9) ranged from 171 ppm to 4,172 ppm for soil samples collected from depths of approximately 2 to 10 feet below grade.

Total BTEX concentrations for soil samples collected from off-site boreholes (MW-5 through MW-7, and AH-5) ranged from 0.0045 mg/kg (AH-5, from a depth of 8 to 10 feet) to 18.9 mg/kg (MW-6, from a depth of 3 to 5 feet). TVH concentrations for these same boreholes ranged from not-detected (MW-5, 8 to 10 feet) to 548 mg/kg (MW-6, 3 to 5 feet) (Figure 7).

4.0 SOIL BORING AND MONITOR WELL DRILLING AND INSTALLATION

4.1 Drilling and Well Completion Operations

On August 18 - 20, 1992, Groundwater Technology supervised the drilling of five soil borings on the southeastern part of the site. The borings were completed as multi-purpose wells for use in the ASVE pilot tests and future remediation system to be installed at the site. The borings were also drilled to further characterize the site geology and hydrogeology, and to aid in defining the vertical and lateral extent of petroleum hydrocarbons in the subsurface. The locations of the wells are illustrated in Figures 1 and 2 and the rationale for each was as follows:

PR-2 Nested monitoring probe screened across two discreet intervals within the vadose zone (3 to 5 feet and 7 to 9 feet below the surface) to monitor field response during air sparging and soil venting;

PR-3 Same as above, except installed closer to, and in an opposite direction from, the air sparge and soil vent test wells than PR-2;

VP-1 Multi-purpose well to be used as a monitoring point during the air sparge pilot test, as a soil vapor extraction well for use in the pilot vent test and in the future remediation system, and as a monitor well for groundwater sampling;

AS-1 Air sparging well for use in the air sparge pilot tests and in the future remediation system. Can also be used as a monitor well for groundwater sampling at approximately 10 feet below the water table to determine the vertical extent of dissolved-phase hydrocarbons; and

MW-9 Monitor well installed in the downgradient portion of the hydrocarbon plume for groundwater monitoring and sampling; also used as a monitor point for ASVE system response during pilot testing and will be used as a soil vapor extraction well in the future remediation system.

The air sparge (AS-1) and vapor extraction well (VP-1) were originally proposed for installation as one nested well, to be screened over different intervals in the same borehole. However, the

presence of heaving sands encountered below the water table precluded proper completion of the nested well pair and, therefore, two separate wells had to be installed.

Drilling was performed using a CME-75 drilling rig and nominal eight- and twelve-inch outside diameter hollow-stem augers. All downhole drilling and completion equipment was steam-cleaned prior to drilling each boring, and soil sampling devices were decontaminated with non-phosphatic soap and distilled water between each sample.

Soil samples were collected at continuous or 3 to 5 feet intervals for lithologic identification and field and laboratory analysis using a 2-foot long split-spoon or a 5-foot long core barrel sampler. Detailed geologic logs based on the samples were recorded by an experienced Groundwater Technology scientist during drilling and are presented in Appendix A. The soil samples were field-screened for relative concentrations of volatile organic compounds using a PID calibrated to 100 ppm isobutylene gas. Soil samples for field-screening were placed in 16-ounce glass jars, sealed with aluminum foil, agitated, and allowed to equilibrate for 5 to 10 minutes prior to analyzing. The PID results are included on the geologic logs in Appendix A. Soil samples from each boring with the highest PID readings, and/or the samples collected from directly above the water table, and/or additional samples to characterize vertical extent of adsorbed-phase hydrocarbons, were retained for laboratory analysis. The soil samples were secured in 250-ml glass jars with teflon septa, sealed, labeled, placed on ice in an insulated shipping cooler, and transported to GTEL Environmental Laboratories in Torrance, California via overnight courier. The samples were analyzed for BTEX and TPH-as-gasoline in accordance with EPA modified methods 5030/8020/8015. Laboratory Certificates of Analysis and Chain-of-Custody documentation are included in Appendix D.

Following completion of drilling, each soil boring was converted to a well. Vadose wells PR-2 and PR-3 were completed as nested monitoring probes to total depths of 9 to 9.5 feet. Each probe consists of two casing strings with nested screened intervals at 3 to 5 feet and 7 to 9 feet, and blank casing to the surface. Each well within the nested pair was completed with 2-inch diameter Schedule 40 PVC well casing and screen (0.020-inch factory-slotted). The bottom of each well was fitted with a threaded PVC plug. Each nested well screen is separated from the other in the same boring by 6 inches of 10-20 Colorado silica sand followed by approximately 16 inches of bentonite and grout seal material. The remainder of the well annulus was grouted to the surface.

Vapor extraction well VP-1 was drilled to a total depth of 14.5 feet. VP-1 was completed with 5 feet of 0.020-inch factory-slotted 4-inch diameter well screen below the water table, 5 feet of 0.040-inch slotted well screen above the water table, and 4.5 feet of blank casing to the surface. The bottom of the well was fitted with a threaded PVC cap. The annular space of the well was backfilled with 10-20 silica sand to 9 feet below the surface, followed by 8-12 silica sand to 3.5 feet. A 1.5 feet thick bentonite seal was placed above the sand, and the remainder of the annulus was grouted to the surface with a cement/bentonite slurry.

Air sparge point AS-1 was drilled to a total depth of approximately 22 feet below the ground surface with a screened interval installed 11 feet below the water table from 20 to 22 feet, followed by blank casing to the surface. The well was completed with 2-inch diameter, 0.020-inch slotted well screen and well casing and the bottom of the well was fitted with a PVC well cap. The annular space was backfilled with 10-20 silica sand to 17.5 feet below the surface, followed by bentonite to 15.5 feet and grout to the surface.

Monitor well MW-9 was drilled to a total depth of 20 feet and completed with 15 feet of 2-inch diameter schedule 40 PVC screen (0.010-inch slotted) and 5 feet of blank casing. The bottom of the well was fitted with a PVC cap and the annular space was backfilled to 1.5 feet above the well screen with sand pack, followed by a 1-foot thick bentonite seal and grout to the surface.

All wells were completed with locking plugs and keyed-alike padlocks in bolted, traffic-rated, steel road boxes and concrete well pads. Well completion details and well completion logs are included in Appendix A. Drill cuttings from the soil borings were placed in 55-gallon steel, DOT-approved drums, labeled, and stored on site pending laboratory analysis and off-site disposal.

Subsequent to well installation, wells AS-1, VP-1, and MW-9 were developed by purging using well-dedicated 2-inch and 4-inch diameter PVC bailers until water removed from the wells was relatively free of sediment. The bailers were decontaminated prior to use in each well using a non-phosphatic detergent and distilled water. Purge water removed from the wells was placed in a 55-gallon steel drum, labeled, and stored on site pending laboratory analysis and off-site disposal. Following receipt of analytical results, the drums containing drill (soil) cuttings and purge water were transported by Rhino Tank and Line Testing, Inc. to their state-licensed landfill in Hobbs, New Mexico for final disposal on September 7, 1992.

4.2 Soil Analytical Results

Soil samples were field-screened with a Photovac Microtip PID during drilling for relative concentrations of volatile organic compounds. Field readings for soil samples collected from all borings ranged from 171 ppm to 4,712 ppm. Laboratory results for soil samples collected during drilling are presented in Table 2. Total BTEX concentrations for all borings samples ranged from 15 to 35 mg/kg, with maximum concentrations detected in the soil sample collected from MW-9 from a depth of 9 feet. TPH-as-gasoline concentrations for all soil samples ranged from 340 to 820 mg/kg, with maximum levels recorded in the soil sample from MW-9 at 9 feet.

5.0 SOIL VENT/AIR SPARGE PILOT TESTS

On August 24 - 26, 1992, Groundwater Technology conducted short-term air sparge (AS) and vapor extraction (VE) (soil vent) pilot tests at the Barelas Bridge site. The purpose of the pilot tests was to determine the following information:

- The effective radius of influence for a proposed ASVE remediation system at the site;
- Engineering criteria and equipment specifications for use in designing a full-scale remediation system; and
- Hydrocarbon mass extraction rates for selection of air emissions treatment methodology.

Prior to conducting the pilot tests, Groundwater Technology notified the AEHD Air Pollution Control Division (APCD) of potential air emissions as a result of the tests (Correspondence, Groundwater Technology, August 6, 1992). The AEHD/APCD responded that air emissions control would be required (Correspondence, AEHD/APCD, August 10, 1992).

Pilot testing consisted of three components: a soil vapor extraction test, an air sparge test, and a combined air sparge/soil vent test. The tests consisted of actual field operation of a soil vacuum blower and an air compressor temporarily connected to vapor extraction and air sparge wells. Induced response in the subsurface as a result of the tests was measured in surrounding monitor points. The sparge and vent tests were performed first to define the individual radii of influence and to determine the most effective operational conditions (pressure and vacuum settings) of these individual systems. The combined test documented actual field response to the optimum pressure and vacuum identified during the individual tests and allowed for balancing of the two systems.

Pilot tests at the Barelas Bridge site were performed using the newly installed air sparge (AS-1) and vapor extraction (VP-1) wells as the test wells. Monitoring points were selected to provide multi-directional data at varying distances from the test wells, and to provide information concerning potential vertical differences in response both in the unsaturated and saturated zones. The monitoring network utilized for the pilot tests consisted of three existing monitor wells (MW-4, MW-7, and MW-8), and newly installed monitor well MW-9, all screened at various intervals across the saturated and unsaturated zones, two nested probes (PR-2 and PR-3), each screened at two

intervals (3 to 5 feet and 7 to 9 feet) in the unsaturated zone, and the soil vapor extraction well (VP-1). Construction of all test wells and monitor points are detailed on the well logs included in Appendix A. Figure 2 shows the layout of the pilot test monitoring array.

5.1 Soil Vent Pilot Test

5.1.1 Soil Vent Test Equipment

Soil vapor extraction pilot tests were performed by attaching a 5-horsepower (HP) regenerative vacuum blower to the pilot test well (VP-1). The blower system included a particulate filter, vacuum gauges, and an ambient air intake valve to control flow/vacuum. The blower was powered by a portable generator. The blower exhaust was manifolded to two 200-pound carbon canisters placed in series for treatment of extracted vapors prior to atmospheric discharge. One in-line air sampling port for collection of air samples and PID measurements was installed in the blower discharge line prior to carbon treatment (influent), and another air sampling port for PID monitoring of carbon-treated air was installed in the discharge line after the second carbon canister (effluent).

Blower performance and vacuum were monitored using pre- and post-filter Ashcroft vacuum gauges with a range of 0 to 100 inches of water (in 1-inch increments). The vacuum gauges have an accuracy of $\pm$ 1%. Air velocity measurements were obtained at a port installed in the 4-inch diameter PVC pipe at a point located approximately midway between the extraction wellhead and the blower. Measurements were obtained using a Dwyer Instruments thermal anemometer (Model 470). The thermal anemometer was calibrated following manufacturer's instructions prior to initiating each test.

Ambient air temperature and process flow temperature were measured using an Omega HH-70KF pocket thermometer, which has a range of -112 to 1,383°F and an accuracy of $\pm$ 1% for ambient air temperatures between 68°F to 86°F. Process air stream temperature was measured during the test at inlet ports installed in the piping prior to the blower (pre-blower temperature) and on the discharge side of the blower (post-blower temperature) to monitor blower performance and for use in hydrocarbon mass extraction calculations.

Organic vapor concentrations were monitored at the air sampling ports located on the discharge side of the blower (both pre and post-carbon treatment) using a Microtip PID calibrated with 100 ppm isobutylene gas.

Induced vacuum at monitor wells surrounding the vapor extraction well was measured using a combination of Dwyer Instruments, Inc. magnehelic gauges (Model Nos. 2000-00, 2000-0C, 2002, and 2010). Gauges were attached to the pressure monitoring ports with 1- to 2-foot lengths of flexible rubber tubing.

5.1.2 Soil Vent Test Protocol

Following equipment set-up and calibration, Groundwater Technology conducted soil venting pilot tests at three separate vacuum settings; 19.5, 30, and 43 inches of water, respectively. A complete round of static pressure, temperature, velocity, and organic vapor concentration readings were collected from each of the measurement and sampling ports prior to starting the initial test. The tests were run at each vacuum setting until stabilization occurred in the monitoring parameters, usually 1 to 2 hours or less.

The following parameters were monitored during each test at approximate 5-minute intervals for the first elapsed 15 minutes, at approximate 15-minute intervals for the remainder of the first elapsed hour, and hourly thereafter. Field measurements are included in Appendix E:

- Pre- and post-filter vacuum at the blower;
- Induced vacuum at surrounding monitor points;
- Applied vacuum at the vapor extraction wellhead;
- Pre- and post-blower air stream temperature;
- Process air stream velocity; and
- Air influent (pre-carbon treatment) and effluent (post-carbon treatment) organic vapor concentrations.

An air effluent sample was collected at the end of the test (1 hour) conducted at the maximum vacuum setting (43 inches of water). The sample was collected in 3-liter Tedlar bags from the air sampling port located on the blower discharge stack prior to carbon treatment. Following sample collection, the Tedlar bags were labeled and stored at ambient air temperature inside a shipping cooler. Following completion of the soil vent pilot test, the air sample was shipped with full Chain-of-Custody documentation to GTEL Environmental Laboratories in Concord, California for analysis of BTEX and TPH-as-gasoline in accordance with EPA methods 5030/8020/8015/18, and for methane, carbon dioxide, and oxygen per method GC-TCD.

5.1.3 Soil Vent Test Results

The soil vent test was conducted at three vacuum settings; 19.5, 30, and 43 inches of water at the wellhead, respectively. To achieve these vacuum settings, the air dilution (bypass) valve on the blower was opened 100%, 80%, and 50%, respectively. The vent test could not be conducted at greater than 50% blower capacity (i.e. less than 50% dilution air) without pulling water up from the vacuum extraction well to the blower, and without exceeding recommended maximum blower operating conditions.

Maximum induced vacuum as a result of venting was observed during the test in which 43 inches of water (maximum vacuum) was applied at the wellhead. At the maximum applied vacuum of 43 inches of water, maximum induced vacuum measured at the monitor wells ranged from 0.07 inches of water in well MW-9 (located approximately 38 feet from VP-1) to 1.90 inches of water at PR-3D (located approximately 10 feet from VP-1). No vacuum (0.00 inches of water) was measured at MW-7, located approximately 147 feet from VP-1.

Vacuum in the subsurface generally decreases exponentially with distance. To calculate an effective radius of influence, the natural log (ln) of the induced vacuum was plotted versus distance for each vacuum setting (Figure 8). A best fit line was then drawn through each set of data points. An effective radius of influence was then determined for each vacuum setting from the graphs. A vacuum of 0.1 inches of water was selected to define a significant response based on previous field data collected for similar soil vapor extraction systems. A more conservative estimate of the effective radius of influence was also determined by selecting the distance from the graph which corresponded to 1% of each of the applied vacuums. Using these methods, the maximum radius of

influence ranged from approximately 27 to 39 feet at 43 inches of water vacuum, with an average of 33 feet.

To aid in specifying the correct blower size for a full scale SVES, air velocity was measured at the wellhead for the various applied vacuum settings. At applied vacuums of 19.5, 30, and 43 inches of water, air velocities of 1,000, 1,250, and 1,500 feet per minute (fpm), respectively, were measured in 4-inch diameter pipe. Conversion to cubic feet per minute (cfm) yielded air flow rates of 88, 109, and 131 cfm for the three vacuum settings, respectively. A graph of air flow rate versus applied vacuum for the pilot test is provided in Figure 9.

Organic vapor concentrations in the process air stream were measured to determine emission and hydrocarbon mass removal rates. Maximum organic vapor concentrations, based on PID readings, were 1,383, 1,447, and 1,740 ppm for vacuum settings of 19.5, 30, and 43 inches of water, respectively. LEL readings in the process air stream were 100% at the start of the test at 19.5 inches of water vacuum.

Air sample analytical data collected during the pilot test at 43 inches of vacuum indicate that benzene concentrations were 220 ug/l in the air effluent, toluene concentrations were 79 ug/l, and TPH-as-gasoline concentrations were 26,000 ug/l. Methane concentrations were 3,800 parts per million volume (ppm-v) in the air samples. Carbon dioxide and oxygen in air were detected at concentrations of 18,000 ppm-v and 180,000 ppm-v, respectively. A summary of air sample analytical data obtained from well VP-1 is provided in Table 3, and Laboratory Certificates of Analysis, Chain-of-Custody documentation, and QA/QC packages are included in Appendix F.

5.1.4 Soil Vent Test Conclusions

Based on the data obtained during the soil venting pilot test performed on well VP-1, the maximum vacuum which could be applied at the wellhead (43 inches of water) produced the most effective radius of influence (in terms of induced vacuum) and the highest effluent VOC concentration. An effective radius of influence of 33 feet was achieved at an applied vacuum of 43 inches of water at the extraction wellhead.

Air sample analytical data indicate that maximum mass extraction rates of 0.09 pounds per hour (lb/hr) benzene, 0.03 lb/hr toluene, and 10.3 lb/hr TPH-as-gasoline were obtained during the vent

test on VP-1 at 43 inches of water vacuum. Emissions calculations are provided in Appendix G and results are summarized in Table 4.

5.2 Air Sparge Test

5.2.1 Air Sparge Test Equipment

The air sparge pilot test was performed by connecting a compressed air line to the top of the air sparge well. The compressed air system consisted of a 100 pounds per square inch (psi) (105 cfm) air compressor, 3/4-inch diameter air hose, an in-line oil/water filter, and a pressure regulator to control flow/pressure.

Air velocity measurements were obtained using a combination of Dwyer air flowmeters (Model Nos. RMC and VFC) plumbed into the air line at the air sparge wellhead. Induced pressure at monitoring points surrounding the air sparge well was measured using a combination of Dwyer magnehelic gauges, (Model Nos. 2000-00, 2000-0C, 2002, and 2010). Organic vapor concentrations were measured at the surrounding monitor points using a properly calibrated Microtip PID. Depth-to-water and dissolved oxygen in surrounding monitor wells screened across the water table were measured using an ORS electronic interface probe (IP) and a YSI Model 51B Dissolved Oxygen Meter, respectively.

5.2.2 Air Sparge Test Protocol

The sparge test was performed at 3 different pressures, 5 psi, 7 psi, and 10 psi (approximately 10%, 50%, and 100% over the pressure needed for air to overcome the 9 foot water column). A complete round of static pressure, dissolved oxygen (DO), fluid-level, and volatile organic compound (VOC) concentration measurements were collected from each monitor point prior to starting the sparge test.

The following parameters were collected during each pressure setting at periodic intervals. Field measurements are included in Appendix E:

- Applied air pressure at the sparge wellhead;
- Air flow rate of compressed air injected into the sparge well;

- Induced pressure at surrounding monitor points;
- VOC concentrations at the surrounding monitor points; and
- DO and depth-to-water were recorded in the monitor wells at the end of each pressure setting (removal of the pressure caps during sparging would interfere with the pressure readings).

5.2.3 Air Sparge Test Results

The air sparge test was conducted at three pressures, 5 psi, 7 psi, and 10 psi at the wellhead. At the maximum applied pressure of 10 psi, maximum induced pressure measured at the monitor wells ranged from 0.025 inches of water in well MW-9 (located approximately 43 feet from AS-1) to 11.0 inches of water at MW-8 (located approximately 29 feet from AS-1) (Table 5). No significant pressure response was detected above background in MW-7, located approximately 150 feet from AS-1. The maximum induced pressure versus distance for each of the injection pressures is plotted in Figure 10.

VOC concentrations recorded at each monitor point throughout the test are included in Appendix E and summarized in Table 6. VOCs versus time for all applied pressures during the sparging tests are plotted in Figures 11 and 12. A graph of the maximum change in VOC concentrations versus distance for the test at 5 psi applied pressure is also illustrated in Figure 13.

The most significant increase in VOC concentrations was observed following initial start-up of the sparge test at 5 psi injection pressure and in those monitor points located closest to the sparge well. VOC concentrations increased from less than approximately 500 ppm (background) to 3,000 to 5,208 ppm in the initial 15 minutes of sparging in the nested PR-3 wells and in VP-1, located 5.5 and 9 feet from AS-1, respectively. Increases in VOC concentrations were also observed in wells MW-4 (from 230 to 1,315 ppm) and MW-8 (from 26 to 840 ppm), located 19.5 and 29 feet from AS-1, respectively, indicating that sparging influence with respect to VOC concentrations generally decreased with distance away from the sparge point. VOCs in MW-9, located 43 feet from AS-1, showed a delayed response to sparging, with increased VOCs not observed until after approximately 45 minutes into the test. This may indicate that as the test progressed, the radius of influence of the sparge well slowly increased until a response was observed in the outlying wells.

Figures 11 and 12 also illustrate that the most significant increases in VOCs occurred at injection pressures of 5 psi and 7 psi, with less influence occurring at 10 psi. The figures also show that in general, as sparging time progressed, VOCs decreased from initially spiked concentrations, as initially high VOCs in the headspace of the wells and at the water table were driven off, and then stabilized at lower concentrations.

Fluid levels and the concentration of DO in water were measured in those wells screened across the water table prior to pilot testing at each sparge pressure. An increase in the DO concentration is indicative of aeration during the sparge test, which in turn indicates the transport of injected air through the aquifer. The data indicates significant increases in the DO concentrations in wells VP-1 and MW-8, from background concentrations of 0.2 ppm to maximum concentrations of approximately 7.0 ppm for both wells. No significant increases in DO concentrations were observed in wells MW-4 and MW-9 (Table 7).

An increase in the groundwater elevation as a result of sparging (i.e., water table mounding) was detected in wells MW-4, MW-8, MW-9, and VP-1. The maximum difference (pre-test minus post-test values) in depth-to-water values ranged from 0.03 feet in MW-9 (located 43 feet from AS-1) to 1.26 feet in MW-8 (located 29 feet from AS-1) (Table 7).

5.2.4 Air Sparge Test Conclusions

Aquifer sparging effectiveness was evaluated based on observed induced pressure, VOC concentration, depth-to-water observations, and DO concentrations while sparging at the maximum applied pressure of 10 psi. The resultant maximum effective radial distances for each evaluation methodology are presented in Table 8. A conservative value of 30 feet was selected as the effective radius of influence for the sparge test, based on the observed pressure responses. The remaining monitoring parameters (DO, depth-to-water, and VOC concentrations) exhibited greater variability between wells and were less conclusive.

The sparge test results appear to indicate some potential directional variability in sparging influence beneath the site. Well MW-8, located 29 feet north of the sparge well, exhibited a greater response to sparging than any other well, out-performing four other wells which were located closer (from 5.5 to 19.5 feet) to the sparge well. This may be due to the possible presence of more permeable fill material located in the fuel island/piping area in which MW-8 is located, or may be a result of the

well construction detail for MW-8. Because MW-8 is located beneath the fuel island canopy, it is the only well on site which was installed by driving a steel well point. All other wells were installed by a hollow-stem auger drill rig, using standard well completion techniques. Auger drilling of the boreholes may have resulted in a "smeared zone" in the annulus around the well screen, resulting in reduced permeability, compared to MW-8 which was driven into the natural sandpack with minimal formation disturbance.

5.3 Combination Air Sparge/Soil Vent Test

5.3.1 Combination Air Sparge/Soil Vent Test Protocol

The last phase of pilot testing consisted of a combination air sparge/soil vent test. The objective of the combination test was to ensure that a net vacuum could be established across the site under maximum operating conditions so that all sparge vapors were contained. The combination test was run at 7 psi pressure and 40 to 44 inches of water vacuum, which were the intermediate air sparge and maximum venting levels recorded during the individual vent and sparge tests. Because the air sparge system exerted a greater influence over the maximum vacuum setting, a short-term combination test was also run at a lower sparge pressure (5 psi), while the vacuum was maintained at the maximum level of 43 inches of water.

The same parameters listed above for the individual vent and sparge tests were collected periodically during the combination tests. An effluent air sample was collected at the end (1.5 hours) of the initial combination test (at 7 psi pressure and 40 to 44 inches of water vacuum). The sample was collected in 3-liter Tedlar bags from the sampling port located on the vacuum blower discharge stack prior to carbon treatment. The sample was shipped at ambient air temperature under full Chain-of-Custody to GTEL in Concord, California for analysis of BTEX and TPH-as-gasoline in accordance with EPA methods 5030/8020/8015/18.

5.3.2 Combination Air Sparge/Soil Vent Test Results

The final test involved simultaneous operation of both the vent and sparge pilot systems. Monitoring results for the combined test are included in Appendix E and summarized in Table 9. Readings taken during the corresponding vent only and sparge only tests are also presented in Table 9 for comparison.

During the combined test at 43 inches of water vacuum and 7 psi, net positive (pressure) readings were detected in wells PR-2 and MW-8, while negative (vacuum) readings were recorded for the remaining wells. Only by reducing the sparge injection pressure to 5 psi and maintaining a maximum applied vacuum of 43 inches of water, was a net negative induced vacuum observed in all monitoring points at the site.

Air sample analytical data collected during the combined test at 7 psi sparge pressure and 40 inches of water vacuum indicate that benzene concentrations were 650 ug/l in the air effluent, toluene concentrations were 110 ug/l, and TPH-as-gasoline concentrations were 32,000 ug/l. A summary of air sample analytical data obtained during the combined test from well VP-1 is provided in Table 3, and Laboratory Certificates of Analysis, Chain-of-Custody documentation, and QA/QC packages are included in Appendix F.

5.3.3 Combination Air Sparge/Soil Vent Test Conclusions

Based on the results of the combined pilot test, the optimum operating settings for the air sparge and soil vapor extraction systems were determined to be 5 psi sparge pressure and 43 inches of water vacuum. At these settings, the two system components were balanced and a zero or net negative pressure response was observed in surrounding monitor points, indicating that any sparge vapors would be contained by the vacuum system.

Air sample analytical data indicate that mass extraction rates of 0.26 lb/hr benzene, 0.04 lb/hr toluene, and 12.81 lb/hr TPH-as-gasoline were obtained during the combined test while sparging at 7 psi and venting at 40 inches of water vacuum. A comparison of the air analytical data and the hydrocarbon extraction rates for the vent only and the combined air sparge/soil vent test (Tables 3 and 4) reveals that air emission concentrations were 1.2 to 3 times higher during the combined test than for the vent only test. This indicates that sparging in conjunction with venting results in significantly increased levels of VOCs being stripped and recovered from the unsaturated and saturated zones than by venting alone. Emissions calculations are provided in Appendix G and results are summarized in Table 4.

6.0 SITE REMEDIATION

6.1 Remediation Technology

Groundwater Technology, Inc. has identified two approaches to hydrocarbon remediation at 800 Bridge Blvd., S.W.:

- Installation and operation of an air sparge/vapor extraction (ASVE) system to remediate the main body of the hydrocarbon plume; and

- A provision for *insitu* bioreclamation near the downgradient edge of the hydrocarbon plume (if required).

Subsurface hydrocarbons have been identified in the approximate area of the former USTs beneath the southeastern corner of the site, and an ASVE system is proposed for mitigating hydrocarbons in this area. A network of combined ASVE points installed around the perimeter of the former UST area will inject air into the saturated zone, causing dissolved- and adsorbed-phase contaminants in the aquifer to volatilize. The entrained organics will be carried by the air bubbles into the vadose zone, where they will be captured by a vapor extraction system. As an added bonus, the sparged air will maintain high dissolved oxygen, which will enhance natural biodegradation of hydrocarbons.

The results of the air sparge/soil venting pilot tests conducted at the 800 Bridge Blvd., S.W. site indicate that ASVE technology is a feasible and effective means of removing adsorbed- and dissolved-phase hydrocarbons from beneath the site based on the following criteria:

- The contaminant at the site, gasoline (BTEX), is a strippable/ventable and biodegradable compound;

- The contamination extends into the saturated zone. Maximum concentrations of dissolved-phase hydrocarbons beneath the site include 880 ug/l benzene based on the most recent sampling event (August 1992);

- The saturated zone is relatively homogeneous and of high permeability material (coarse to very coarse-grained sand) and is of known minimum thickness of 14 feet (based on the installation of air sparge well AS-1); and

- An effective radius of influence of 30 feet for the air sparge system (at approximately 5 to 10 psi) and an effective radius of influence of 33 feet for the vapor extraction system (at approximately 40 to 43 inches of water) can be induced, as determined by pilot testing at the site.

Dissolved-phase hydrocarbons in excess of state standards (including 24 - 30 ug/l benzene) are present in groundwater off-site as far south as 300 feet, based on the most recent sampling event of June 1992. Active sparging and venting of the main body of the upgradient source may effectively dissect the hydrocarbon plume and aid in mitigating hydrocarbons in groundwater east and south of the site. Oxygen is generally the limiting factor for those systems utilizing aerobic microbial processes. Feeding of atmospheric oxygen into the saturated zone via air spargers which will be installed as part of the upgradient remediation system, may also act to stimulate downgradient biodegradation. The transmissivity and hydraulic conductivity of the aquifer, concurrent with active upgradient remediation, will aid in naturally flushing and/or attenuating hydrocarbon concentrations in the downgradient portions of the aquifer. In addition, air sparging around the perimeter of the main body of the plume will create a barrier (due to mounding) to further off-site groundwater contamination. Because of the site configuration, other methods of active remediation east and south of the site would be difficult to construct and operate, due to the necessity of running recovery lines across or down La Vega Drive.

A passive bioremediation system will be considered for the off-site area to the south if, after six months of operating the upgradient ASVE system, hydrocarbon concentrations in downgradient wells are not found to be diminishing. The bioremediation system will consist of manually adding nutrients to the aquifer via an appropriate number of off-site bioinfiltration wells to augment natural biodegradation.

6.2 Remediation System Design

6.2.1 Air Sparge/Vapor Extraction (ASVE) System

6.2.1.1 System Layout

Based on data obtained during the pilot tests, an ASVE system was designed for the site. Figure 14 presents a schematic of the proposed ASVE system. Preliminary engineering plans for the proposed ASVE system are provided in Appendix H. A corrective action implementation schedule is provided in Table 10. The schedule presents the approximate submittal and projected approval times for the Reclamation Proposal. Based on the projected schedule, assuming no public hearings are required, and depending on the regulatory review process, procurement of equipment, and subcontractor availability, start-up of the remediation system will begin in March 1993.

A pattern of additional air sparge/vent points was developed to provide overlapping influence (negative net pressure) and favorable site coverage for the treatment system. The well spacing was overlain on the area requiring remediation to develop the overall remedial layout. Strategically placed probe nests and wells will also be used to monitor system performance. A complete list of treatment and monitor points to be installed/used at the site is provided below and all well and trench locations are illustrated in Figure 14. ASVE well completion details will be similar to that previously described in Section 4.1 for the pilot test wells:

- 7 air sparge wells (AS-1 through AS-7) (including one existing well from the pilot test, AS-1) will be installed around the perimeter of the gasoline station area (assumed to be the area of highest dissolved- and adsorbed-phase hydrocarbons beneath the site);

- 9 soil vapor extraction wells (including existing wells VP-1, MW-4, and MW-9) will be installed in close proximity to the air sparge wells;

- Horizontal vent wells will be laid in the piping trenches along the south and east side of the site. These wells will be installed at approximately 3 feet in depth and will target remediation of the upper vadoze zone (above the clay layer which occurs at approximately 3 to 6 feet) in this area;

- Horizontal wells currently located in the existing UST area will be located and tied into the soil vapor extraction system; and

- 4 monitor probe nests (PR-1 through PR-4) (including PR-2 and PR-3, previously installed during the pilot tests in August 1992) will be used to monitor remediation response, progress, and periphery conditions, along with select monitor wells already present at the site.

The soil vapor extraction system will consist of four separate legs leading back to the equipment compound:

- One leg servicing proposed wells VP-4 through VP-7;

- A second leg servicing wells MW-9, VP-1, MW-4, VP-2, and VP-3;

- A third leg serving the lateral vent well on the southern and eastern perimeter of the property; and

- A fourth leg servicing the horizontal tank pit wells.

The air sparge system will consist of three separate legs leading back to the equipment compound:

- One leg servicing proposed wells AS-6 and AS-7;

- A second leg servicing proposed wells AS-4 and AS-5; and

- A third leg servicing AS-1 through AS-3.

Because adsorbed-and dissolved-phase hydrocarbon data is insufficient for the northwest half of the site, the actual installation of the proposed north and west legs of the ASVE system will be contingent on field conditions encountered during the drilling of these wells. The four vapor extraction wells proposed for the north and west legs will be drilled first (VP-4 through VP-7). If PID screening of soil samples yields VOC concentrations in excess of 100 ppm, the wells will be completed as 4-inch diameter vapor extraction wells. If PID results are less than 100 ppm, then 2-

inch diameter monitor/vapor extraction wells will be completed in the boreholes. Water and soil samples will be collected from the wells and submitted for BTEX and TPH-as-gasoline analysis. If dissolved hydrocarbons in the wells are in excess of state standards, then the proposed air sparge wells (AS-4 through AS-7) will subsequently be installed, and both the sparge wells and the 2 or 4-inch diameter vapor extraction wells will be plumbed into the remediation system. If adsorbed-and dissolved-phase hydrocarbons are below state standards, then the four wells installed on the north and west sides of the station will be used for up- and side-gradient groundwater monitoring wells.

Four-inch diameter, schedule 40 PVC subgrade vacuum air lines will lead from the vent wells to the equipment compound. The vacuum air lines will connect to the vent wells and each well will be fitted with a ball valve for controlling individual well air streams and a 1/4-inch diameter PVC labcock sampling/monitoring port. Each vent wellhead and ball valve assembly will be completed within a 12-inch diameter traffic-rated manhole. The vacuum air lines along each leg will then be manifolded together and will lead back to the equipment compound.

One-and a-half inch diameter steel air sparge pressure lines will be connected to each of the sparge wells. At each of the wellheads, the air line will be fitted with a pressure regulator for controlling injection pressure and a flow meter for monitoring air flow rate. The sparge air lines along each leg will then be manifolded together and will lead back to the equipment compound.

All vacuum and pressure lines will be buried two to four feet below grade in the same trench. At the equipment compound, the vacuum and air pressure lines will stub-up above grade and will be manifolded to the soil vacuum and air sparge blowers, respectively. All remediation equipment, including the air sparge and vacuum blowers, the air treatment equipment, and the control panels, will be located within a fenced equipment compound in the southwestern corner of the site (Figure 14).

6.2.1.2 Equipment Specifications

The vent system will be operated at 43 inches of water vacuum and 100 scfm per vapor well for a total flow of 500 scfm. Venting will be accomplished using a 10 Hp explosion-proof (XP) soil vent system blower with a capacity of 500 scfm at 60 inches of water column. Influent vacuum/flow rate will be controlled with an ambient air intake valve. A liquid knockout tank, particulate filter, and muffler will be placed on the influent line to eliminate or reduce water generated during system

operation, solids, and noise, respectively. Sampling/monitoring ports will be placed before the blower and after the air treatment unit to monitor the air influent and effluent for chemical and physical parameters.

The sparge system will be operated at 5 psi and a flow of 10 scfm per sparge well for a total flow of 70 scfm. The sparge air will be provided by a 5 Hp liquid ring pump capable of delivering 70 scfm at 10 psi. System pressure will be controlled with a valve on the ambient air discharge line placed on the pressure side of the sparge blower. Noise reduction mufflers will also be placed on the discharge lines of the system.

Based on the results of the air sparge/soil venting pilot tests, air emission rates of approximately 10 to 13 lb/hr total petroleum hydrocarbons (as gasoline) can be expected from the ASVE remediation system installed at this site. Initial lower explosive limit (LEL) values of 100% were obtained on the air emissions from the vent test. Based on the LEL value and air analytical data collected during the pilot tests, a thermal oxidation unit is recommended for treating air emissions at the site. A heat exchanger and a catalytic module are also tentatively recommended as "add-ons" to the thermal oxidation unit, to conserve operating fuel and thereby control operating costs. The catalytic module would allow for use of a second, built-in and more cost-effective treatment technology after active venting has progressed and LEL levels have dropped below 30%.

The off-gas treatment specified for the site will consist of one natural gas-fired 230 VAC, 3 phase, 500 scfm thermal oxidizer. The oxidizer will be equipped with the housing for a catalytic element for possible future service should influent LEL concentrations stabilize at 20 - 30% LEL or lower. The thermal oxidizer will be rated for a 99% or greater destruction efficiency for non-methane hydrocarbons. The purge blower will be rated XP for mounting in Class I, Division 2 area, and the electrical control panel will be purged to meet NFPA Code 496 or will be mounted outside the hazardous classified area.

6.2.2 Insitu Bioreclamation System

If, after operation of the upgradient ASVE system for a six month period, hydrocarbon concentrations in wells near the downgradient edge of the plume (Figure 5) have not decreased or have increased, then an *insitu* bioreclamation system will be installed at the site. If concentrations are found to be diminishing, then quarterly monitoring of the downgradient wells, in conjunction with active remediation of the upgradient hydrocarbon source beneath the Barelas Bridge site will continue.

6.2.2.1 Biodegradation Feasibility Study

Before the field application of the *insitu* groundwater bioreclamation system (if necessary), the groundwater quality in the downgradient portion of the site will be assessed with respect to chemical and physical parameters, bacterial enumeration, and contaminant concentrations. A laboratory pilot study will be conducted to discern the biodegradability of the residual hydrocarbons and the subsurface parameters (nutrients) necessary to stimulate maximum degradation in the groundwater south of the site. Groundwater samples will be collected from select monitor wells and analyzed for microbiology (plate counts), hydrocarbon utilizers, inorganic chemical constituents, pH, conductivity, temperature, and dissolved oxygen levels. These data will also be used to form a baseline for later comparison during the biodegradation program.

6.2.2.2 System Design

Based on the results of the laboratory feasibility study, an *insitu* bioremediation system will be designed to mitigate the southern, off-site portion of the hydrocarbon plume. The passive bioremediation system will consist of manually adding nutrients into the saturated zone via strategically-placed infiltration wells to enhance natural biodegradation. The nutrients necessary to stimulate biodegradation (generally phosphorous and nitrogen) will be supplied to the groundwater as a nutrient/water mix via infiltration wells located 50 to 100 feet upgradient of the toe of the plume. Phosphorous will be supplied in one of several forms; common sources for groundwater augmentation are orthophosphate and polyphosphate salts. Common supplies of nitrogen sources are ammonium salts. If additional oxygen must be supplied to supplement the upgradient air spargers, then oxygen in the form of hydrogen peroxide will be added through the infiltration wells. Batch doses of nutrient mix will be followed with water to flush the nutrients into the formation.

MW-1 through MW-3 will be used as monitor wells downgradient of the bioinfiltration wells. These wells will be monitored for groundwater quality (dissolved oxygen, pH, inorganic water chemistry, organic water chemistry, and bacterial enumeration) during initial start-up to establish subsurface transport patterns, nutrient transport times, oxygen consumption rates, and contaminant degradation rates. Throughout operation, quarterly monitoring will ensure that optimum conditions are being maintained in the subsurface to affect maximum degradation rates. Select private wells will be monitored closely to ensure that inorganic water quality is not adversely impacted due to the nutrient augmentation.

7.0 REMEDIATION SYSTEM MONITORING AND MAINTENANCE

7.1 Monitoring and Maintenance

During start-up (a 1-week period), the remediation system will be monitored for LEL, effluent emissions concentrations, PID, pressure/vacuum, and depth-to-water readings at the monitor probes, operating temperature at the treatment unit, and air velocity through the system. Groundwater Technology recommends operation of the vacuum extraction system only during the first few months following start-up to remediate those areas of the site containing the highest concentrations of hydrocarbons (i.e. from the horizontal wells in the existing UST area and from the horizontal and vertical wells installed along the south and east sides of the property). Based on a maximum design capacity of 500 scfm, a total of approximately five vertical vapor extraction wells, or the horizontal tank pit wells, or the south and east perimeter horizontal wells can be operated at one time. The vacuum extraction system will be optimized to maximize hydrocarbon influent emissions. Valving adjustments will be made at the individual wells to direct greater vacuum to those areas yielding higher hydrocarbon concentrations.

Operation of the vent system only during the first few months will remove the highest, most volatile hydrocarbon concentrations from the subsurface and will reduce the risk of mobilizing hydrocarbons (possibly including methane) off-site when the sparge system is turned on. Following the first few months of venting only and after air emissions from the vent system have decreased, the sparge system will be put in operation. Sparge wells will only be operated in conjunction with their corresponding vapor extraction wells, so that all VOCs generated as a result of sparging will be captured and contained by the vent system. If water table mounding or VOC concentrations in peripheral probes and monitor wells indicate possible downgradient mobilization of dissolved or VOCs by the ASVE system, then the system vacuum rates and sparge pressures will be adjusted to compensate.

Prior to start-up, one complete round of groundwater samples will be collected to determine baseline concentrations for BTEX and TPH-as-gasoline analysis from select monitor and vapor extraction wells. Air emissions samples will also be collected from the influent and effluent air streams for baseline data on the system. After installation and start-up, the system will be monitored twice monthly, and air samples will be collected as required by the AEHD permit (assumed to be quarterly).

The maintenance and monitoring schedule for the proposed remediation system is provided in Table 11. The schedule is designed to comply with applicable permits and regulations, to maintain the system in proper working condition, and to protect human health and the environment. Groundwater Technology anticipates twice-monthly maintenance and monitoring visits following initial system start-up and adjustment.

Twice-Monthly Maintenance and Monitoring:

- Air sparging/vapor extraction blower pressures and air flow rates;
- PID/LEL and temperature readings of air sparge/vapor extraction total emissions influent and effluent; and
- Draining of moisture knock-out drums and inspection of equipment and aboveground line connections for leaks or malfunction.

Monthly Maintenance and Monitoring:

- Induced vacuum, pressure, and flow rates at vacuum extraction and air sparge wells;
- PID, DO, and vacuum/pressure readings at nested monitor probes and surrounding monitor wells to gauge effectiveness of the ASVE system;
- Fluid-level measurements in all on- and off-site monitor wells; and
- Manually add nutrients to infiltration wells, depending on dispersion rates (if necessary).

Quarterly Maintenance and Monitoring:

- Collection and analysis of influent and effluent air samples to/from air treatment unit for BTEX and TPH-as-gasoline;
- Water quality sampling in monitor and private wells (12 wells total) to gauge remediation progress and containment of soil vapors and dissolved hydrocarbons by the ASVE system, and in downgradient wells to monitor levels of organic and if necessary, inorganic water quality; and
- Dosing of infiltration wells with dilute H_2O to prevent bio-growth and fouling in the bioinfiltration points (if installed).

7.2 Reporting

In accordance with NMEIB/USTR 1216, quarterly reports will be prepared for the system. The reports will document all work performed during the preceding quarter and will include the following information:

- Copies of all air and water quality analyses;
- Field logs of all groundwater and remediation system monitoring and maintenance conducted at the site;
- A report on the performance and efficiency of each aspect of the system;
- Hydrographs, dissolved-phase hydrocarbon concentration maps, groundwater contour maps; and
- An estimate of the total quantity of hydrocarbons removed from the site based on ASVE removal rates.

The reports will be prepared for submittal to the NMED three months after the date the preceding report was due.

Groundwater Technology will also prepare and submit all necessary monthly and quarterly reports required for the operating permits for the system, including:

- Quarterly reports to the AEHD Air Quality Program, reporting the influent and effluent concentrations to/from the air treatment unit; and
- Quarterly reports to the NMED Groundwater Bureau for discharge permit for infiltration wells (if necessary).

7.3 QA/QC Procedures

All air and groundwater samples collected and submitted for laboratory analysis during the course of site monitoring will be handled and analyzed in accordance with recommended EPA methods for the collection and analysis of environmental samples (EPA, 1986). A synopsis of the GTEL Environmental Laboratories QA/QC plan is provided in Appendix I. The EPA proficiency test results (WP Series) for the period December 1989 to June 1991 for GTEL are also included in Appendix I.

Sample containers, preservation techniques, and sample holding times are dependent upon the analyte of interest and analytical methods, and are listed by sample matrix and EPA method in Appendix I, pages 6 through 10. All samples will be logged on a Chain-of-Custody form that will remain with the samples from point of origin to time of disposal. A sample Chain-of-Custody form is included in Appendix I.

8.0 CONTINGENCY PLAN AND CLOSURE CRITERIA

Because the system will be unmanned and inspected on a twice-monthly basis, safety interlocks will be provided to protect the equipment and to signal the operator in case of system failure. The vent blower will be of XP design and will be equipped with thermal overload motor protection. The sparge blower will be non-XP and located outside the Class I, Division II hazardous area. All electrical control panels will either be purged, XP-rated, or located outside of the classified hazardous area. The thermal oxidizer will also contain several built-in safety features including a flame arrestor on the inlet line, and alarm/automatic shutdown components for low or high gas pressure, process or combustion blower failure, loss of panel pressure, high temperature, or loss of flame. The controls for the sparge blower, vent blower, and the thermal oxidizer will be interactive such that if either the vent blower or the thermal oxidizer shuts down, all ASVE system components will automatically cease operation.

The ASVE will operate for a period of approximately six months to two years. As is typical of an ASVE, the mass removal rate of hydrocarbons by the system will decrease with time. Plots of the hydrocarbon mass removal rate versus time will be prepared from the air quality samples collected each quarter and when it is determined that no significant quantities of hydrocarbons are being removed by the system, then the system will be evaluated and modified as necessary. If at this time, levels of applicable dissolved hydrocarbon (BTEX) concentrations are below New Mexico Water Quality Control Commission (NMWQCC) Part III standards, then it will be recommended that the NMED consider approval to terminate ASVE operation pursuant to NMEIB/USTR Part XII, Section 1219. Soil borings will be drilled in the areas of former highest hydrocarbon concentrations to demonstrate that adsorbed-phase hydrocarbon concentrations have been reduced to a level which will not recontaminate the groundwater. In accordance with NMEIB/USTR Part XII, Section 1219, groundwater monitoring will then continue until the NMWQCC standards have been met in at least four compliance wells for eight consecutive quarters. When all remediation criteria have been met, the site will be submitted for consideration for closure.

9.0 REGULATORY REQUIREMENTS

Remedial action at the 800 Bridge Blvd., S.W. site is regulated by the NMED/USTB in accordance with NMEIB/USTR, Part XII, Sections 1212 through 1222. Operation, monitoring, and maintenance of the remediation system is also regulated by NMEIB/USTR, Part XII.

Air emissions from the ASVE system are regulated by the Albuquerque Bernalillo County/Air Quality Control Board (ABC/AQCB), and the regulations are administered by the AEHD Air Pollution Control Division (APCD) in the City of Albuquerque. Stationary sources emitting air pollutants in excess of city, county, state, or federal ambient air standards are required to obtain an air quality construction permit if the emission rate of a regulated air contaminant is greater than 10 pounds per hour, or if significant amounts of classified hazardous air pollutants for which no numeric standards have been promulgated (e.g. benzene) are emitted (ABC/AQCB, Regulation No. 20). The Application for Air Quality Construction Permit for the ASVE system will tentatively be submitted to the AEHD/APCD on or before December 14, 1992. Approval of the permit application is anticipated in 60 to 90 days from the submittal date, however, the ABC/AQCB regulations allow a time period of up to 120 days following submittal of a complete application prior to granting or disapproving a permit application.

If necessary, in compliance with NMWQCC Regulations 1-201 and 3-106, a discharge permit application will be prepared for the passive bioinfiltration wells for submittal to the NMEID Groundwater Bureau. The permit application will specify the concentrations of nutrients to be added, and a monitoring schedule to ensure that groundwater quality is not impacted by remediation activities. A Notice of Intent to Discharge and a request to allow temporary batch-feeding of nutrients to the infiltration wells will initially be submitted to the NMEID Groundwater Bureau, followed by a complete discharge permit application.

In addition, equipment compound construction will be in compliance with applicable City of Albuquerque zoning and building ordinances. Additional inspections by the Fire Marshall's office or utility companies (natural gas and electric) will be arranged if required. An access permit to install monitor probes and/or bio-infiltration wells located on off-site property to the south will be the responsibility of the NMED/USTB.

10.0 REFERENCES

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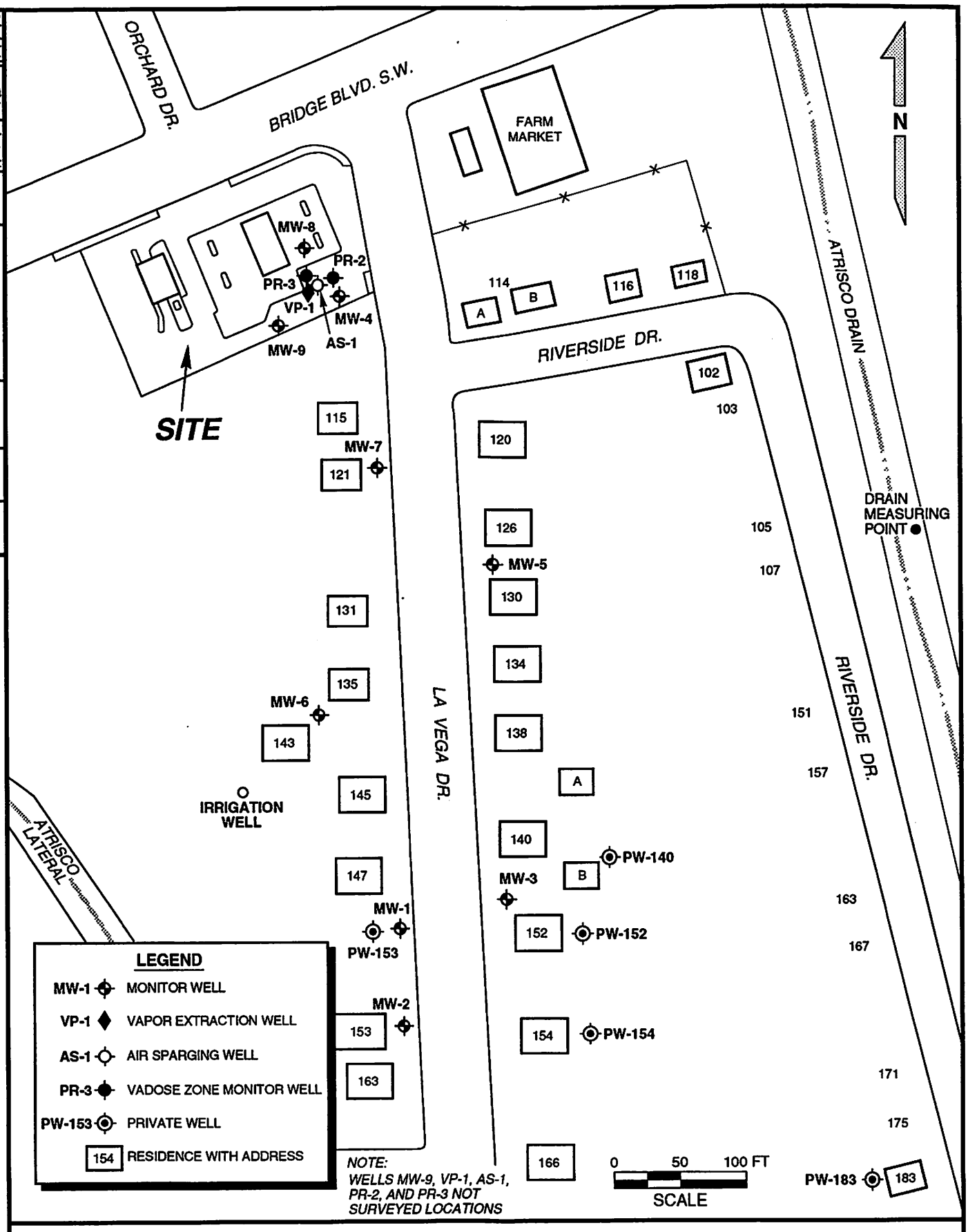

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EF 11/3/92		023352875	TB 11-17-92	TB 11-19-92

NMED / 800 BRIDGE BLVD. S.W.

FIGURE 1

SITE VICINITY MAP

LOCATION: ALBUQUERQUE, NEW MEXICO PROJECT NO.: 023352875

GROUNDWATER TECHNOLOGY

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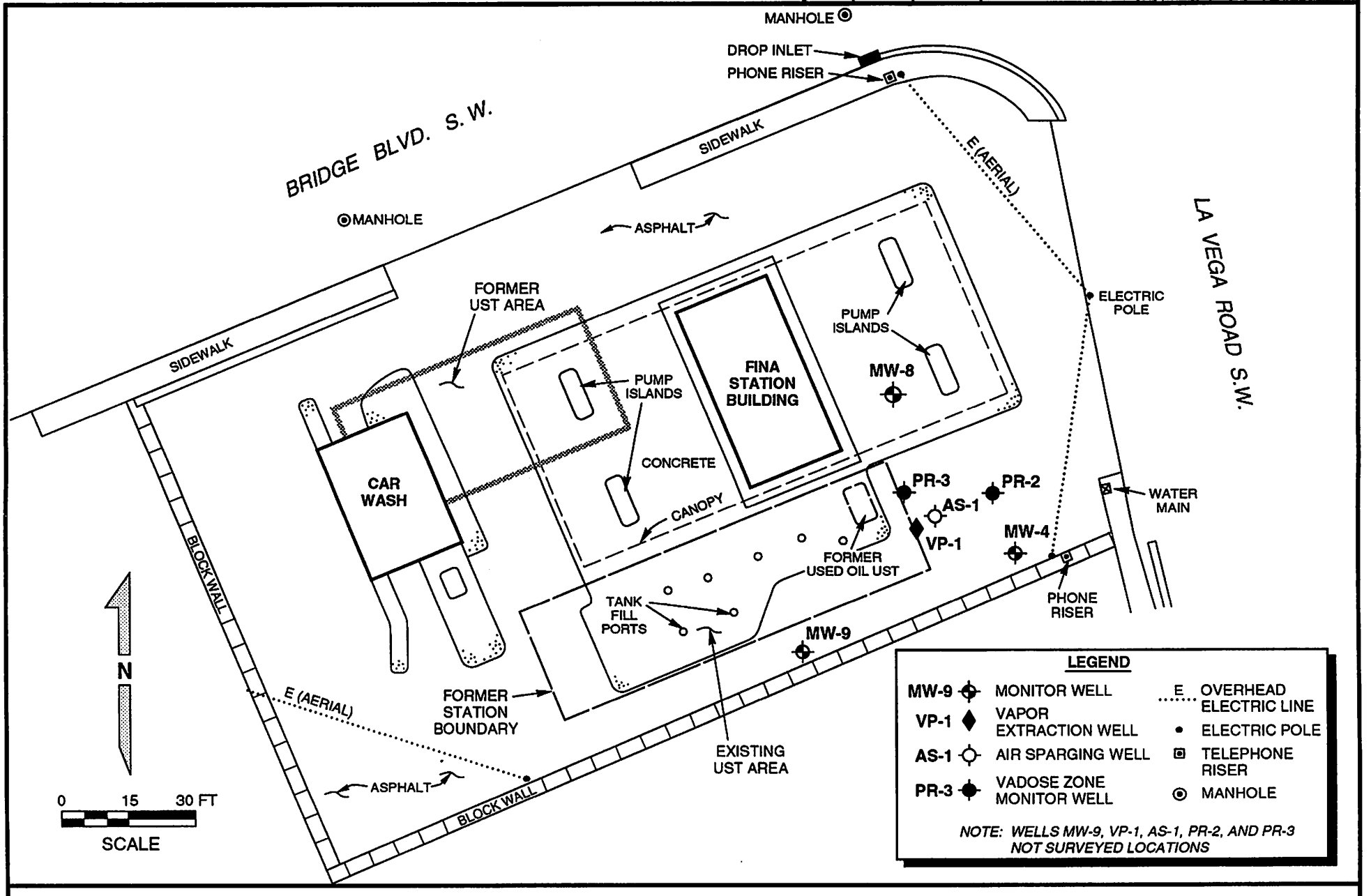

NMED / 800 BRIDGE BLVD. S.W.

FIGURE 2

SITE MAP

LOCATION: ALBUQUERQUE, NEW MEXICO

PROJECT NO.: 023352875

GROUNDWATER TECHNOLOGY

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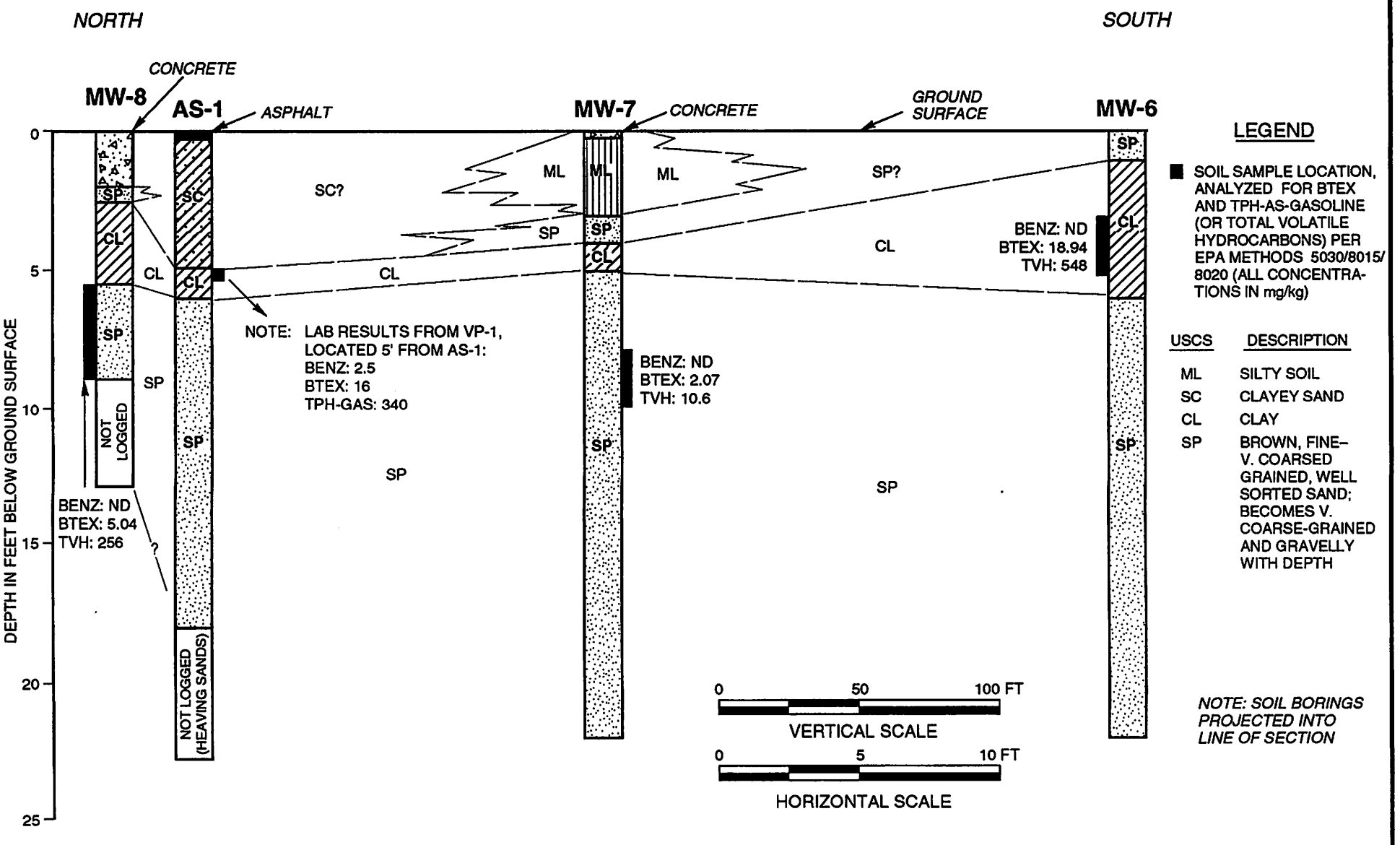


NMED / 800 BRIDGE BLVD. SW

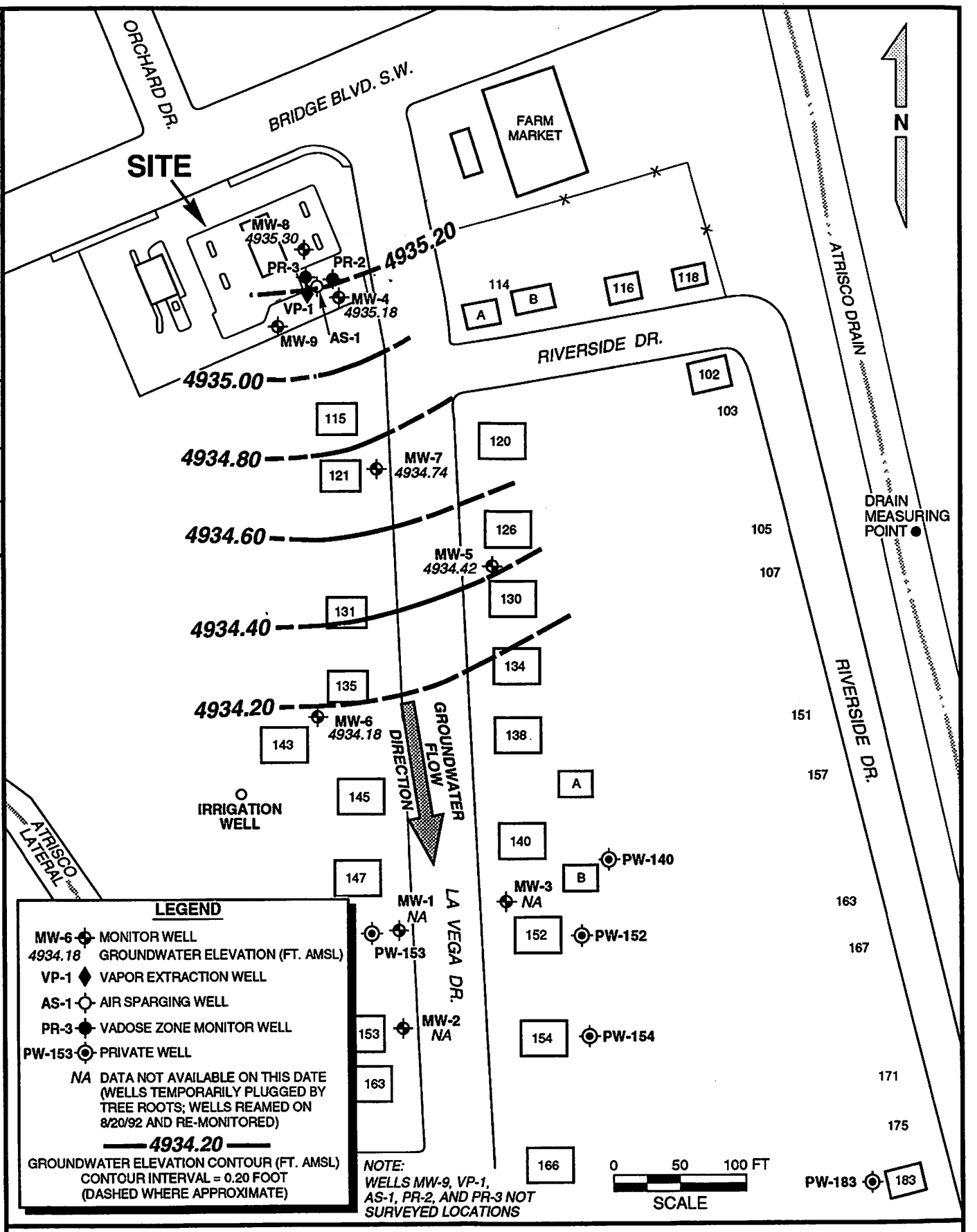
GEOLOGIC CROSS-SECTION

FIGURE 3

LOCATION: ALBUQUERQUE, N.M.

PROJECT NO.: 023352875

GROUNDWATER TECHNOLOGY



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NMED / 800 BRIDGE BLVD. S.W.

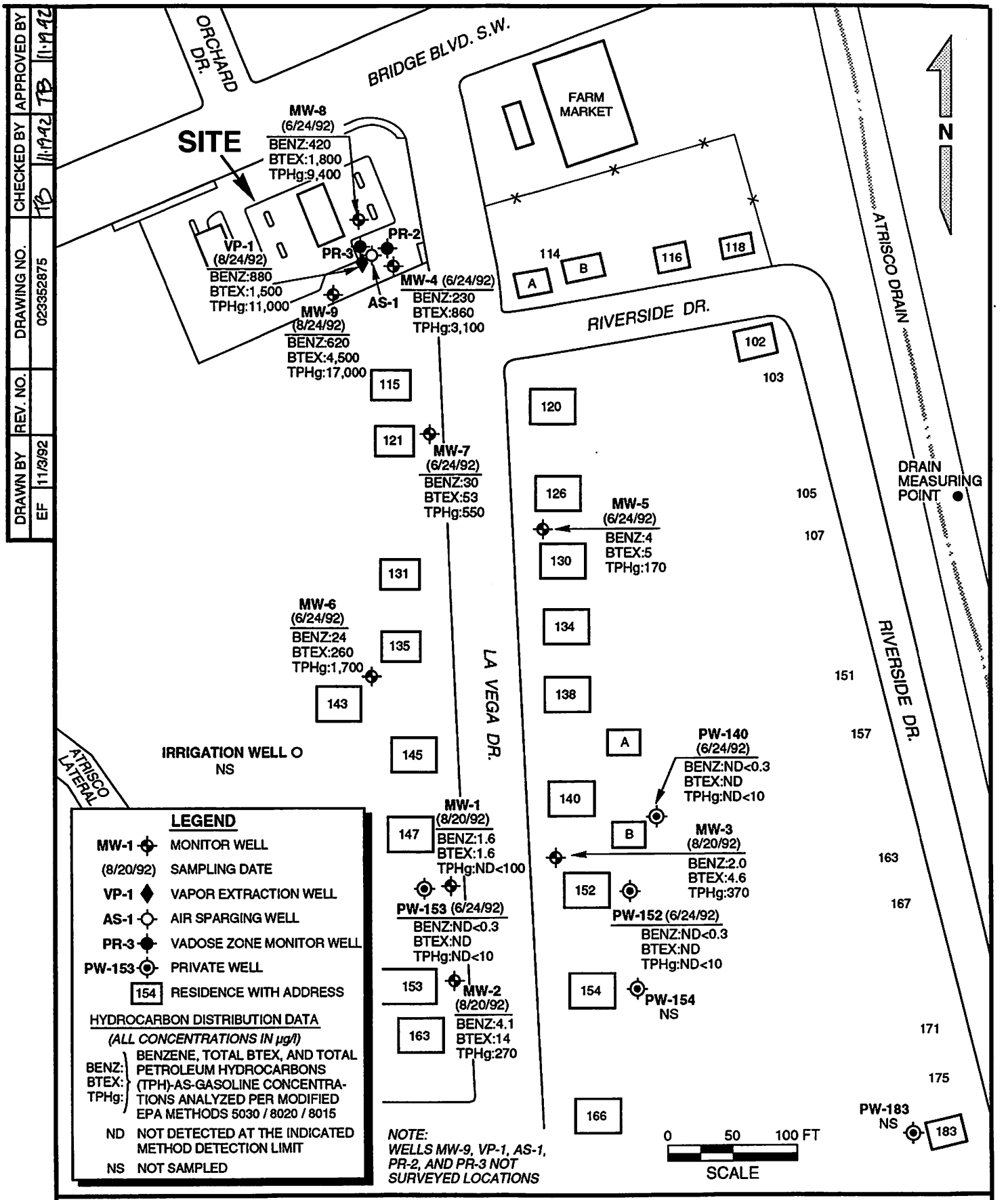
GROUNDWATER ELEVATION CONTOUR MAP

MONITORING DATE: JUNE 24, 1992

FIGURE 4

LOCATION: ALBUQUERQUE, NEW MEXICO PROJECT NO.: 023352875

GROUNDWATER TECHNOLOGY



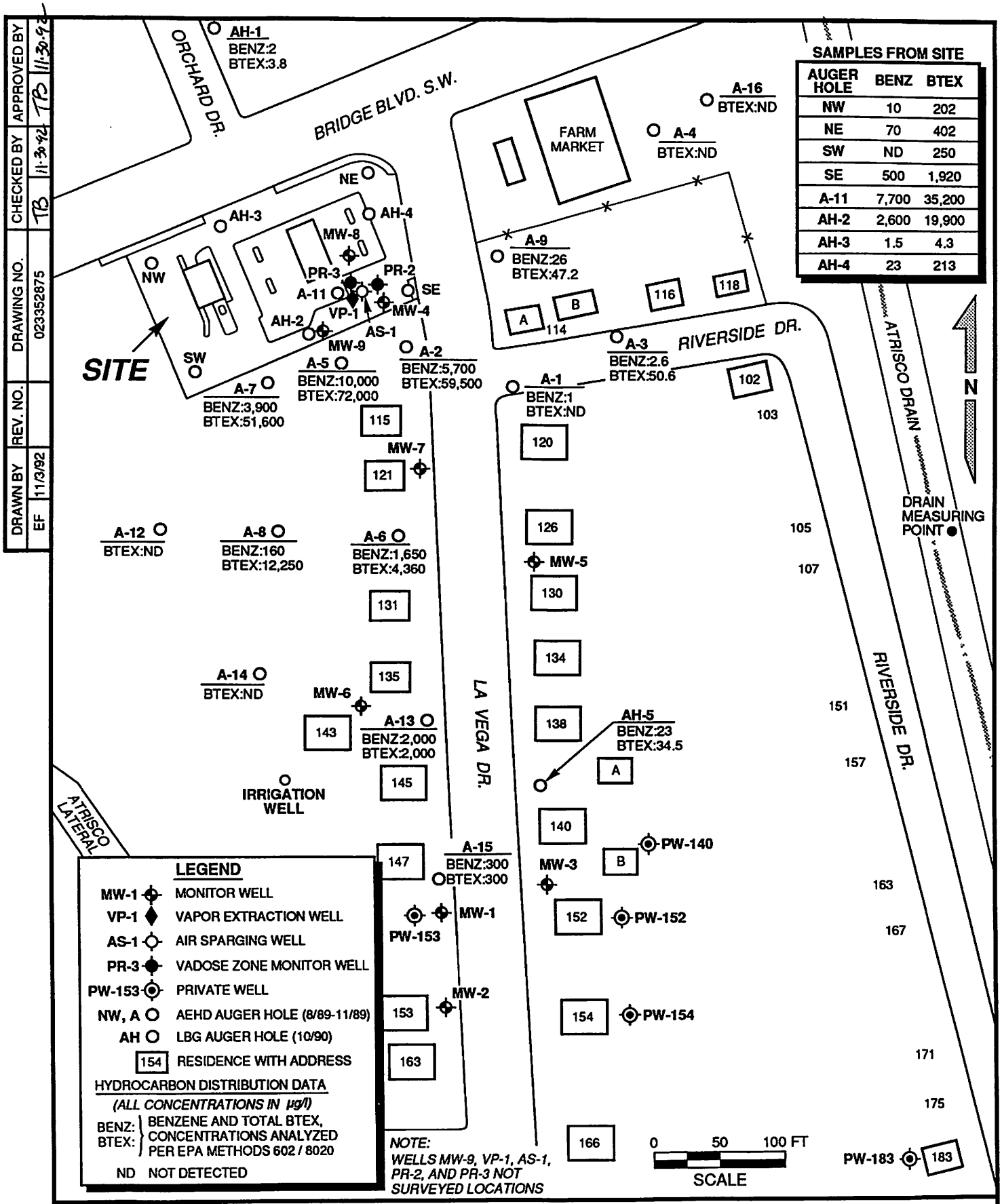
NMED / 800 BRIDGE BLVD. S.W.

DISSOLVED-PHASE HYDROCARBON DISTRIBUTION MAP

FIGURE 5

LOCATION: ALBUQUERQUE, NEW MEXICO PROJECT NO.: 023352875

GROUNDWATER TECHNOLOGY



SAMPLES FROM SITE

AUGER HOLE	BENZ	BTEX
NW	10	202
NE	70	402
SW	ND	250
SE	500	1,920
A-11	7,700	35,200
AH-2	2,600	19,900
AH-3	1.5	4.3
AH-4	23	213

NMED / 800 BRIDGE BLVD. S.W.

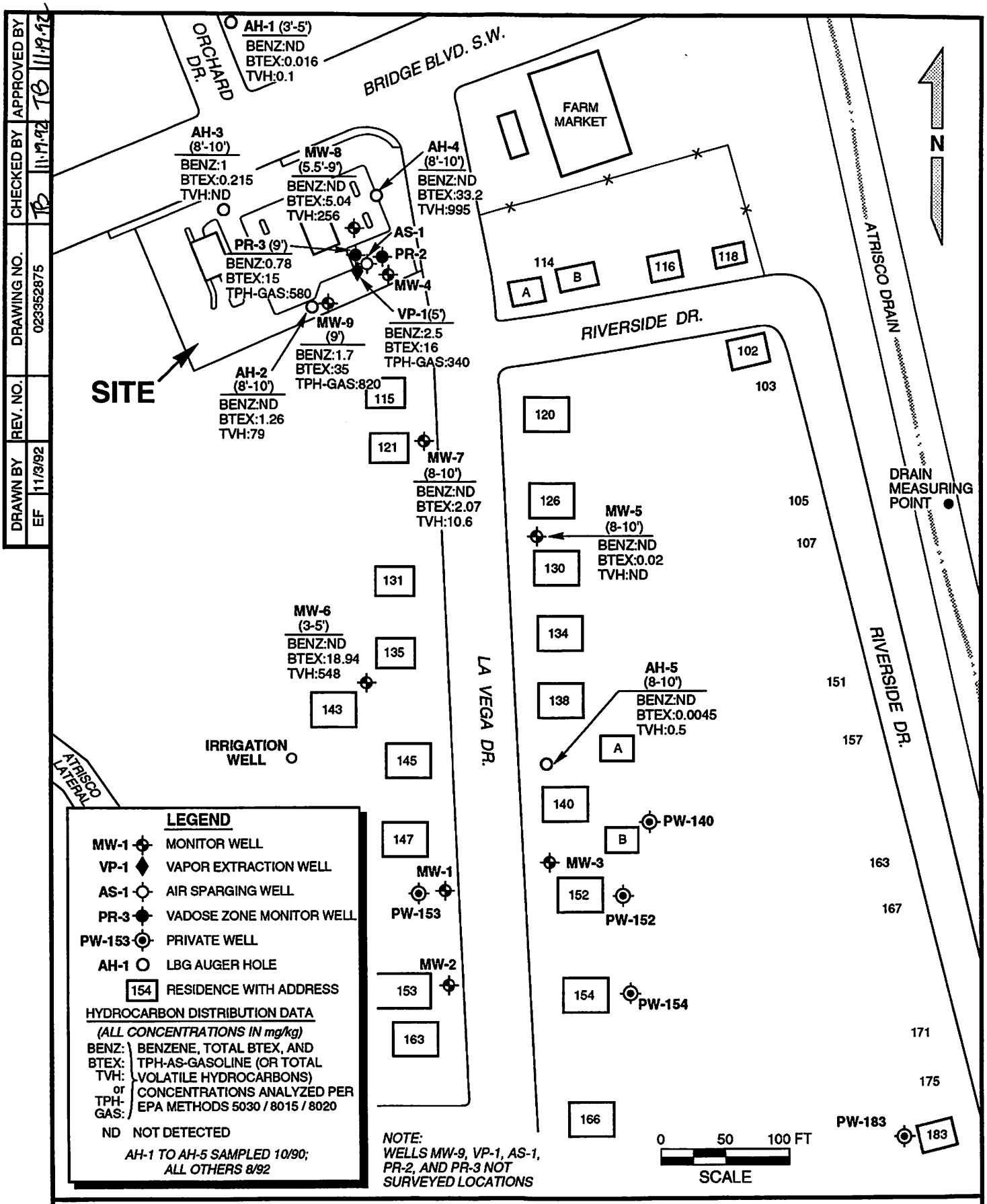
HYDROCARBON CONCENTRATIONS IN WATER

BASED ON AUGER HOLE DATA, 1989-1990

FIGURE 6

LOCATION: ALBUQUERQUE, NEW MEXICO PROJECT NO.: 023352875

GROUNDWATER TECHNOLOGY



NMED / 800 BRIDGE BLVD. S.W.

ADSORBED-PHASE HYDROCARBON DISTRIBUTION MAP

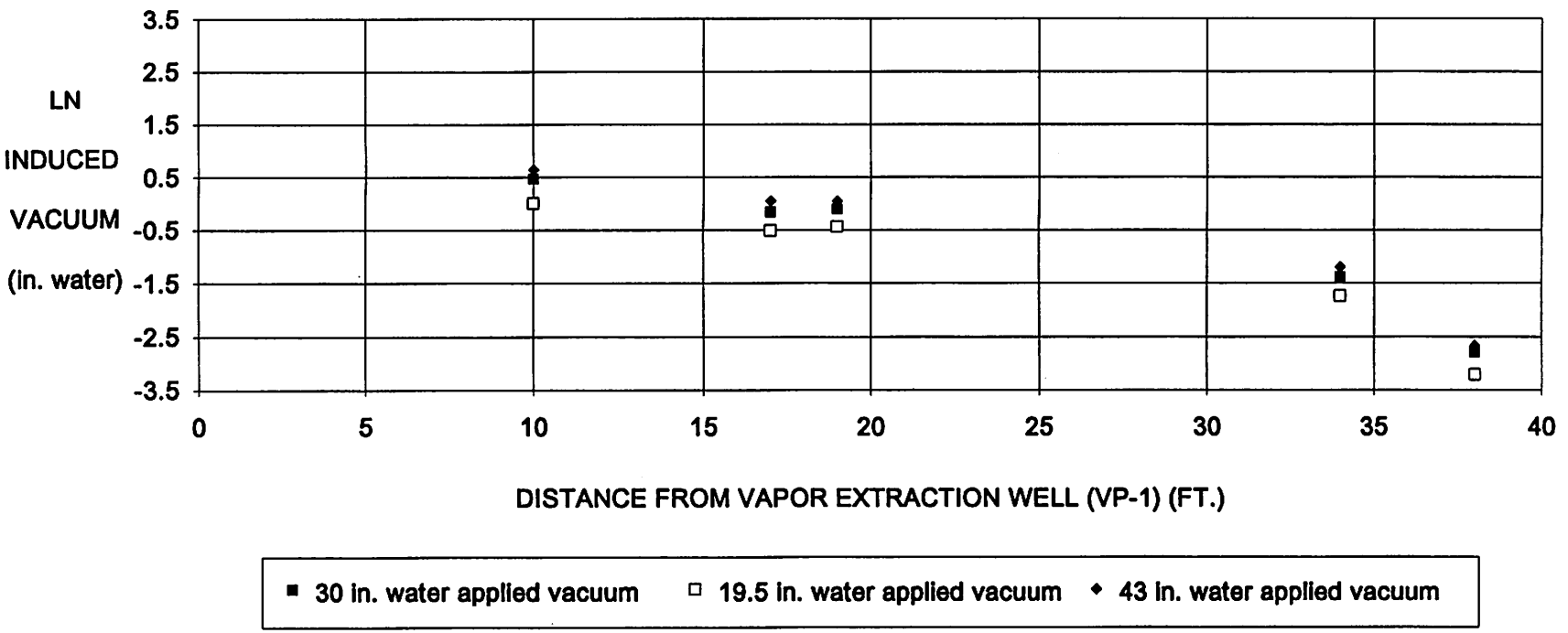
SAMPLING DATES: OCTOBER 1990 AND AUGUST 1992

FIGURE 7

LOCATION: ALBUQUERQUE, NEW MEXICO PROJECT NO.: 023352875

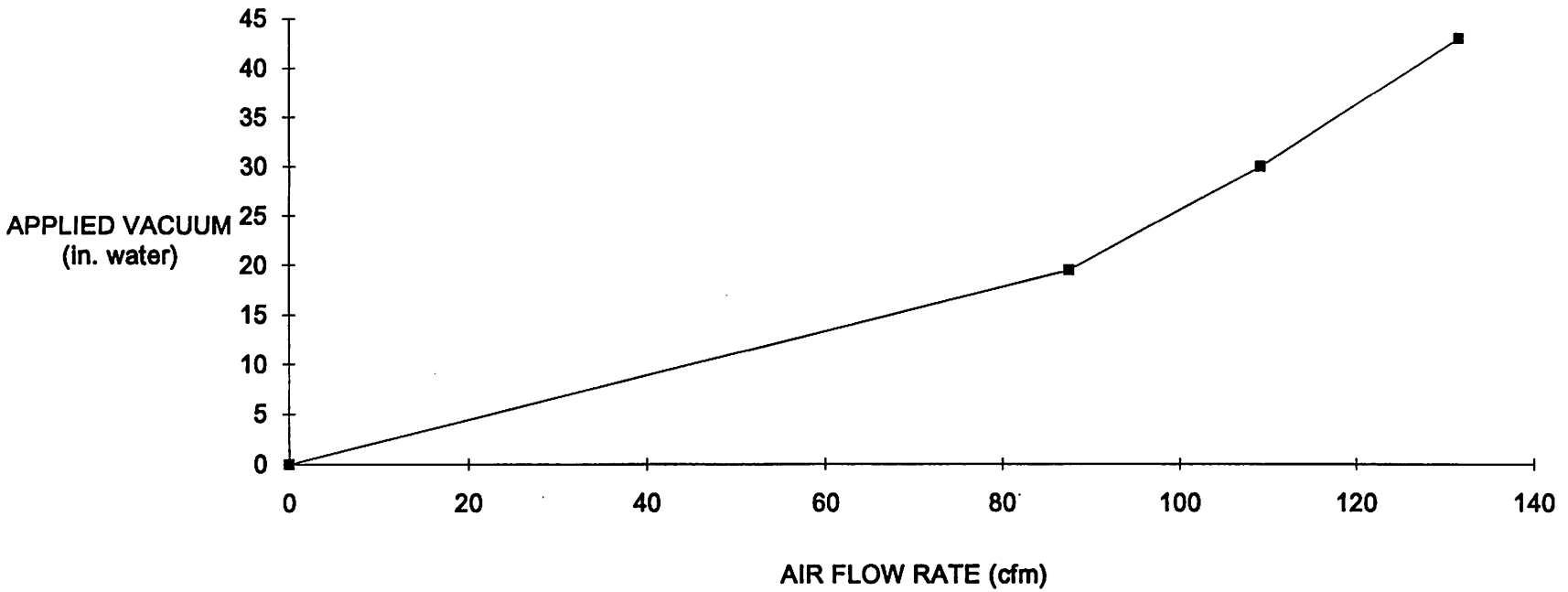
GROUNDWATER TECHNOLOGY

FIGURE 8
LN OF INDUCED VACUUM VS. DISTANCE
SOIL VENT PILOT TEST
BARELAS BRIDGE GWPA SITE
AUGUST 26, 1992



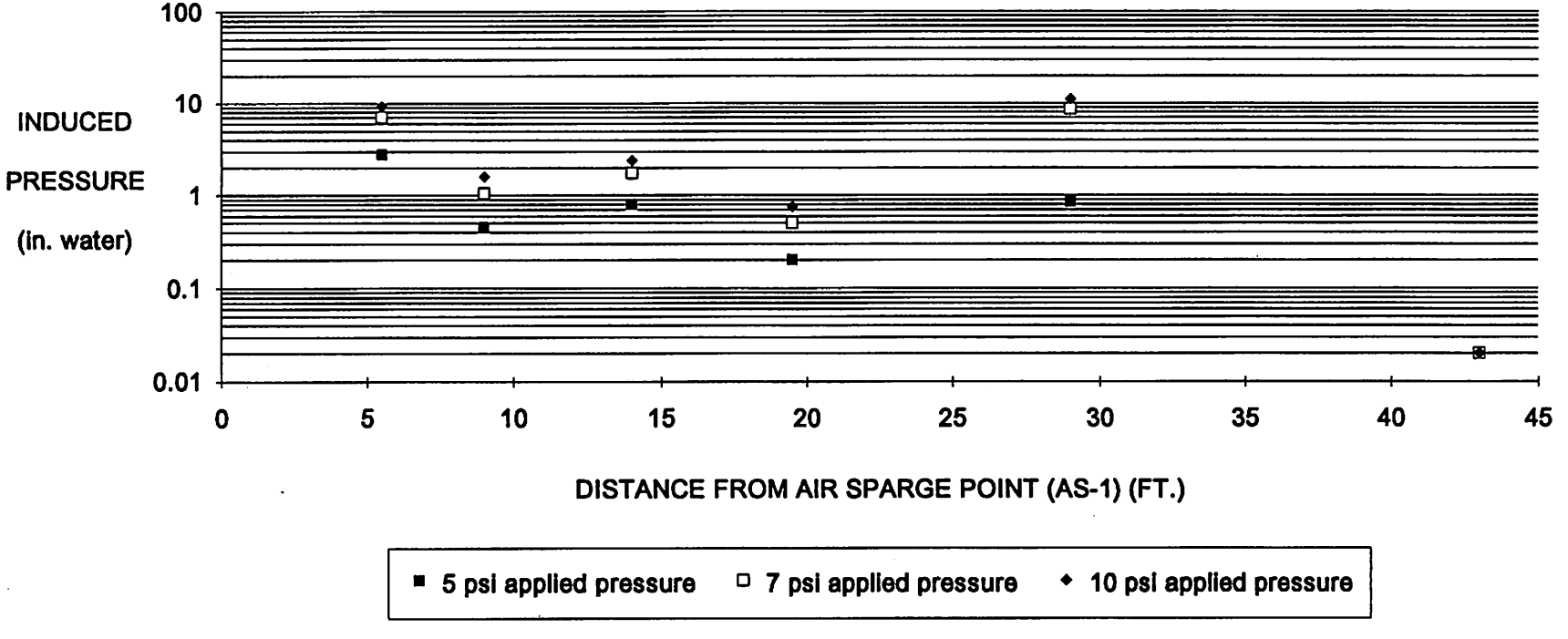
GROUNDWATER TECHNOLOGY

FIGURE 9
APPLIED VACUUM VS. AIR FLOW RATE
SOIL VENT PILOT TEST
BARELAS BRIDGE GWPA SITE
AUGUST 26, 1992



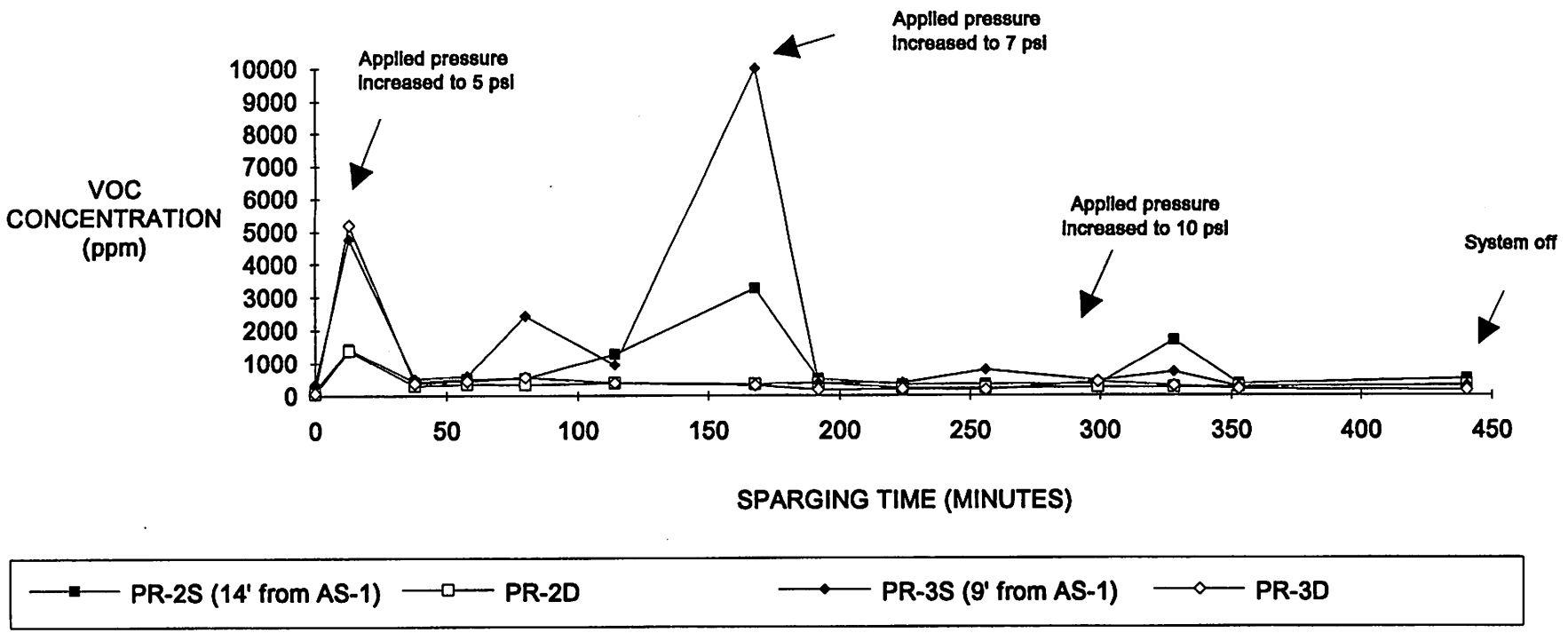
GROUNDWATER TECHNOLOGY

FIGURE 10
INDUCED PRESSURE VS. DISTANCE
AIR SPARGE PILOT TEST
BARELAS BRIDGE GWPA SITE
AUGUST 25, 1992



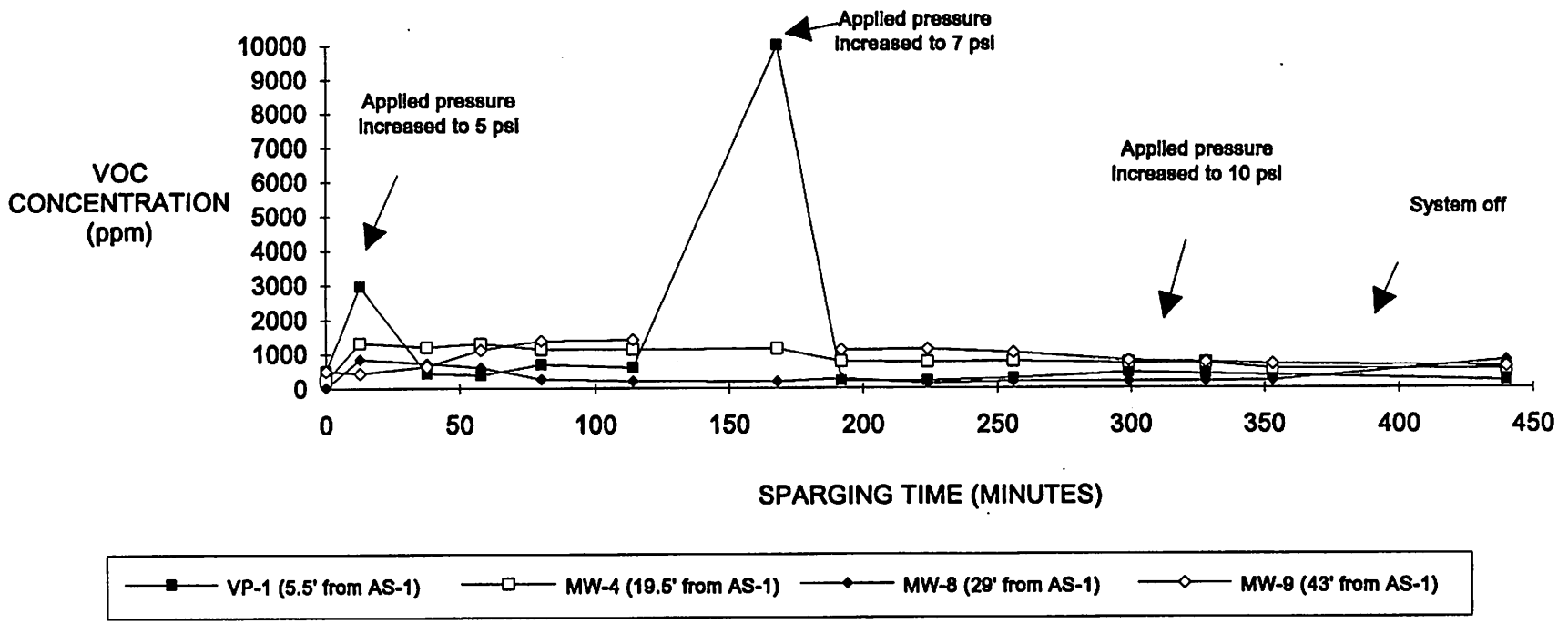
GROUNDWATER TECHNOLOGY

FIGURE 11
VOC CONCENTRATIONS VS. TIME FOR PR MONITOR POINTS AIR SPARGE PILOT TEST BARELAS BRIDGE GWPA SITE AUGUST 25, 1992



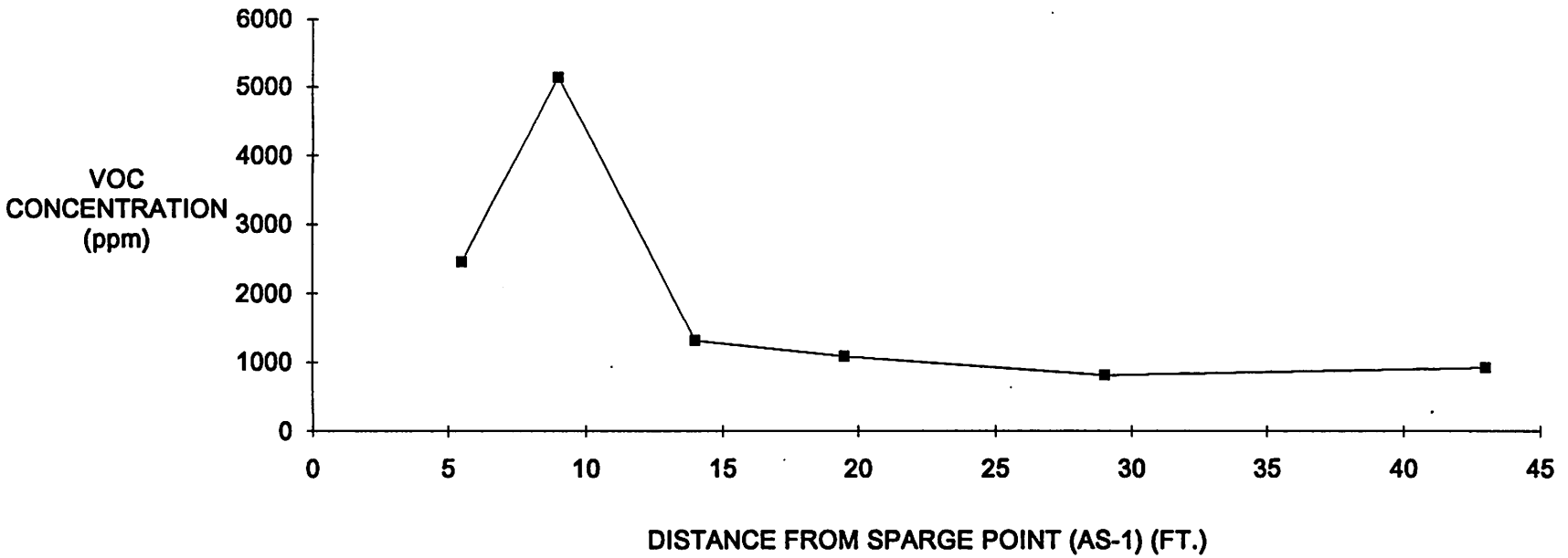
GROUNDWATER TECHNOLOGY

FIGURE 12
VOC CONCENTRATIONS VS. TIME FOR MONITOR WELLS AIR SPARGE PILOT TEST BARELAS BRIDGE GWPA SITE AUGUST 25, 1992



GROUNDWATER TECHNOLOGY

FIGURE 13
MAXIMUM CHANGE IN VOC CONCENTRATIONS VS. DISTANCE
AT 5 PSI APPLIED AIR SPARGE PRESSURE
AIR SPARGE PILOT TEST
BARELAS BRIDGE GWPA SITE
AUGUST 25, 1992



GROUNDWATER
TECHNOLOGY

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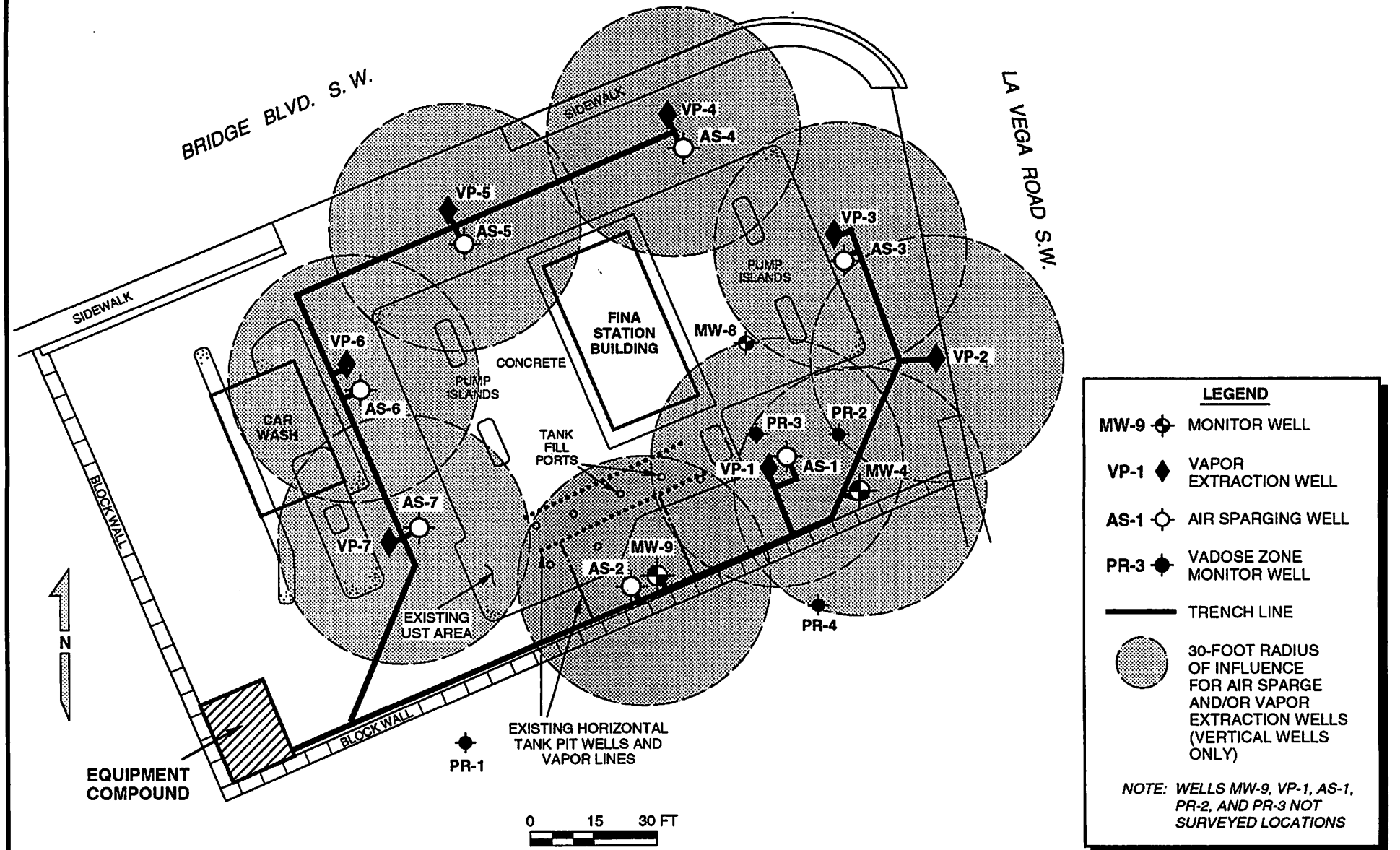

NMED / 800 BRIDGE BLVD. S.W.

REMEDIATION SYSTEM SITE PLAN AND RADII OF INFLUENCE OF ASVE WELLS

FIGURE 14

LOCATION: ALBUQUERQUE, NEW MEXICO

PROJECT NO.: 023352875

GROUNDWATER TECHNOLOGY

TABLE 1

SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS[1]
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO
JUNE 24, AUGUST 20, AND AUGUST 24-25, 1992

SAMPLE (WELL) ID	BENZENE (ug/l)	TOLUENE (ug/l)	ETHYL-BENZENE (ug/l)	TOTAL XYLENES (ug/l)	TOTAL BTEX (ug/l)	TPH-AS-GASOLINE (ug/l)
MW-3	ND[2]	ND	ND	ND	ND	46
MW-4	230	7	200	420	860	3,100
MW-5	4	ND	0.5	0.7	5	170
MW-6	24	50	44	140	260	1,700
MW-7	30	0.3	8	15	53	550
MW-8	420	82	720	580	1,800	9,400
PW-140	ND	ND	ND	ND	ND	ND
PW-152	ND	ND	ND	ND	ND	ND
PW-153	ND	ND	ND	ND	ND	ND
MW-1[3]	1.6	ND	ND	ND<0.6	1.6	ND<100
MW-2[3]	4.1	1.6	6.7	1.4	14	270
MW-3[3]	2.0	1.3	0.5	0.8	4.6	370
MW-9	620	510	740	2,600	4,500	17,000
VP-1[4]	880	54	310	300	1,500	11,000
VP-1[5]	1,600	220	800	590	3,200	15,000
MDL	0.3	0.3	0.3	0.5	--	10

(1) Water samples analyzed for BTEX and TPH-as-gasoline per EPA modified methods 8015/8020.

(2) ND - Not detected at the indicated method detection limit (MDL).

(3) Sample collected on August 20, 1992 after rehabilitating well.

(4) Sample collected on August 24, 1992, prior to air sparge pilot test.

(5) Sample collected on August 25, 1992, following air sparge pilot test.

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GROUNDWATER TECHNOLOGY

TABLE 2

SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS[1]
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

AUGUST 18 - 20, 1992

SAMPLE ID	SAMPLE DEPTH (ft.)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)	TOTAL BTEX (mg/kg)	TPH-AS-GASOLINE (mg/kg)
PR3-9	9	0.78	1.4	5.1	7.6	15	580
VP1-5	5	2.5	1.0	5.2	7.4	16	340
MW-9-9	9	1.7	2.2	7.6	23	35	820
MDL[2]	--	0.005	0.005	0.005	0.015	--	10

(1) Soil samples analyzed for BTEX and TPH-as-gasoline in accordance with EPA modified methods 8020/8015.

(2) MDL - Method detection limit.

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GROUNDWATER TECHNOLOGY

TABLE 3

SUMMARY OF AIR SAMPLE ANALYTICAL RESULTS[1]
AIR SPARGE/SOIL VENT PILOT TESTS
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

AUGUST 26, 1992

SAMPLE ID[2]	EXTRACTION WELL	BENZENE (mg/m^3)	TOLUENE (mg/m^3)	ETHYL-BENZENE (mg/m^3)	TOTAL XYLENES (mg/m^3)	TPH-AS-GASOLINE (mg/m^3)
VP1-EFF1	VP-1	220	79	52	52	26,000
VP1-EFF2	VP-1	650	110	110	130	32,000
MDL[3]	--	0.5	0.5	0.5	0.5	50

SAMPLE ID[2]	EXTRACTION WELL	METHANE (ppm-v)	CARBON DIOXIDE (ppm-v)	OXYGEN (ppm-v)
VP1-EFF1	VP-1	3,800	18,000	180,000
VP1-EFF2	VP-1	NA[4]	NA	NA
MDL[3]	--	20	20	20

(1) Air samples analyzed for BTEX and TPH-as-gasoline in accordance with modified EPA methods 8020/8015 and for methane, carbon dioxide and oxygen per method GC-TCD.

(2) Sample VP1-EFF1 collected during vent only pilot test; sample VP1-EFF2 collected during combined air sparge/soil vent pilot test.

(3) MDL - Method detection limit.

(4) NA - Not analyzed for this parameter.

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TABLE 4

SUMMARY OF HYDROCARBON MASS EXTRACTION RATES[1]
AIR SPARGE/SOIL VENT PILOT TESTS
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

AUGUST 26, 1992

WELL ID	PILOT TEST	BENZENE (lb/hr)	TOLUENE (lb/hr)	ETHYL-BENZENE (lb/hr)	TOTAL XYLENES (lb/hr)	TPH-AS-GASOLINE (lb/hr)
VP1-EFF1	Soil vent only	0.09	0.03	0.02	0.02	10.31
VP1-EFF2	Combined air sparge/soil vent	0.26	0.04	0.04	0.05	12.81

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GROUNDWATER TECHNOLOGY

TABLE 5

INDUCED PRESSURE RESPONSE
AIR SPARGE PILOT TEST
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

AUGUST 25, 1992

(Induced pressure response reported in inches of water)

MONITOR POINT	DISTANCE FROM AS-1 (FT.)	APPLIED SPARGING PRESSURE		
		5 PSI	7 PSI	10 PSI
VP-1	5.5	2.8	7.0	9.3
PR-3S	9	0.35	0.83	1.20
PR-3D	9	0.45	1.05	1.60
PR-2S	14	0.65	1.40	2.0
PR-2D	14	0.80	1.75	2.4
MW-4	19.5	0.20	0.50	0.75
MW-8	29	0.85	8.6	11.0
MW-9	43	0	0.02	0.025
MW-7	150	0	0	0

TABLE 6

MAXIMUM CHANGE IN VOC CONCENTRATIONS[1]
AIR SPARGE PILOT TEST
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

AUGUST 25, 1992

(VOC concentrations reported in ppm)

MONITOR POINT	DISTANCE FROM AS-1 (FT.)	APPLIED SPARGING PRESSURE		
		5 PSI	7 PSI	10 PSI
VP-1	5.5	2,452	9,491	-49[2]
PR-3D	9	5,131	236	338
PR-2D	14	1,314	324	210
MW-4	19.5	1,085	915	490
MW-8	29	814	255	195
MW-9	43	918	634	294

(1) Calculated by subtracting the background concentration measured in each well before start-up from the maximum concentration observed in each well for each applied sparging pressure.

(2) Bentonite seal at top of vent well (VP-1) observed to be leaking at start of 10 psi air sparge pilot test.

TABLE 7

MAXIMUM CHANGE IN DEPTH-TO-WATER
AND DISSOLVED OXYGEN CONCENTRATIONS
AIR SPARGE PILOT TEST
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

AUGUST 25, 1992

MONITOR POINT	DISTANCE FROM AS-1 (FT.)	CHANGE IN DTW (FT.)	CHANGE IN DO (MG/L)
VP-1	5.5	+0.22	~6.8
MW-4	19.5	+0.06	0.1
MW-8	29	+1.26	6.7
MW-9	43	+0.03	0

TABLE 8

SUMMARY OF MAXIMUM RADIUS OF
INFLUENCE EVALUATIONS
AIR SPARGE PILOT TEST
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

AUGUST 25, 1992

PARAMETER	MAXIMUM RADIUS OF INFLUENCE (FT.)
Pressure Response	29
Dissolved Oxygen Response	29
Increase in Water Level	29
Increase in VOC Concentrations	43

TABLE 9

MAXIMUM INDUCED PRESSURE/VACUUM RESPONSE
COMBINED AIR SPARGE/SOIL VENT PILOT TEST
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

AUGUST 25, 1992

(Induced pressure/vacuum responses reported in inches of water)

MONITOR POINT	VACUUM ONLY (43" H_2O)	SPARGE ONLY (7 PSI)	COMBINED TEST (43" H_2O & 7 PSI)	SPARGE ONLY (5 PSI)	COMBINED TEST (43" H_2O & 5 PSI)
PR-2S	-1.05	+1.40	+0.40	+0.65	-0.85
PR-2D	-1.05	+1.75	+0.65	+0.80	-0.73
PR-3S	-1.60	+0.83	-0.60	+0.35	-1.50
PR-3D	-1.90	+1.05	-0.65	+0.45	-1.75
MW-4	-1.05	+0.50	-0.33	+0.20	-1.05
MW-7	0	+0.02	+0.015?	0	0
MW-8	-0.30	+8.6	+11.25	+0.85	0
MW-9	-0.07	+0.02	-0.03	0	-0.075
VP-1	NA	+7.0	NA	+2.8	NA

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GROUNDWATER TECHNOLOGY

TABLE 10
PROJECT SCHEDULE: SOIL AND GROUNDWATER RECLAMATION
BARELAS BRIDGE GWPA SITE, ALBUQUERQUE, NEW MEXICO

Name	Scheduled Start
DATA REVIEW/SITE SAFETY PLAN	**6/16/92**
Data Review/SSP/Site Visit	6/16/92
ADDITIONAL HYDRO INVEST.	**6/24/92**
Groundwater Sampling/Analysis	6/24/92
Re-Drilling MW-2 and MW-3	8/20/92
GW sample Analy (MW-1 thru MW-3)	8/20/92
Water Disposal	9/7/92
ASVE PILOT TEST	**8/18/92**
Well & probe installations	8/18/92
ASVE Test	8/24/92
Soil & Carbon Disposal	9/7/92
RECLAMATION PROPOSAL	**8/27/92**
Recl. Prop. Preparation/Eng. Design	8/27/92
Submittal to NMED	12/7/92
NMED rvw/appr, prpty owner mtgs, etc.	12/8/92
AEHD-APCD Air Permit Preparation	11/30/92
Submittal to AEHD-APCD	12/14/92
AEHD-APCD Review/approval	12/15/92
INSTALLATION/STARTUP	**2/1/93**
Order/delivery of equipment	2/1/93
ASVE Well Installations	2/1/93
ASVE Installation/Startup	3/15/93
O&M/MONITORING 1 YR	**4/1/93**
O&M Biweekly following startup	4/1/93
Qtrly Rpt 120 dys following approv.	5/1/93

Critical | Noncritical | Progress | Milestone | Summary

NOTE: Schedule dependent upon subcontractor availability, regulatory review, permit procurement, site access, and equip. available within 4 weeks of order.

TABLE 11
MONITORING AND MAINTENANCE SCHEDULE FOR REMEDIATION SYSTEM
BARELAS BRIDGE GWPA SITE, 800 BRIDGE BLVD., S.W., ALBUQUERQUE, NEW MEXICO

		MONITORING						MAINTENANCE		
SYSTEM COMPONENT	REGULATORY AGENCY	BI-WEEKLY	MONTHLY	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4	BIWEEKLY	MONTHLY	QUARTERLY
All monitor wells	NMED	NA	Fluid levels	NA	NA	NA	NA	NA	NA	NA
9 monitor or VP wells, 3 private wells	NMED	NA	NA	BTEX, TPH-GAS	BTEX, TPH-GAS	BTEX, TPH-GAS	BTEX, TPH-GAS	NA	NA	NA
ASVE System	AEHD-APCD	-PID, LEL influent/effl -Therm-oxid. oper. temp. -Blowers velocities, press., vacuum -Dilution valve settings -temp influ/efflu @ blower -Power meter rdgs.	NA	BTEX, TPH-as-gas (Air)	BTEX, TPH-as-gas (Air)	BTEX, TPH-as-gas (Air)	BTEX, TPH-as-gas (Air)	-Visual inspection of lines -Empty water knock-out drums -Clean and/or replace blower filters	NA	NA
Air sparge & vapor extraction wells and monitor probes	NA	NA	-Vacuum, pressure, flow rate at ASVE wells -Ball valve setting @ ASVE wells -Vac., press., PID, DO, DTW at monitor points	NA	N/A	NA	NA	NA	-Visual inspection wellhead lines/connections	
(1)Downgradient monitor wells MW-1 thru MW-3	NMED/GW Bureau	NA	NA	NO_3, PO_4, DO	NO_3, PO_4, DO	NO_3, PO_4, DO	NO_3, PO_4, DO	NA	NA	NA
(1)4 monitor wells	NA	NA	NA	Hydrocarbon utillzers	Hydrocarbon utillzers	Hydrocarbon utillzers	Hydrocarbon utillzers	NA	NA	
(1)Bioinfiltration wells	NMED/GW Bureau	NA	NA	NA	NA	NA	NA	NA	Add nutrients if needed	Dosing w/H_2O_2 if needed

(1) Contingent upon installation of insitu bioremediation system

NMED = New Mexico Environment Department AEHD-APCD = Albuquerque Environmental Health Department - Air Pollution Control Division
WATER -- BTEX and TPH-as-gasoline - EPA methods 8020/8015 AIR -- BTEX and TPH-as-gasoline - EPA methods 8020/8015/18

GROUNDWATER TECHNOLOGY

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APPENDIX A

WELL COMPLETION AND LITHOLOGIC LOGS

SUMMARY OF WELL COMPLETION INFORMATION
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO

WELL ID	DATE INSTALLED	MP OR TOC ELEV. (FTAMSL)	TOTAL DEPTH OF WELL (FT)	WELL DIAMETER/ CONSTRUCTION	SCREENED INTERVAL/ SLOT SIZE	SCREEN LENGTH (FT)	STATUS/ COMMENTS
MW-1	02/07/90	4942.94	17	2" PVC	2'-17'/0.020"	15	
MW-2	02/07/90	4942.36	23	2" PVC	3'-18'/0.020"	15	
MW-3	02/07/90	4941.97	22.5	2" PVC	2.5'-17.5'/0.020"	15	
MW-4	02/08/90	4943.86	23.5	2" PVC	3.5'-18.5'/0.020"	15	
MW-5	10/16/90	4942.09	21.5	2" PVC	7'-22'/0.010"	15	
MW-6	10/16/90	4943.18	22	2" PVC	7'-22'/0.010"	15	
MW-7	10/18/90	4942.94	22	2" PVC	7'-22'/0.010"	15	
MW-8	10/18/90	4944.57	13	2" STEEL	8'-13'/0.010"	5	
MW-9	08/20/92	--	20.0	2" PVC	5'-20'/0.020"	15	
VP-1	08/19/92	--	14.5	4" PVC	9.5'-14.5'/0.020" 4.5'-9.5'/0.040"	10	Vapor extraction well
AS-1	08/19/92	--	22.2	2" PVC	20'-22'/0.010"	2	Air sparge well
PR-2	08/18/92	--	9	2" PVC	3'-5'/0.020" 7'-9'/0.020"	2'/2'	Nested vadose monitor probe
PR-3	08/18/92	--	9.3	2" PVC	3'-5'/0.020" 7'-9'/0.020"	2'/2'	Nested vadose monitor probe

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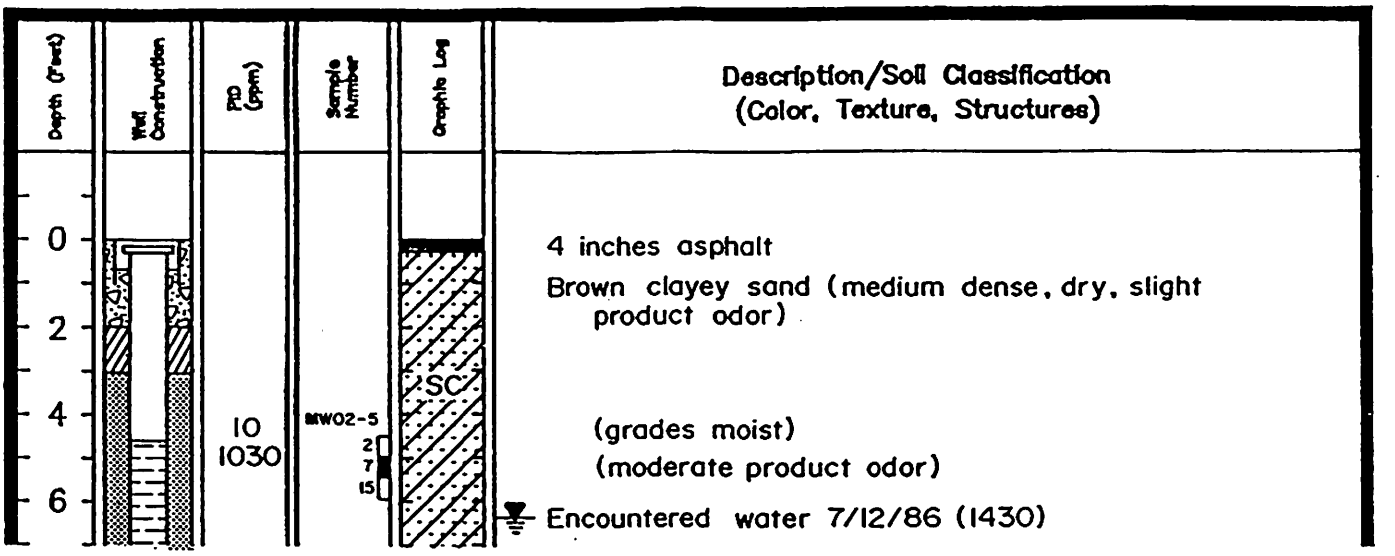
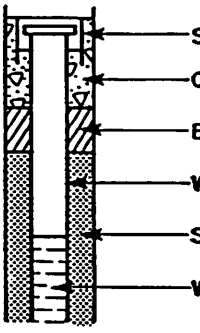
KEY TO BORING LOG





10
1030 — ORGANIC VAPOR CONCENTRATION DETERMINED BY PHOTO IONIZATION DETECTOR (P.I.D.) IN PARTS PER MILLION (ppm) FROM SOIL SAMPLES (TIME COLLECTED)

MW02-5 — SAMPLE IDENTIFICATION (TEST HOLE – SAMPLE DEPTH)

2
7
15 — BLOW COUNTS TO DRIVE A SPLIT BARREL SAMPLER USING A 140 lb. HAMMER FALLING 30 INCHES. COUNTS ARE FOR EACH 6 INCH INCREMENT THE SAMPLER IS DRIVEN.

INTERVAL SAMPLED
SAMPLE INCREMENT RETAINED FOR LABORATORY ANALYSES

SOIL CLASSIFICATION GRAPHIC/SYMBOL (SEE UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH TO WATER, DATE, TIME

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Vapor Point PR-2

Drilling Log

Project NMED/ Barelas Bridge Owner NMED/USTB
Location 800 Bridge Blvd SW Project Number 023352875
Date Drilled 8.18.92 Total Depth of Hole 9' Diameter 12"
Surface Elevation ____ Water Level Initial NA 24-hour NA
Screen: Dia. 2" Length 2'/2' Slot Size 0.020"
Casing: Dia. 2" Length 7'/3' Type PVC
Drilling Company Rodgers + Co., Inc. Drilling Method HSA/2' SS
Driller Brian Hitchcock Log by T. TINL
Geologist / Engineer T. TINL License No. ____

Sketch Map

Notes: Hand dug first 3' of hole

Depth (Feet)	Well Construction	PID (ppm)	Sample Number (Blow Counts)	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
					Start 0845 hrs
0					3" asphalt w/ coarse gravel to cobble base (black-stained, hydrocarbon odor, trace brick frasments)
2		1266 (0926) 585 (0943)		SC	Clayey Sand (damp, black-stained, hydrocarbon odor) (drill cuttings 0-2')
4			PR2-5 2 2 8 8	CL	(grades to sandy Clay, damp, black-stained, hydrocarbon odor)
6		730 (1008)	PR2-7 2 5 4 5	SP	Grey-brown fine-grained, v. well sorted Sand (loose, damp, slight staining, slight hydrocarbon odor)
8					(grades moist)
10		2207 (1038)			TD 9' (1020 hrs)
12					
14					
16					
18					
20					
22					
24					

GROUNDWATER TECHNOLOGY, INC.

Vapor Point PR-3

Drilling Log

Project NMED/Barelas Bridge Owner NMED/USTB
Location 800 Bridge Blvd. SW, ALBQ NM Project Number 02335289S
Date Drilled 8.18.92 Total Depth of Hole 9.5' Diameter 12"
Surface Elevation ____ Water Level Initial NA 24-hour NA
Screen: Dia. 2" Length 2'/2' Slot Size 0.020"
Casing: Dia. 2" Length 7'/3' Type Sch 40 PVC
Drilling Company Rodgers+Co., Inc Drilling Method HSA/2'SS
Driller Brian Hitchcock Log by T. TINL
Geologist / Engineer T. TINL License No. ____

Sketch Map

Notes: Hand dug first 3' of hole

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
					Start 1319 hrs
0					2" asphalt base over gravel base
					Brown fine-grained, well sorted sand (damp, no odor)
2		1899 (1349)		SP	(hydrocarbon odor and grey-stained soil at 1')
		1622 (1400)			
4					
			PR3-5	SW	(grades to fine-medium-grained sand, poorly sorted, trace gravel, then 2" fine-grained sand, well sorted (hydrocarbon odor and grey staining))
6				CL	Brown clay (soft; moist, slight hydrocarbon odor)
		565 (1434)	PR3-7	SW	Brown fine-medium grained, poorly sorted Sand (trace coarse gravel and clay; v. loose, damp, no odor)
8				SP	
		2298 (1443)			(grades gray-brown, medium-grained, well sorted sand (loose, moist, strong hydrocarbon odor, stained))
10					
12					
14					TD 9' 3.5" (1422 hrs)
16					
18					
20					
22					
24					

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Vapor Point VP-1

Drilling Log

Project NMED/Barelas Bridge Owner NMED/USTB
Location 800 Bridge Blvd. S.W. Project Number 023352875
Date Drilled 8.19.92 Total Depth of Hole 14.5' Diameter 12"
Surface Elevation ____ Water Level Initial ____ 24-hour ____
Screen: Dia. 4" Length 10' Slot Size 0.020"/0.040"
Casing: Dia. 4" Length 4.5' Type PVC
Drilling Company Rodgers + Co., Inc. Drilling Method HSA / 2.25
Driller Brian Hitchcock Log by ____
Geologist / Engineer T. TINL License No. ____

Sketch Map

Vapor Extraction Well

Notes: Hand dug first 3' of hole

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
					start 1330 hrs
0					2-3" asphalt over coarse gravel and cobble base
				CL	sandy CLAY (damp, black-stained, strong hydrocarbon odor) (drill cuttings 0-3')
2		4712 (1400)	VP1-3 2 2 2 2		
4				SC	clayey SAND (trace gravel, damp, black-stained, strong hydrocarbon odor) (40% recovery)
6		1829 (1421)	VP1-7 2 5 7 9		Grey-brown, fine-grained SAND (wet, grey-black-stained, v. strong hydrocarbon odor) (80% recovery)
8					
10		1146 (1422)		SP	
12					(Adding water to hole to keep heaving sands out of augers)
14					TD 14.5' (1415 hrs)
16					
18					9.5-14.5' 0.020" screen 9'-14.5 10-20 sand 4.5-9.5 0.040" screen 3.5-9' 8-12 sand
20					
22					
24					

Drilling Log

GROUNDWATER TECHNOLOGY

Monitoring Well AS-1

Project NMED/Barelas Bridge Owner NMED/USTB
Location 800 Bridge Blvd. S.W. Project No. 023352875 Date drilled 8.19.92
Surface Elev. ____ Total Hole Depth 22.2' Diameter 10"
Top of Casing ____ Water Level Initial ____ Static ____
Screen: Dia 2" Length 2' Type/Size PVC/0.020"
Casing: Dia 2" Length 20' Type PVC
Filter Pack Material 10-20 Sand Rig/Core Type CME75-5' Cont. Core
Drilling Company Rodgers+Co., Inc. Method HSA Permit # ____
Driller Brian Hitchcock Log By Terry TINL
Checked By ____ License No. ____

See Site Map For Boring Location

COMMENTS:
Air Sparge Well

Hand dug first 2-3' of hole

Depth (ft.)	Well Completion	PID (ppm)	Sample ID Blow Count/ % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
-2						Start 0746 hrs
0						3" asphalt over coarse gravel-cobble base
						Brown fine clayey SAND (black-stained, strong hydrocarbon odor
2		567 (0835)	AS1-3	SC		(less clay, v. well sorted, damp, no odor)
4		242 (0931)				Brown CLAY (moist, plastic, slight hydrocarbon odor)
6		195 (0922)		CL		Grey-brown fine-medium, v. well sorted SAND (moist, black-stained, strong hydrocarbon odor)
8		1455 (0921)	AS1-8			(grades brown, wet) (50% recovery)
10						(Note: Adding water to hole from 8' to TD to keep heaving sands out of hole)
12		1495 (0917)		SP		(grades coarse-grained, saturated)
14		1842 (0919)	AS1-13			(some gravel, slight hydrocarbon odor) (bottom 1.5' of sample recovered only)
16						
18		23.2 (0930)				(no recovery; 18-22' heaving sands)
20						
22						TD 22.2' (0930)
24						

Drilling Log

GROUNDWATER TECHNOLOGY

Monitoring Well MW-9

Project NMED/ Barelas Bridge Owner NMED/USTB
Location 800 Bridge Blvd. S.W. Project No. 023352875 Date drilled 8.20.92
Surface Elev. ____ Total Hole Depth 20 Diameter 11"
Top of Casing ____ Water Level Initial 9.5' Static ____
Screen: Dia 2" Length 15' Type/Size Sch 40 PVC/0.010"
Casing: Dia 2" Length 5' Type Sch 40 PVC
Filter Pack Material 10-20 SAND Rig/Core Type CME 75 / 2' SS
Drilling Company Rodgers & Co., Inc. Method HSA Permit # ____
Driller Brian Hitchcock Log By Jerry MAY
Checked By ____ License No. ____

See Site Map For Boring Location

COMMENTS:

Depth (ft.)	Well Completion	PID (ppm)	Sample ID Blow Count/ % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
-2						Start 0730 hrs
0						0-3" asphalt
						(3"-3' drill cuttings)
2					CL	Brown silty, sandy CLAY (dry, low plasticity)
			MW-9-5			Brown-tan fine, poorly-graded silty SAND (dry)
4			6 8 6 7		SM	
		171				Brown silty CLAY (dry, low plasticity)
6					CL	(grades moist)
		2,500				Gray, fine, poorly-graded SAND (moist)
8						
		2553	MW-9-9			▼ Groundwater encountered at 9.5' (0825 hrs)
10		1227				
			MW-9-11		SP	(grades to fine-medium grained at 12')
12						
14						
16						
18						
20						TD 20' (0850 hrs)
22						
24						

/11/90 THURSDAY

EFT OFFICE @ 8:30 WENT
COCA-COLA TANK PULL (W.O. TANKS)
ID A HEADSPACE ON SOIL SPL
FROM UNDERNEATH TANK ON
AST SIDE OF PIT. SPL WAS
EALED ON TOP W/ AL-FOIL AND
ID PUT ON OVER FOIL. SPL
AS HEATED FOR ≈ 15 MIN.
HEN SAMPLES W/ OVA
EADING ≈ 90 PPM. STEVE
YER'S OVM (GASTECH) READ
00. IT WAS DECIDED
HAT SOME SOIL REMOVAL
AS NECESSARY. STEVE
XER WILL CHECK SOIL W/
IS MACHINE PERIODICALLY.

ENT TO WHITFIELD TANK
INES SITE 9:30 AND
HOWED STEVE DYER AROUND
OR MLL (.5 HR). THEN
ENT TO G&S TO TRY &
AMPLE WATER IN MTN. BELL
ANWAY, BUT GROUND WATER
EVEL HAS DROPPED TOO FAR.
O WATER.

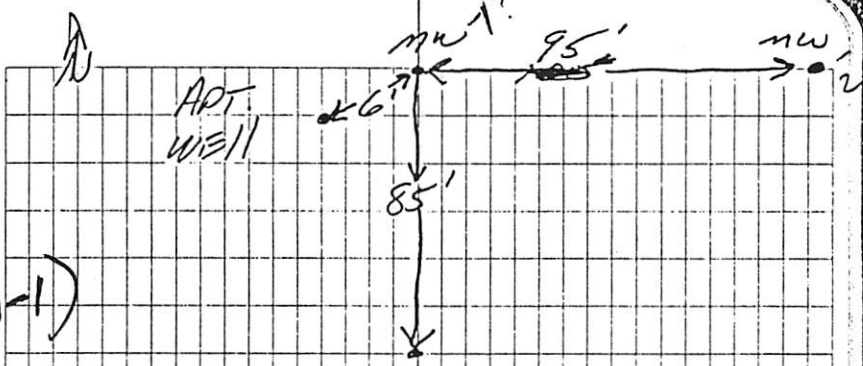
1-29-90 MONDAY

WENT TO G&S TO INSPECT
SOIL VENT SYSTEM IN PLACE.
SYSTEM CONSISTS OF 2"-SLOT-
TED PVC TIED TOGETHER
ALONG TANK EXCAVATION
WALLS AND WILL BE CONNECT-
ED TO VENT PIPE W/ WIND
TURBINE. LEFT OFFICE @
11:30.

NEXT STOPPED BY BARELAS
BRIDGE TO GET PERMISSION
FROM PAT CHAVEZ & BOB PARGIN
TO INSTALL MONITOR WELL ON
THEIR PROPERTY. MR. PARGIN
SAID IT ~~WAS~~ WAS ALRIGHT.
MRS. CHAVEZ ALSO GAVE
HER APPROVAL

WEDNESDAY 2/7/90

LEFT OFFICE @ 7:50 AM, WENT DOWN TO BARELAS. RIG SHOWED UP @ ≈ 8:30. NORTH WELL ON MARCILLA PROPERTY WAS FIRST. (MW-1) HAD SOME TROUBLE W/ SAND COMING INTO HOLE. DRILLED 25' BUT LOST 8' DUE TO SLOUGHING. WELL COMPLETED W/ 15' OF SCREEN (10'-5') THEN 2' OF BLANK. TOTAL 17'. SAND ABOVE SCREEN, THEN 6" OF BENTONITE, THEN GROUTED ≈ 20" AND FIT W/ MANWAY. FINISHED @ ≈ 11:30. NEXT DRILLED WELL ON SOUTH MARCILLA PROPERTY. (MW-2) MINOR SLOUGH; DRILLED 27'. HOLE COMPLETED W/ 5' BLANK, 15' SCREEN (10'-5'), AND 3' BLANK. FINISHED ABOUT 1:00.



BEGAN DRILLING ON CHAVEZ LOT ≈ 1:45. FINISHED @ 4:00. HOLE COMPLETED W/ 5' BLANK, 15' SCREEN (10'-5'), AND 2.5' BLANK. WILL DRILL LAST HOLE @ GAS STATION TOMORROW.

MW-3

THURSDAY 2/8/90

LEFT OFFICE @ ~ 10:30

TO GO OUT TO BARELAS & FINISH LAST MONITOR WELL ON ORIGINAL SITE (6TH STATION). RIG SHOWED UP @ 11:00 AND HOLE WAS COMPLETED ABOUT 1:15 PM W/ 5' BLANK, 15' SCREEN (.020"; 10'-5') THEN 3½' BLANK. ALL HOLES WERE THEN SEALED @ TOP W/ CONCRETE PLUG & FITTED W/ MANWAY & LOCKING WELL CAP.

MW-4

THURSDAY 2/8/90

LEFT OFFICE @ ~ 10:30 TO GO OUT TO BARELAS & FINISH LAST MONITOR WELL ON ORIGINAL SITE (GAS STATION). RIG SHOWED UP @ 11:00 HAND HOLE WAS COMPLETED ABOUT 1:15 PM W/ 5' BLANK, 15' SCREEN (.020"; 10'-5'). THEN 3½' BLANK. ALL HOLES WERE THEN SEALED @ TOP W/ CONCRETE PLUG & FITTED W/ MANWAY & LOCKING WELL CAP.

AMOUNT OF PIPE IN HOLE - TOTAL

MARCILLA N	= 17'	MW-1
MARCILLA S	= 23'	MW-2
CHAVEZ	= 22.5'	MW-3
PARGIN	= 23.5'	MW-4

TUESDAY 2/13/90

WENT TO BARELAS TO BEGIN DEVELOPMENT OF WELLS (MONITOR) INSTALLED LAST WEEK. MEASURED ~~WATER~~ DEPTH TO WATER FIRST IN ALL WELLS

		pH
MARCILLA N (NORTH)	9'1" = 9.083'	7.5-8
MARCILLA S (SOUTH)	8'8" = 8.67'	
CHAVEZ	8'3" = 8.25'	
PARGIN	9'8" = 9.67'	7.5

ALSO MEASURED pH w/ LITMUS PAPER. NEXT ~~PURGED~~ 12 BAILER FULL OF WATER FROM WELLS.

1 BAILER (FULL) = .275 GALS

MARCILLA N. Vol. in Well = 1.292 Gals.
MARCILLA S. Vol. in Well = 2.339 Gals.
CHAVEZ Vol. in Well = 2.325 Gals.
PARGIN Vol in Well = 2.257 Gals.

PIPE BELOW WATER LEVEL

MARCILLA N = 7.92'
MARCILLA S = 14.33'
CHAVEZ = 14.25'
PARGIN = 13.83'

~30 BAILERS FULL would = 3 well Vol.

WEDNESDAY 4/11/90
LEFT FOR BARE/AS @
≈ 7:45. MEASURED
WATER LEVELS:
MARCILLA N 8'6"
MARCILLA S 8'0"
CHAVEZ 7'6"
PARGIN 8'4"

BAILED MARCILLA N. ≈ 25 BAILS
SAMPLED @ 9:00 AM. VERY
HEAVY HYDROCARBON ODORS.

BAILED MARCILLA S. ≈ 30 BAILS
SAMPLED @ 9:25. HYDROCARBON
ODOR.

BAILED CHAVEZ ≈ 35 BAILS
SAMPLED @ 9:50. HYDROCARBON
ODOR.

BAILED PARGIN ≈ 35 BAILS
SAMPLED @ 10:35. VERY STRONG
HYDROCARBON ODOR AND SHEEN.

WEDNESDAY 4/11/90
ARRIVED @ KILLOUGH 1:30 PM
TOOK WATER LEVEL READING
DEPTH TO H_2O = 34.3" TO
GRADE. BAILED 10 BAILERS
OUT OF WELL; ONLY ≈ 4" OF
H_2O IN 2" WELL. SAMPLED
@ 2:00 PM. ANALYZED FOR
601 ONLY.

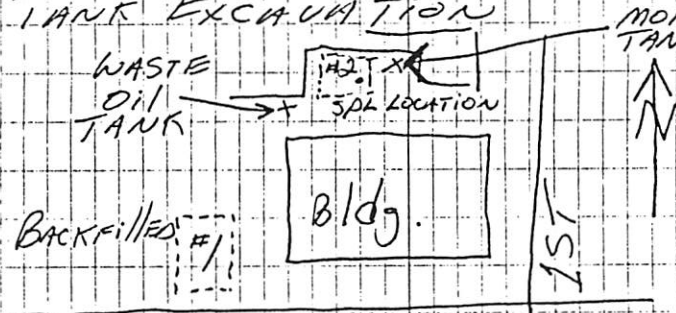
WEDNESDAY 4/11/90
ARRIVED @ CARROLL VENTURES
@ 9:30. JIM POWDER WAS
ON SITE PURGING WELL.
TOTAL DEPTH OF WELL WAS
43'. WATER LEVEL ~~WAS~~ WAS
37.5'. 15' OF SCREEN FROM
BOTTOM OF WELL. SEE SCHE-
MATIC FOR DETAILS.

MONDAY 2/19/90
LEFT OFFICE @ 9:00
1.) SAMPLED MARCILLA N. (M-1)
@ ≈ 10:30 pH = 7.63
BAILED 22 BAILS
GASOLINE ODOR
2.) MARCILLA S. (M-2)
@ ≈ 11:30 pH = 7.6
BAILED 35 BAILS
GASOLINE ODOR
3.) CHAVEZ (M-3)
@ ≈ 1:15 pH = 7.66
BAILED 30 BAILS
NO ODOR
4.) BARGIN (M-4)
@ ≈ 1:45 pH 7.2
BAILED 30 BAILS
SHEEN ON WATER,
NAMES - PRESERVED W/ HCl
NUMBERS (M-3) - PRESERVED W/
MERCURIC CHLORIDE

TEUSDAY 2/27/90

MGR - BOB WOODWARD
BRADBURY & STAMM CONST. CO. INC.
1217 1ST ST. NW
765-1200

OVA - 685 PPM
WENT OUT TO B&S @ REQUEST OF SHELDA MENDOZA (EID) W/ OVA TO TEST SOIL IN BOTTOM OF #2 PIT OF TANK EXCAVATION



MOUNTAIN
MET W/ ED KELLY, B&S CONSULTANT. TOOK SPL ADHERING TO NEW EID, FIELD TEST METHOD FOR SOILS.
OVA READING - 685 PPM
TANKS CONTAINED GASOLINE

GEOLOGIC LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
423 Sixth Street, N.W.
Albuquerque, New Mexico 87102
(505) 247-2000

OWNER NMEID	
WELL NO. AH-1	Page 1 of 1 Pages
SCREEN TYPE	
DIAMETER	SLOT NO.
LOCATION Bridge & LaVega	SETTING
DATE COMPLETED 10/15/90	SAND PACK
DRILLING COMPANY Rogers	CASING
DRILLING METHOD Hollow Stem Auger	SETTING
SAMPLING METHOD	DEVELOPMENT
OBSERVER LA Hohweiler	DURATION
REFERENCE POINT (RP)	STATIC WATER LEVEL DTW 9.24
ELEVATION OF RP	YIELD
REMARKS Water ph 7.98, conduct. 750 (Water sampled from temporary casing)	

DEPTH (feet) FROM	TO	DESCRIPTION
0	2"	Asphalt
2"	3'	Sand, med-fine grain, brown, minor gravel
3'	5'	SPOON SAMPLE, 1 ft. recovery TVH: 620ppm(HNu), 0.1ppm (LAB)
		Sand, med-fine grain, brown, minor gravel
		some silt, trace coal
5'	8'	Sand, med-fine, brown, minor gravel
8'	10'	SPOON SAMPLE, 15" recovery TVH: 1.8ppm (HNu)
		Sand, med-coarse, brown, quartz rich
		TD-10'

GEOLOGIC LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
423 Sixth Street, N.W.
Albuquerque, New Mexico 87102
(505) 247-2000

OWNER NMEID	
WELL NO. AH-2	PAGE 1 OF 1 PAGES
SCREEN TYPE	
DIAMETER	SLOT NO.
LOCATION Bridge & LaVega	SETTING
DATE COMPLETED 10/15/90	SAND PACK
DRILLING COMPANY Rogers	CASING
DRILLING METHOD Hollow Stem Auger	SETTING
SAMPLING METHOD	DEVELOPMENT
OBSERVER LA Hohweiler	DURATION
REFERENCE POINT (RP)	STATIC WATER LEVEL DTW 10.02'
ELEVATION OF RP	YIELD

REMARKS: Water ph 6.59, conduct. 880, redox -107 (Water sample bailed from temporary casing)

DEPTH (feet) FROM	TO	DESCRIPTION
0	2"	Asphalt
2"	.1'	Soil, brown, silty, moist
1'	3'	Sand, very fine to fine, brown, moist
3'	5'	SPOON SAMPLE, sand, med. grain, brow TVH: 5.2ppm (HNu)
		Clay, brown, lower 5"
5'	8'	Sand, fine grain to medium, brown, HC odor
8'	10'	SPOON SAMPLE TVH: 30ppm (HNu),79 ppm (LAB)
		6" sand,a coarse, brown, quartz rich, minor gravel
		2" black sand, minor gravel
		1' sand, coarse to very coarse, quartz rich, strong odor
		TD 12'

GEOLOGIC LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
423 Sixth Street, N.W.
Albuquerque, New Mexico 87102
(505) 247-2000

OWNER NMEID	
WELL NO. AH-3	Page 1 of 1 Pages
SCREEN TYPE	
DIAMETER	SLOT NO.
LOCATION Bridge & LaVega	SETTING
DATE COMPLETED 10/15/90	SAND PACK
DRILLING COMPANY Rogers	CASING
DRILLING METHOD Hollow Stem Auger	SETTING
SAMPLING METHOD	DEVELOPMENT
OBSERVER LA Hohweiler	DURATION
REFERENCE POINT (RP)	STATIC WATER LEVEL DTW 9.73'
ELEVATION OF RP	YIELD
REMARKS Water ph 6.69, conduct. 733 (Water sampled from temporary casing)	

DEPTH (feet) FROM	TO	DESCRIPTION
0	0.5'	Asphalt
0.5'	1'	Sand, brown, medium grain
1'	3'	Clay, dark brown, minor silt, slight odor
3'	5'	SPOON SAMPLE 1'8" recovery TVH: 60ppm (HNu)
		2" Clay, dark brown
		Sand, fine grain, brown
5'	7.5'	Sand, medium grain, brown
7.5'	8'	Sand, coarse, black, quartz rich
8'	10'	SPOON SAMPLE 1'4" recovery TVH: 180ppm(HNu), undetected (LAB)
		Sand, coarse, black, quartz rich, wet, HC odor

GEOLOGIC LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
423 Sixth Street, N.W.
Albuquerque, New Mexico 87102
(505) 247-2000

OWNER: NMEID	
WELL NO.: AH-4	Page 1 of 1 Pages
SCREEN TYPE	
DIAMETER	SLOT NO.
LOCATION: Bridge & LaVega	SETTING
DATE COMPLETED: 10/15/90	SAND PACK
DRILLING COMPANY: Rogers	CASING
DRILLING METHOD: Hollow Stem Auger	SETTING
SAMPLING METHOD	DEVELOPMENT
OBSERVER: LA Hohweiler	DURATION
REFERENCE POINT (RP)	STATIC WATER LEVEL: DTW 9.70'
ELEVATION OF RP	YIELD

REMARKS: Water ph 7.04, conduct. 901, redox 133 (Water sample bailed from temporary casing)

DEPTH (feet) FROM	TO	DESCRIPTION
0	3"	Asphalt
3"	3'	Soil, black, some clay, gravel, cobbles,moist,
		strong odor
3'	5'	SPOON SAMPLE 20" recovery TVH: 220ppm (HNu)
		Sand, very fine grain, brown, silty, moist, odor
		3" clay
		4" sand, medium grain, light brown, quartz rich
5'	8'	Sand, medium grain, light brown HC odor
8'	10'	SPOON SAMPLE 1.5' recovery TVH: 300ppm (HNu),995ppm (LAB)
		8" sand, coarse, light brown, quartz rich, HE odor
		10" sand, as above, wet, odor
10'	12'	Sand, as above

GEOLOGIC LOG

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Professional Ground-Water Consultants
423 Sixth Street, N.W.
Albuquerque, New Mexico 87102
(505) 247-2000

OWNER: NMEID	
WELL NO.: AH-5	Page 1 of 1 Pages
SCREEN TYPE	
DIAMETER	SLOT NO.
LOCATION: 140 LeVega	SETTING
DATE COMPLETED: 10/16/90	SAND PACK
DRILLING COMPANY: Rogers	CASING
DRILLING METHOD: Hollow Stem Auger	SETTING
SAMPLING METHOD	DEVELOPMENT
OBSERVER: LA Hohweiler	DURATION
REFERENCE POINT (RP)	STATIC WATER LEVEL: DTW 8.91'
ELEVATION OF RP	YIELD
REMARKS	

DEPTH (feet) FROM	TO	DESCRIPTION
0	1'	Sand, fine to medium, brown, minor gravel, cobbles
1'	3'	Clay, brown, minor sand, gravel
3'	5'	SPOON SAMPLE 20" recovery
		2" Clay, brown
		18" Sand, fine to medium, tan, upper 3" moist
5'	8'	Silty sand, fine grain, light brown, slight odor
8'	10'	SPOON SAMPLE 16" recovery TVH: 0.5ppm(LAB)
		12" quartz sand, coarse, brown, some gravel
		Slight HC odor
		4" quartz sand, very coarse, gravel

GEOLOGIC LOG

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Professional Ground-Water Consultants
423 Sixth Street, N.W.
Albuquerque, New Mexico 87102
(505) 247-2000

OWNER: NMEID	
WELL NO.: MW-5	Page 1 of 2 Pages
SCREEN TYPE: slotted PVC	
DIAMETER: 2"	SLOT NO.: 10
LOCATION: Bridge & LaVega	SETTING: 7 - 22'
DATE COMPLETED: 10/16/90	SAND PACK: 4.5 - 22'
DRILLING COMPANY: Rogers	CASING: PVC 2"
DRILLING METHOD: Hollow Stem Auger	SETTING: 4920.09 to 4942.09
SAMPLING METHOD	DEVELOPMENT
OBSERVER: LA Hohweiler	DURATION
REFERENCE POINT (RP): top of casing	STATIC WATER LEVEL: 4933.09
ELEVATION OF RP: 4942.09	YIELD
REMARKS	

DEPTH (feet) FROM	TO	DESCRIPTION
0	1'	Sand, fine grain, brown, gravel
1'	3'	Clay, brown, minor silt
3'	5'	SPOON SAMPLE 20" recovery
		4" clay, brown, minor silt, grades to silt then sand (10")
		6" sand, fine grain, tan
5'	7'	Sand, medium coarse, tan, some quartz, moist
7'	8'	Sand, medium-fine, dark brown, moist, HC odor
8'	10'	SPOON SAMPLE 17" recovery TVH: undetected (LAB)
		Sand, coarse to very coarse, dark brown, gravel, wet, odor
		Middle 5" medium grain
		Lower 7" black stained
10'	15'	Sand, coarse to very coarse, black, wet, slight odor

OWNER

NMEID

WELL NO. MW-5

DEPTH (FEET) FROM	TO	DESCRIPTION
15'	20'	Sand, fine to medium, dark brown, wet, slight odor
		TD - 21.5'

GEOLOGIC LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
423 Sixth Street, N.W.
Albuquerque, New Mexico 87102
(505) 247-2000

OWNER NMEID	
WELL NO. MW-6	Page 1 of 2 Pages
SCREEN TYPE slotted PVC	
DIAMETER 2 Inches	SLOT NO. 10
LOCATION 145 LaVega	SETTING 7 - 22'
DATE COMPLETED 10/16/90	SAND PACK 5 - 22'
DRILLING COMPANY Rogers	CASING 2" PVC
DRILLING METHOD Hollow Stem Auger	SETTING 4921.18 to 4943.18
SAMPLING METHOD	DEVELOPMENT
OBSERVER LA Hohweiler	DURATION
REFERENCE POINT (RP) top of casing	STATIC WATER LEVEL 4933.56
ELEVATION OF RP 4943.18	YIELD
REMARKS	

DEPTH (fe		DESCRIPTION
RO	TO	
0	1'	Sand, fine-medium, brown, some gravel
1'	3'	Clay, barown
3'	5'	SPOON SAMPLE 20" recovery TVH: 548ppm (LAB)
		8" clay, brown
		12" silty, clay, brown
5'	6'	Clay, brown
6'	8'	Sand, fine grain, tan, quartz rich, strong odor
8'	10'	SPOON SAMPLE 12" recovery
		Sand, coarse to very coarse, quartz rich, black stain, wet some gravel, strong odor
10'	13'	Sand, coarse, tan, quartz rich, wet, odor
13'	15'	Sand, coarse to very coarse, black stain, gravel, wet, strong odor
15'	22'	Sand, as above.

GEOLOGIC LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
423 Sixth Street, N.W.
Albuquerque, New Mexico 87102
(505) 247-2000

OWNER NMEID	
WELL NO. MW-7	
SCREEN TYPE slotted PVC	
DIAMETER 2 Inches	SLOT NO. 10
LOCATION Bridge & LaVega	SETTING 7-22'
DATE COMPLETED 10/18/90	SAND PACK 5 - 22'
DRILLING COMPANY Rogers	CASING 2" PVC
DRILLING METHOD Hollow Stem Auger	SETTING 4920.94 to 4942.94
SAMPLING METHOD	DEVELOPMENT
OBSERVER LA Hohweiler	DURATION
REFERENCE POINT (RP) top of casing	STATIC WATER LEVEL 4934.22
ELEVATION OF RP 4942.94'	YIELD
REMARKS	

DEPTH (fe RO	TO	DESCRIPTION
0	3'	Soil, brown, silty
3'	5'	SPOON SAMPLE 22" recovery TVH: 142ppm(HNu)
		12" sand, fine grain, tan, black stain, HC odor
		10" silty clay, brown
5'	8'	Sand, very fine to fine, black stain, HC odor
8'	10'	SPOON SAMPLE 20" recovery TVH: 600ppm(HNu), 10.6ppm (LAB)
		Sand, coarse, brown, quartz rich, wet
		black stain, strong odor
10'	13'	Sand, as above, coarse to very coarse, black stain,
		wet, strong odor
13'	15'	Sand, very coarse, black stain, wet HC odor
15'	22'	Sand, very coarse, quartz rich, gravel, wet, HC odor

GEOLOGIC LOG	OWNER NMEID	
LEGGETTE, BRASHEARS & GRAHAM, INC. Professional Ground-Water Consultants 423 Sixth Street, N.W. Albuquerque, New Mexico 87102 (505) 247-2000	WELL NO. MW-8	Page 1 of 1 Pages
	SCREEN TYPE slotted steel	
	DIAMETER 2"	SLOT NO. 10
LOCATION Fina station, Bridge & LaVega	SETTING 8 - 13'	
DATE COMPLETED 10/18/90	SAND PACK 2 - 9'	
DRILLING COMPANY Rogers	CASING 2" galvanized steel	
DRILLING METHOD Hand Auger	SETTING 4931.86' to 4944.57'	
SAMPLING METHOD	DEVELOPMENT	
OBSERVER LA Hohweiler	DURATION	
REFERENCE POINT (RP) top of casing	STATIC WATER LEVEL 4935.66'	
ELEVATION OF RP 4944.57'	YIELD	
REMARKS		

DEPTH (feet) FROM	TO	DESCRIPTION
0	2'	Concrete
2'	2.5'	Sand, medium grain, brown, HC odor
2.5'	5.5'	Clay, dark brown, black stain, strong odor TVH: 380ppm(HNu)
5.5'	9'	Sand, medium grain, black stain, quartz rl TVH: 520ppm(HNu), 256ppm(LAB)
		strong odor
		TD - 13'

APPENDIX B

GROUNDWATER SAMPLE LABORATORY CERTIFICATES OF ANALYSIS AND CHAIN-OF-CUSTODY DOCUMENTATION JUNE 24, AUGUST 20, AND AUGUST 24-25, 1992

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Southwest Region
20000 / 300 Mariner Drive
Torrance, CA 90503
(213) 371-1044
(800) 727-GTEL
Fax (213) 371-8720

GTEL Client Number: 023352875.041043
Project I.D.: Barelas Bridge
Work Order Number: T208181

September 1, 1992

Ms. Terry Tinl
Groundwater Technology, Inc.
2501 Yale Blvd. S.E., Suite 204
Albuquerque, NM 87106

Dear Ms. Tinl,

Enclosed please find the analytical results for the samples received by GTEL Environmental Laboratories, Inc. on 8-21-92 under chain-of-custody record 76-5466.

A formal Quality Assurance/Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria unless otherwise stated in the footnotes.

GTEL is certified by the state of California under Certification #E723.

If you have any questions concerning this analysis or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,

GTEL Environmental Laboratories, Inc.

Minsoon Song
Laboratory Director

GTEL Client Number: 023352875.041043
Project I.D.: Barelas Bridge
Work Order Number: T208181

ANALYTICAL RESULTS

Volatile Organics in Water
EPA Methods Modified 8020 and Modified 8015[a]

GTEL Sample Number		08181-1	08181-2	08181-3	
Client Identification		MW-1	MW-2	MW-3	
Date Sampled		8-20-92	8-20-92	8-20-92	
Date Analyzed		8-25-92	8-25-92	8-25-92	
Analyte	Reporting Limit, ug/L	Concentration, ug/L			
Benzene	0.3	1.6	4.1	2.0	
Toluene	0.3	<0.3	1.6	1.3	
Ethylbenzene	0.3	<0.3	6.7	0.5	
Xylene, total	0.6	<0.6	1.4	0.8	
BTEX, total	--	1.6	14	4.6	
TPH as Gasoline	100	<100	270	370	
Dilution Multiplier[b]		1	1	1	

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Board LUFT Manual procedures.

b. Indicates the adjustments made for sample dilution.

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Northwest Region
4080-C Pike Lane
Concord, CA 94520
(510) 685-7852
(800) 544-3422 *from inside California*
(800) 423-7143 *from outside California*
(510) 825-0720 (FAX)

Client Number: 02335P002
Project ID: 800 Bridge SW
Albuquerque, NM
Work Order Number: C2-06-790

July 6, 1992

Terry Tinl
Groundwater Technology, Inc.
2501 Yale Blvd. SE., Ste. #204
Albuquerque, NM 87106

Enclosed please find the analytical results for samples received by GTEL Environmental Laboratories, Inc. on 06/25/92, under chain of custody record 76-5459.

A formal Quality Control/Quality Assurance (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria, unless otherwise stated in the footnotes.

GTEL is certified by the California State Department of Health Services to perform analyses for drinking water, wastewater, and hazardous waste materials according to EPA protocols.

If you have any questions concerning this analysis or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,
GTEL Environmental Laboratories, Inc.

Rose Condit/ep

Eileen F. Bullen
Laboratory Director

Client Number: 02335P002
Project ID: 800 Bridge SW
Albuquerque, NM
Work Order Number: C2-06-790

Table 1

ANALYTICAL RESULTS

Aromatic Volatile Organics and Total Petroleum Hydrocarbons as Gasoline in Water

EPA Methods 5030, 8020, and Modified 8015[a]

GTEL Sample Number		01	02	03	04
Client Identification		PW-153	PW-152	PW-140	MW-3
Date Sampled		06/24/92	06/24/92	06/24/92	06/24/92
Date Analyzed		06/26/92	06/26/92	06/26/92	06/26/92
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.3	<0.3	<0.3	<0.3	<0.3
Toluene	0.3	<0.3	<0.3	<0.3	<0.3
Ethylbenzene	0.3	<0.3	<0.3	<0.3	<0.3
Xylene, total	0.5	<0.5	<0.5	<0.5	<0.5
BTEX, total	--	--	--	--	--
Gasoline	10	<10	<10	<10	46
Detection Limit Multiplier		1	1	1	1

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision.

Client Number: 02335P002
Project ID: 800 Bridge SW
Albuquerque, NM
Work Order Number: C2-06-790

Table 1 (Continued)

ANALYTICAL RESULTS

Aromatic Volatile Organics and Total Petroleum Hydrocarbons as Gasoline in Water

EPA Methods 5030, 8020, and Modified 8015[a]

GTEL Sample Number		05	06	07	08
Client Identification		MW-6	MW-5	MW-7	MW-8
Date Sampled		06/24/92	06/24/92	06/24/92	06/24/92
Date Analyzed		06/26/92	06/26/92	07/02/92	07/02/92
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.3	24	4	30	420
Toluene	0.3	50	<0.3	0.3	82
Ethylbenzene	0.3	44	0.5	8	720
Xylene, total	0.5	140	0.7	15	580
BTEX, total	--	260	5	53	1800
Gasoline	10	1700	170	550	9400
Detection Limit Multiplier		1	1	1	1

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision.

Client Number: 02335P002
Project ID: 800 Bridge SW
Albuquerque, NM
Work Order Number: C2-06-790

Table 1 (Continued)

ANALYTICAL RESULTS

Aromatic Volatile Organics and Total Petroleum Hydrocarbons as Gasoline in Water

EPA Methods 5030, 8020, and Modified 8015[a]

GTEL Sample Number		09			
Client Identification		MW-4			
Date Sampled		06/24/92			
Date Analyzed		07/02/92			
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.3	230			
Toluene	0.3	7			
Ethylbenzene	0.3	200			
Xylene, total	0.5	420			
BTEX, total	--	860			
Gasoline	10	3100			
Detection Limit Multiplier		1			

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision.

GTEL ENVIRONMENTAL LABORATORIES, INC.

20000 Mariner Dr., Suite #300
Torrance, CA 90503

213-371-1044
800-727-GTEL

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

76-5459

Project Manager: TERRY TINL

Phone #: 505-242-3113

FAX #: 505-242-1103

Address: Groundwater Technology, Inc 2501 Yale Blvd SE, Ste 204 Albuquerque, NM 87106

Site location: 800 Bridge SW, Albuquerque, NM

Project Number: 02335P002

Project Name: NMED/800 BRDG/ALBQ NM

I attest that the proper field sampling procedures were used during the collection of these samples.

Sampler Name (Print): Chuck Briscoe

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# CONTAINERS	Matrix: WATER	SOIL	AIR	SLUDGE	OTHER	Method Preserved: Hot HgCl2	HNO3	H2SO4	ICE	NONE	OTHER	Sampling: DATE	TIME
PW-153	TAP	9605	2	X					X			X			6/2/92	10:10
PW-152	[illegible] TAP	9606	2	X					X			X			6/2/92	11:15
PW-140	TAP	9607	2	X					X			X			6/2/92	11:45
MW-3	MONITOR WELL	9608	2	X					X			X			6/2/92	15:45
MW-6	MONITOR WELL	9609	2	X					X			X			6/2/92	15:55
MW-5	MONITOR WELL	9610	2	X					X			X			6/2/92	16:05
MW-7	MONITOR WELL	9611	2	X					X			X			6/2/92	16:15
MW-8	MONITOR WELL	9612	2	X					X			X			6/2/92	16:30
MW-4	MONITOR WELL	9613	2	X					X			X			6/2/92	16:40

ANALYSIS REQUEST

BTEX 602 ☐ 8020 ☒ with MTBE ☐ TPH-GAS	BTEX/TPH Gas 602/8015 ☐ 8020/8015 ☐ MTBE ☐	TPH as ☐ Gas ☐ Diesel ☐ Jet Fuel	Product I.D. by GC (SIMDIS) ☐	Total Oil & Grease: 413.1 ☐ 413.2 ☐ 503A ☐	Total Petroleum Hydrocarbons: 418.1 ☐ 503E ☐	EPA 601 ☐ 8010 ☐ DCA only ☐	EPA 602 ☐ 8020 ☐	EPA 608 ☐ 8080 ☐ PCBs only ☐	EPA 610 ☐ 8310 ☐	EPA 624 ☐ 8240 ☐ NBS +15 ☐	EPA 625 ☐ 8270 ☐ NBS +25 ☐	EPTOX: Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi VOA ☐	EPA Priority Pollutant Metals ☐ HSL ☐	LEAD 7420 ☐ 7421 ☐ 239.2 ☐ 6010 ☐ Org. Lead ☐	CAM Metals ☐ STLC ☐ TTLC	Corrosivity ☐ Flashpoint ☐ Reactivity ☐
X																	
X																	
X																	
X																	
X																	
X																	
X																	
X																	
X																	

SPECIAL HANDLING

24 HOURS ☐
EXPEDITED 48 Hours ☐
SEVEN DAY ☐
OTHER _____(#) BUSINESS DAYS
QA/QC . CLP Level ☐ Blue Level ☐
FAX ☐
Standard TAT

SPECIAL DETECTION LIMITS (Specify)

SPECIAL REPORTING REQUIREMENTS (Specify)

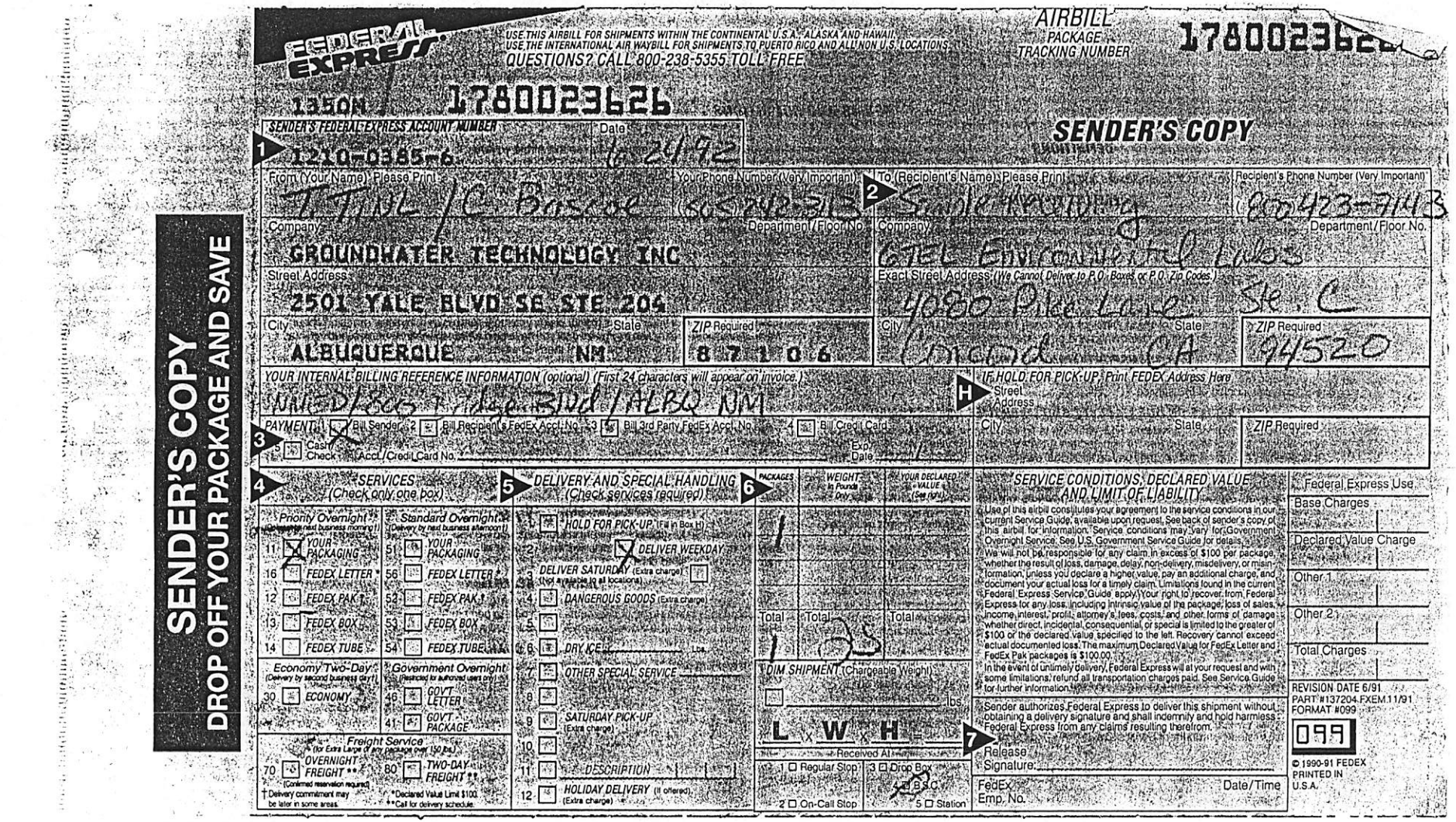
REMARKS:

Lab Use Only Storage Location

Lot #: Work Order #:

CUSTODY RECORD

	Relinquished by Sampler:	Relinquished by:	Relinquished by:
Date	6/2/92		
Time	1800		
Received by:		Received by:	Received by Laboratory: J. Sowell (Waybill # FED-X 1780023626)
Date		Date	Date 6/3/92
Time		Time	Time 10:40



FEDERAL EXPRESS

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USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL PACKAGE TRACKING NUMBER 1780023626

1350N 1780023626

SENDER'S COPY

SENDER'S COPY
DROP OFF YOUR PACKAGE AND SAVE

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER: 1210-0385-6 Date: 6 24 92

From (Your Name) Please Print: T. Tuttle / C. Bosloe Your Phone Number (Very Important): (505) 242-3126

Company: GROUNDWATER TECHNOLOGY INC Department/Floor No.:

Street Address: 2501 YALE BLVD SE STE 204

City: ALBUQUERQUE State: NM ZIP Required: 87106

2 To (Recipient's Name) Please Print: Sandie Keating Recipient's Phone Number (Very Important): (800) 423-7143

Company: GTEL Environmental Labs Department/Floor No.:

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes): 4080 Pike Ln #2 Ste. C

City: Concord State: CA ZIP Required: 94520

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.): NMED/Scott Bridge Blvd/ALBQ NM

H If HOLD FOR PICK-UP, Print FEDEX Address Here: Street Address: City: State: ZIP Required:

3 PAYMENT: 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card
5 [ ] Cash/Check Acct./Credit Card No. Exp. Date

4 SERVICES (Check only one box)

Priority Overnight (Next business morning)
11 [X] YOUR PACKAGING
16 [ ] FEDEX LETTER*
12 [ ] FEDEX PAK*
13 [ ] FEDEX BOX
14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon)
51 [ ] YOUR PACKAGING
56 [ ] FEDEX LETTER*
52 [ ] FEDEX PAK*
53 [ ] FEDEX BOX
54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day)
30 [ ] ECONOMY

Government Overnight (Restricted to authorized users only)
46 [ ] GOVT LETTER*
41 [ ] GOVT PACKAGE

Freight Service (for Extra Large or any package over 150 lbs.)
70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required)
80 [ ] TWO-DAY FREIGHT**
†Delivery commitment may be later in some areas.
*Declared Value Limit $100
**Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

1 [ ] HOLD FOR PICK-UP (Fill in Box H)
2 [X] DELIVER WEEKDAY
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
4 [ ] DANGEROUS GOODS (Extra charge)
5 [ ]
6 [X] DRY ICE 25 Lbs.
7 [ ] OTHER SPECIAL SERVICE
8 [ ]
9 [ ] SATURDAY PICK-UP (Extra charge)
10 [ ]
11 [ ] DESCRIPTION
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

6 PACKAGES: 1 Total

WEIGHT In Pounds Only: 1 Total

YOUR DECLARED VALUE (See box): Total

DIM SHIPMENT (Chargeable Weight): [ ] lbs. L x W x H =

7 Received At:
1 ☐ Regular Stop 3 ☐ Drop Box
2 ☐ On-Call Stop 5 ☐ Station

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide, available upon request. See back of sender's copy of this airbill for information. Service conditions may vary for Government Overnight Service. See U.S. Government Service Guide for details. We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, and document your actual loss for a timely claim. Limitations found in the current Federal Express Service Guide apply. Your right to recover from Federal Express for any loss, including intrinsic value of the package, loss of sales, income, interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the declared value specified to the left. Recovery cannot exceed actual documented loss. The maximum Declared Value for FedEx Letter and FedEx Pak packages is $100.00. In the event of untimely delivery, Federal Express will at your request and with some limitations, refund all transportation charges paid. See Service Guide for further information.

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature:

FedEx Emp. No. Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 6/91
PART #137204 FXEM 11/91
FORMAT #099

099

GTEL ENVIRONMENTAL LABORATORIES, INC.
20000 Mariner Dr., Suite #300
Torrance, CA 90503
213-371-1044
800-727-GTEL

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST 76-5445

Project Manager: TERRY TINL
Phone #: 505-242-3113
FAX #: 505-242-1103
Address: Groundwater Technology 2501 Yale Blvd SE, St 204 Albuquerque, NM 87106
Site location: 800 Bridge Blvd SW, Albuquerque NM
Project Number: 023352875.040664
Project Name: NMED/Barelas Bridge
I attest that the proper field sampling procedures were used during the collection of these samples.
Sampler Name (Print): TERRY TINL

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# Containers	Matrix: Water	Method Preserved: HCl	Method Preserved: Ice	Sampling Date	Sampling Time	BTEX/TPH Gas 602/8015 8020/8015 MTBE
MW-9	well		2	X	X	X	8-24-92	1411	X
VP-1	well		2	X	X	X	8-24-92	1414	X
VP-1	well		2	X	X	X	8-25-92	1547	X

Matrix: WATER, SOIL, AIR, SLUDGE, OTHER. Method Preserved: HCl, HNO_3, H_2SO_4, ICE, NONE, OTHER.

ANALYSIS REQUEST: BTEX 602 ☐ 8020 ☐ with MTBE ☐; BTEX/TPH Gas 602/8015 ☐ 8020/8015 ☒ MTBE ☐; TPH as ☐ Gas ☐ Diesel ☐ Jet Fuel; Product I.D. by GC (SIMDIS) ☐; Total Oil & Grease: 413.1 ☐ 413.2 ☐ 503A ☐; Total Petroleum Hydrocarbons: 418.1 ☐ 503E ☐; EPA 601 ☐ 8010 ☐ DCA only ☐; EPA 602 ☐ 8020 ☐; EPA 608 ☐ 8080 ☐ PCBs only ☐; EPA 610 ☐ 8310 ☐; EPA 624 ☐ 8240 ☐ NBS +15 ☐; EPA 625 ☐ 8270 ☐ NBS +25 ☐; EPTOX: Metals ☐ Pesticides ☐ Herbicides ☐; TCLP Metals ☐ VOA ☐ Semi VOA ☐; EPA Priority Pollutant Metals ☐ HSL ☐; LEAD 7420 ☐ 7421 ☐ 239.2 ☐ 6010 ☐ Org. Lead ☐; CAM Metals ☐ STLC ☐ TTLC; Corrosivity ☐ Flashpoint ☐ Reactivity ☐

Analyze for: BTEX + TPH-GAS only

SPECIAL HANDLING
24 HOURS ☐
EXPEDITED 48 Hours ☐
SEVEN DAY ☐
OTHER ______ (#) BUSINESS DAYS
QA/QC CLP Level ☐ Blue Level ☐
FAX ☐
Standard TAT

SPECIAL DETECTION LIMITS (Specify)

SPECIAL REPORTING REQUIREMENTS (Specify)

REMARKS: Fedex # 197232027[6]
4°C

Lab Use Only Storage Location
Lot #: Work Order #:

CUSTODY RECORD

	Date	Time	
Relinquished by Sampler: Terry Tinl	8-25-92	1614	Received by: Pauline L. Torres 8-26-92
Relinquished by:	Date	Time	Received by:
Relinquished by:	8/26/92	8:45	Received by Laboratory: [signature] Way bill # 1972320276

FEDERAL EXPRESS

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE TRACKING NUMBER
1972320276

2022M 1972320276

SENDER'S COPY

SENDER'S COPY
DROP OFF YOUR PACKAGE AND SAVE

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER: 1210-0395-6 Date: 8/25/92

From (Your Name) Please Print: Your Phone Number (Very Important): 505-242-3113
Company: GROUNDWATER TECHNOLOGY INC Department/Floor No.:
Street Address: 2501 YALE BLVD SE STE 204
City: ALBUQUERQUE State: NM ZIP Required: 8 7 1 0 6

2 To (Recipient's Name) Please Print: SAMPLE RECEIVING Recipient's Phone Number (Very Important): 213-371-1044
Company: GTEL ENVIRONMENTAL LABS Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 20000/300 MARINER DR
City: TORRANCE State: CA ZIP Required: 9 0 5 0 3

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H HOLD FOR PICK-UP. Print FEDEX Address Here
Street Address:
City: State: ZIP Required:

3 PAYMENT: 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card
[ ] Cash/Check Acct./Credit Card No.: Exp. Date:

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning.†)
11 [X] YOUR PACKAGING
16 [ ] FEDEX LETTER *
12 [ ] FEDEX PAK *
13 [ ] FEDEX BOX
14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon.†)
51 [ ] YOUR PACKAGING
56 [ ] FEDEX LETTER *
52 [ ] FEDEX PAK *
53 [ ] FEDEX BOX
54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day.†)
30 [ ] ECONOMY

Government Overnight (Restricted to authorized users.†)
46 [ ] GOVT LETTER
41 [ ] GOVT PACKAGE

Freight Service (for Extra Large or Extra Heavy packages over 150 lbs.)
70 [ ] OVERNIGHT FREIGHT ** (Confirmed reservation required)
80 [ ] TWO-DAY FREIGHT **
† Delivery commitment may be later in some areas.
*Declared Value Limit $100.
**Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

1 [ ] HOLD FOR PICK-UP (Fill in Box H)
2 [X] DELIVER WEEKDAY
3 [ ] DELIVER SATURDAY (Extra Charge)
4 [ ] DANGEROUS GOODS (Extra charge)
5 [ ] DRY ICE
6 [ ] OTHER SPECIAL SERVICE
8 [ ]
9 [ ] SATURDAY PICK-UP (Extra charge)
10 [ ]
11 [ ] DESCRIPTION
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

6 PACKAGES: 1 | WEIGHT in Pounds: 1 | YOUR DECLARED VALUE (See rate): | Total: | Total: | Total:

DIM SHIPMENT (Chargeable Weight)
L x W x H =
Received At:
1 [ ] Regular Stop 3 [ ] Drop Box
2 [ ] On-Call Stop 5 [ ] Station

7 SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide, available upon request. See back of sender's copy of this airbill for information. Service conditions may vary for Government Overnight Service. See U.S. Government Service Guide for details.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, and document your actual loss for a timely claim. Limitations found in the current Federal Express Service Guide apply. Your right to recover from Federal Express for any loss, including intrinsic value of the package, loss of sales, income, interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the declared value specified to the left. Recovery cannot exceed your actual documented loss. The maximum Declared Value for FedEx Letter and FedEx Pak packages is $100.00.

In the event of ungranted delivery, Federal Express will at your request and with some limitations, refund all transportation charges paid. See Service Guide for further information and terms governing liability.

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature:
FedEx Emp. No.: Date/Time:

Federal Express Use
Base Charges:
Declared Value Charge:
Other 1:
Other 2:
Total Charges:

REVISION DATE 6/91
PART #137204 FXEM 1/92
FORMAT #099
099

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Southwest Region
20000 / 300 Mariner Drive
Torrance, CA 90503
(213) 371-1044
(800) 727-GTEL
Fax (213) 371-8720

RECEIVED
SEP 18 1992
GTI, NM

GTEL Client Number: 023352875.040664
Project I.D.: NMED/Barelas Bridge
Work Order Number: T208206

September 11, 1992

Ms. Terry Tinl
Groundwater Technology, Inc.
2501 Yale Blvd. SE, Suite 204
Albuquerque, NM 87106

Dear Ms. Tinl,

Enclosed please find the analytical results for the samples received by GTEL Environmental Laboratories, Inc. on 8-26-92 under chain-of-custody record 76-5445.

A formal Quality Assurance/Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria unless otherwise stated in the footnotes.

GTEL is certified by the state of California under Certification #E723.

If you have any questions concerning this analysis or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,

GTEL Environmental Laboratories, Inc.

Minsoon Song
Laboratory Director

GTEL Client Number: 023352875.040664
Project I.D.: NMED/Barelas Bridge
Work Order Number: T208206

ANALYTICAL RESULTS

Volatile Organics in Water
EPA Methods Modified 8020 and Modified 8015[a]

GTEL Sample Number		08206-1	08206-2	08206-3	
Client Identification		MW-9	VP-1	VP-1	
Date Sampled		8-24-92	8-24-92	8-25-92	
Date Analyzed		9-1-92	9-2-92	9-1-92	
Analyte	Reporting Limit, ug/L	Concentration, ug/L			
Benzene	0.3	620	880	1600	
Toluene	0.3	510	54	220	
Ethylbenzene	0.3	740	310	800	
Xylene, total	0.6	2600	300	590	
BTEX, total	--	4500	1500	3200	
TPH as Gasoline	100	17000	11000	15000	
Dilution Multiplier[b]		10	10	10	

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Board LUFT Manual procedures.

b. Indicates the adjustments made for sample dilution.

GTEL ENVIRONMENTAL LABORATORIES, INC.

20000 Mariner Dr., Suite #300
Torrance, CA 90503

213-371-1044
800-727-GTEL

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

76- 5466

Project Manager: TERRY TINL

Phone #: 505-242-3113

FAX #: 505-242-1103

Address: Groundwater Technology 2501 Yale Blvd SE, Ste. 204 Albuquerque, NM 87106

Site location: 800 Bridge Blvd S.W. Albuquerque, NM

Project Number: 023352875.041043

Project Name: Bonelas Bridge

I attest that the proper field sampling procedures were used during the collection of these samples.

Sampler Name (Print): Jeepy May Chuck Briscoe

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# CONTAINERS	Matrix: WATER	SOIL	AIR	SLUDGE	OTHER	Method Preserved: HCl	HNO_3	H_2SO_4	ICE	NONE	OTHER	Sampling: DATE	TIME
MW-1			5 40ml	X					X			X			8.20.92	1415
MW-2			↓	X					↓			↓			↓	1355
MW-3			↓	X					↓			↓			↓	1430

ANALYSIS REQUEST

BTEX 602 ☐ 8020 ☒ with MTBE ☐ W/TPH GAS	BTEX/TPH Gas 602/8015 ☐ 8020/8015 ☐ MTBE ☐	TPH as ☐ Gas ☐ Diesel ☐ Jet Fuel	Product I.D. by GC (SIMDIS) ☐	Total Oil & Grease: 413.1 ☐ 413.2 ☐ 503A ☐	Total Petroleum Hydrocarbons: 418.1 ☐ 503E ☐	EPA 601 ☐ 8010 ☐ DCA only ☐	EPA 602 ☐ 8020 ☐	EPA 608 ☐ 8080 ☐ PCBs only ☐	EPA 610 ☐ 8310 ☐	EPA 624 ☐ 8240 ☐ NBS +15 ☐	EPA 625 ☐ 8270 ☐ NBS +25 ☐	EPTOX: Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi VOA ☐	EPA Priority Pollutant Metals ☐ HSL ☐	LEAD 7420 ☐ 7421 ☐ 239.2 ☐ 6010 ☐ Org. Lead ☐	CAM Metals ☐ STLC ☐ TTLC	Corrosivity ☐ Flashpoint ☐ Reactivity ☐
X	↓															

SPECIAL HANDLING

24 HOURS ☐

EXPEDITED 48 Hours ☐

SEVEN DAY ☐

OTHER _____ (#) BUSINESS DAYS

QA/QC CLP Level ☐ Blue Level ☐

FAX ☐

Standard TAT

SPECIAL DETECTION LIMITS (Specify)

SPECIAL REPORTING REQUIREMENTS (Specify)

REMARKS: Fedex # 238497142

Lab Use Only

Lot #:

Storage Location

Work Order #: T2108-181

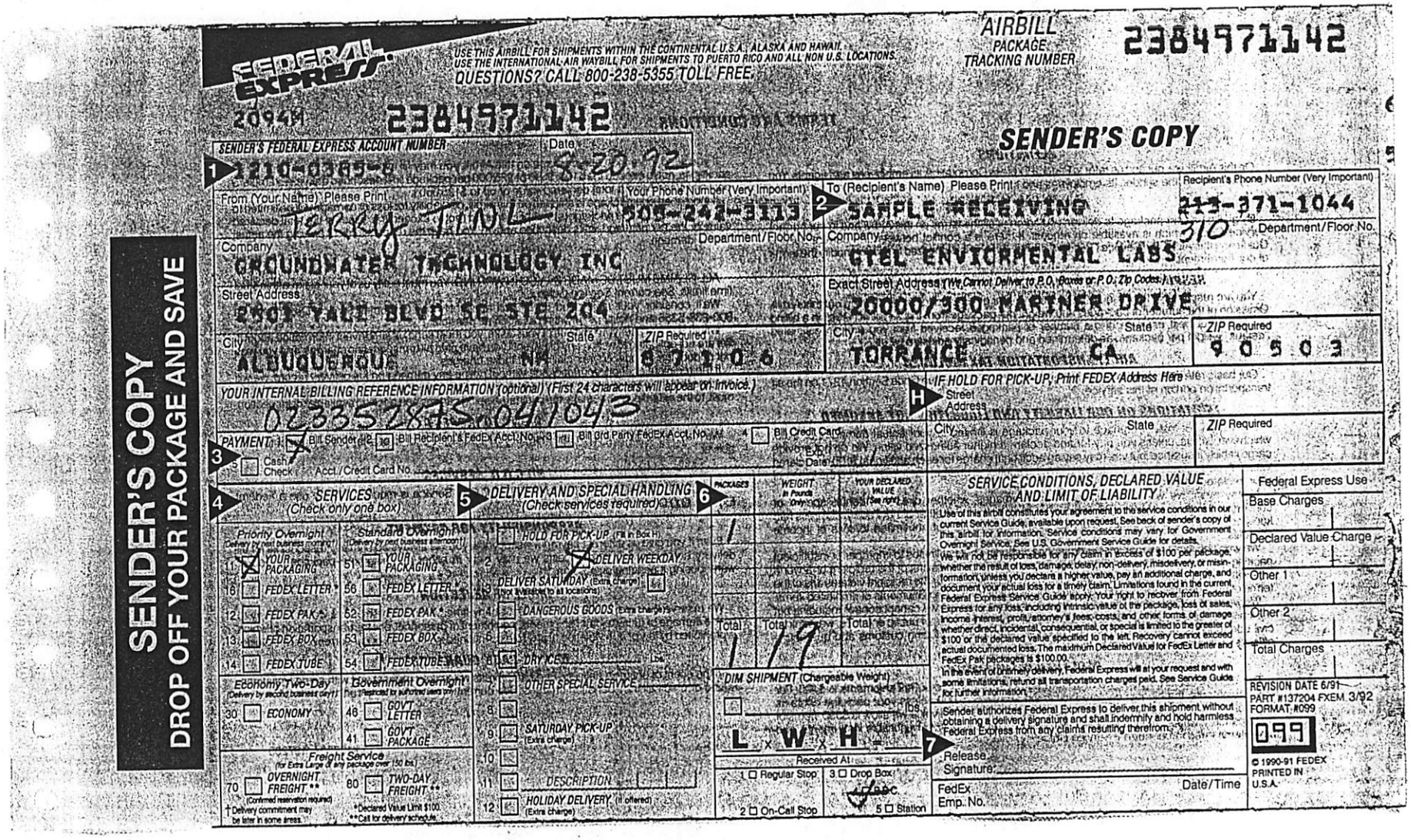
CUSTODY RECORD

	Received by:	Date	Time
Relinquished by Sampler:		8/29/92	1500
Relinquished by:		8/29/92	1700
Relinquished by:		Date	Time

Received by Laboratory:

Way bill #

8/31/92 8:50



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QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL PACKAGE TRACKING NUMBER 2384971142

2094M 2384971142

SENDER'S COPY

SENDER'S COPY
DROP OFF YOUR PACKAGE AND SAVE

SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER 1210-0365-0 Date 8.20.92

From (Your Name) Please Print: TERRY TINDALL Your Phone Number (Very Important): 505-242-3113
Company: GROUNDWATER TECHNOLOGY INC Department/Floor No.:
Street Address: 2901 YALE BLVD SE STE 204
City: ALBUQUERQUE State: NM ZIP Required: 8 7 1 0 6

To (Recipient's Name) Please Print: SAMPLE RECEIVING Recipient's Phone Number (Very Important): 213-371-1044
Company: CTEL ENVIORMENTAL LABS Department/Floor No.: 310
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 20000/900 MARINER DRIVE
City: TORRANCE State: CA ZIP Required: 9 0 5 0 3

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.): 02335285.04/043

H IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address:
City: State: ZIP Required:

3 PAYMENT: X Bill Sender (2) Bill Recipient's FedEx Acct. No. (3) Bill 3rd Party FedEx Acct. No. (4) Bill Credit Card
Cash / Check Acct./Credit Card No. Exp. Date

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning)
11 X YOUR PACKAGING
16 FEDEX LETTER*
12 FEDEX PAK*
13 FEDEX BOX
14 FEDEX TUBE

Standard Overnight (Delivery by next business afternoon)
51 YOUR PACKAGING
56 FEDEX LETTER*
52 FEDEX PAK*
53 FEDEX BOX
54 FEDEX TUBE

Economy Two-Day (Delivery by second business day)
30 ECONOMY

Government Overnight (Not Restricted to authorized users only)
46 GOVT LETTER
41 GOVT PACKAGE

Freight Service (for Extra Large or any package over 150 lbs.)
70 OVERNIGHT FREIGHT** (Confirmed reservation required)
80 TWO-DAY FREIGHT**
†Delivery commitment may be later in some areas.
*Declared Value Limit $100.
**Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)
1 HOLD FOR PICK-UP (Fill in Box H)
2 X DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charge) (Not available to all locations)
4 DANGEROUS GOODS (Extra charge)
5 DRY ICE
7 OTHER SPECIAL SERVICE
8
9 SATURDAY PICK-UP* (Extra charge)
10
11 DESCRIPTION
12 HOLIDAY DELIVERY (If offered) (Extra charge)

6

PACKAGES	WEIGHT in Pounds	YOUR DECLARED VALUE (See right)
1		
Total 1	Total 1.0	Total

DIM SHIPMENT (Chargeable Weight)
L x W x H

7 Received At:
1 ☐ Regular Stop 3 ☐ Drop Box
2 ☐ On-Call Stop 5 ☐ Station

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY
Use of this airbill constitutes your agreement to the service conditions in our current Service Guide, available upon request. See back of sender's copy of this airbill for information. Service conditions may vary for Government Overnight Service. See U.S. Government Service Guide for details.
We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, and document your actual loss for a timely claim. Limitations found in the current Federal Express Service Guide apply. Your right to recover from Federal Express for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the declared value specified to the left. Recovery cannot exceed actual documented loss. The maximum Declared Value for FedEx Letter and FedEx Pak packages is $100.00.
In the event of a missed delivery, Federal Express will at your request and with some limitations, refund all transportation charges paid. See Service Guide for further information.
Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature
FedEx Emp. No. Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 6/91
PART #137204 FXEM 3/92
FORMAT #099
099

APPENDIX C

GROUNDWATER AND SOIL ANALYTICAL RESULTS FROM PREVIOUS INVESTIGATIONS, 1989 - 1991

TABLE 4

NEW MEXICO ENVIRONMENTAL IMPROVEMENT DIVISION
RECORDS OF HYDROCARBON CONCENTRATIONS IN SOIL
800 BRIDGE SITE

DATE	SAMPLE NO.	PPB BENZENE	PPB TOLUENE	PPB ETHYL-BENZENE	PPB TOTAL XYLENES	PPM TVH
10/15/90	AH-1	ND	3	1.2	12	0.1
10/15/90	AH-2	ND	ND	160	1100	79*
10/15/90	AH-3	1	58	16	140	ND
10/15/90	AH-4	ND	1300	7900	24000	995*
10/16/90	AH-5	ND	0.5	ND	4	0.5
10/16/90	MW-5	ND	6.3	1.9	14	ND
10/16/90	MW-6	ND	240	3700	15000	548*
10/18/90	MW-7	ND	160	210	1700	10.6
10/18/90	MW-8	ND	140	1600	3300	256*
NMEID Action Levels		10000				50

* Concentration is above NMEID Action Level

U = Undetected

PPB = Parts per billion

PPM = Parts per million

TABLE 2

NEW MEXICO ENVIRONMENTAL IMPROVEMENT DIVISION
RECORDS OF WATER QUALITY
COLLECTED BY LEGGETTE, BRASHEARS & GRAHAM, INC.
800 BRIDGE SITE

DATE	SAMPLE NO.	PPB BENZENE	PPB TOLUENE	PPB ETHYL-BENZENE	PPB TOTAL XYLENES	PPB MTBE	PPM TVH
10/5/90	TAP WATER	U	U	U	U		U
	140 LaVega						
10/5/90	TAP WATER	U	U	U	U		U
	152 LeVega						
10/11/90	TRIP BLANK	U	U	U	1.6	U	U
10/15/90	AH-1	2	1.8	U	U	U	U
10/15/90	AH-2	2600*	1400*	1900*	14000*	U	73.6
10/15/90	AH-3	1.5	0.6	1.4	0.8	U	1
10/15/90	AH-4	23*	18	150	22	U	15.7
10/15/90	TRIP BLANK	U	U	0.7	3	U	U
10/16/90	AH-5	23*	0.8	0.7	10	U	1
10/30/90	MW-1	2.6	0.5	U	1.7		U
10/30/90	MW-2	U	0.2	U	1		U
10/30/90	MW-3	U	0.4	U	1.3		U
10/30/90	MW-4	590*	35.3	518.4	1871.1*		5
10/30/90	MW-5	U	0.5	U	1.5		U
10/30/90	MW-6	10.7*	33.3	32.7	175.5		4
10/30/90	MW-7	9.8	3	20.8	4.9		1
10/30/90	MW-8	220*	120	960*	1140*		9
10/30/90	FIELD BLANK	U	0.5	U	0.8		U
10/30/90	TRIP BLANK	U	0.7	U	1.5		U
10/31/90	TAP WATER	U	0.6	U	2		U
	153 LaVega						
11/27/90	TRIP BLANK	U	U	U	U		
11/28/90	MW-2	U	1.1	U	0.6		0.7
11/29/90	MW-4	49	1	8.4	14		0.9
NMEID Action Levels		10	750	750	620	100	

* Concentration is above NMEID action level

U = Undetected

ppb = Parts per billion

ppm = Parts per million

TVH = Total volatile hydrocarbons

TABLE 3

NEW MEXICO ENVIRONMENTAL IMPROVEMENT DIVISION
RECORDS OF WATER QUALITY SAMPLES
COLLECTED BY ALBUQUERQUE ENVIRONMENTAL HEALTY DEPARTMENT
800 BRIDGE STREET SW

SAMPLE DATE	LOCATION	PPB BENZENE	PPB TOLUENE	PPB ETHYL-BENZENE	PPB TOTAL XYLENES	PPM IRON	PPM MANGANESE	PPM LEAD	PPM ZINC
8/8/89	NW 800 BRDG	10*	190	0	2				
8/8/89	NE 800 BRDG	70*	220	68	44				
8/8/89	SW 800 BRDG	U	250	U	U				
8/8/89	SE 800 BRDG	500*	120	930*	370				
	A-1	1	U	U	U				
9/12/89	A-2	5700*	4100*	29000*	20700*	10.2*	1.78*	0.011	0.082
9/12/89	A-3	2.6	4.1	25	18.9	U	1.12*	U	0.02
9/12/89	A-4	U	U	U	U				
9/13/89	A-5	10000*	7000*	14500*	40500*				
9/13/89	A-6	1650*	160	1620*	930*				
9/26/89	A-7	3900*	7500*	9700*	30500*	12.5*	1.55*	0.026	0.052
9/26/89	A-8	160*	490	2100*	9500*	7.5*	0.601*	0.029	0.051
9/27/89	A-9	26*	5	8.8	7.4	0.568	1.14*	U	0.019
10/11/89	A-11	7700*	2800*	5700*	19000*	12.2*	1.35*	0.018	0.071
10/11/89	A-12	U	U	U	U	0.423	0.36*	U	0.013
10/10/89	A-13	2000*	U	U	U	6.96*	0.992*	0.012	0.034
11/8/89	A-14	U	U	U	U	0.859	0.451*	U	0.018
11/8/89	A-15	300*	U	U	U	2.45*	1.08*	0.003	0.021
11/8/89	A-16	U	U	U	U	0.289	0.41	U	U
2/19/90	MW-1	4.8	7.2	U	U				
2/19/90	MW-2	5.7	7.2	U	U				
2/19/90	MW-3	U	2.6	U	U				
2/19/90	MW-4	190*	25	280	865*				
9/13/89	145 LA VEGA	U	U	U	U				
8/10/89	183 RIVERSIDE	U	U	U	U				
8/11/89	183 RIVERSIDE	U	U	U	U				
10/4/89	154 LA VEGA	U	U	U	U				
10/4/89	152 LA VEGA	U	U	U	U				
10/16/89	153 LA VEGA	U	U	U	U				
NMEID Action Levels		10	750	750	620	1	0.2	0.05	10

* Concentration is above NMEID Action Level
U = Undetected
Ppb = Parts per billion
Ppm = Parts per million

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT
SCIENTIFIC LABORATORY DIVISION
P.O. Box 4700 700 Camino de Salud, NE
Albuquerque, NM 87196-4700 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

March 11, 1991

Request
ID No. 009907

ANALYTICAL REPORT
SLD Accession No. OR-91-0724

Distribution
(_) User 55211
(■) Submitter 303
(※) SLD Files

To: Richard Renn
Albuq. Environ Health & Energy
Environmental Services Div.
P.O.Box 1293
Albuquerque, NM 87103

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

RECEIVED
JUL 16 1992

Re: **A water, purgeable sample submitted to this laboratory on March 5, 1991**

DEMOGRAPHIC DATA

GTI, NM

COLLECTION

On: 5-Mar-91 *By:* Ren . . .
At: 10:15 hrs. *In/Near:* Albuquerque

LOCATION

Barelas Bridge-153, MW#1

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable [EPA-601/2] Screen {754}

Parameter	Value	Note	MDL	Units
Halogenated Volatiles (42)	0.00	N	1.00	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed[X]; Intact: No[ ], Yes[ ] & Broken By: _____ Date: _____

Laboratory Remarks:

Seventy compounds eluting from near benzene through the C3 substituted benzene region at trace levels to 5 ppb detected by the photoionization detector but not identified.

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Water Lab Sample ID: OR-91-0724
Sample wt/vol: 5.0 (g/mL) mL Lab File ID: _____
Level: (low/med) Low Date Received: 3/5/91
% Moisture: not dec. N/A dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 3/6/91
GPC Cleanup: (Y/N) No pH: _____ Dilution Factor: 1
CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/L

This sample was analyzed for the following compounds

(Continued on page 2.)

using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER
67-64-1	Acetone	5.0	U
71-43-2	Benzene	1.0	U
108-86-1	Bromobenzene	1.0	U
74-97-5	Bromochloromethane	1.0	U
75-27-4	Bromodichloromethane	1.0	U
75-25-2	Bromoform	1.0	U
78-93-3	2-Butanone (MEK)	5.0	U
104-51-8	n-Butylbenzene	1.0	U
135-98-8	sec-Butylbenzene	1.0	U
98-06-6	tert-Butylbenzene	1.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	5.0	U
56-23-5	Carbon tetrachloride	1.0	U
108-90-7	Chlorobenzene	1.0	U
67-66-3	Chloroform	1.0	U
95-49-8	2-Chlorotoluene	1.0	U
106-43-4	4-Chlorotoluene	1.0	U
96-12-8	1,2-Dibromo-3-chloropropane	1.0	U
124-48-1	Dibromochloromethane	1.0	U
106-93-4	1,2-Dibromoethane	1.0	U
74-95-3	Dibromomethane	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	U
75-71-8	Dichlorodifluoromethane	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
75-35-4	1,1-Dichloroethene	1.0	U
156-59-4	cis-1,2-Dichloroethene	1.0	U
156-60-5	trans-1,2-Dichloroethene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
142-28-9	1,3-Dichloropropane	1.0	U
590-20-7	2,2-Dichloropropane	1.0	U
563-58-6	1,1-Dichloropropene	1.0	U
1006-01-5	cis-1,3-Dichloropropene	1.0	U
1006-02-6	trans-1,3-Dichloropropene	1.0	U
100-41-4	Ethylbenzene	1.0	U
87-68-3	Hexachlorobutadiene	1.0	U
98-82-8	Isopropylbenzene	1.0	U
99-87-6	4-Isopropyltoluene	1.0	U
75-09-2	Methylene chloride	5.0	U

(Continued on page 3.)

91-20-3	Naphthalene	1.0	U
103-65-1	Propylbenzene	1.0	U
100-42-5	Styrene	1.0	U
630-20-6	1,1,1,2-Tetrachloroethane	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
127-18-4	Tetrachloroethene	1.0	U
109-99-9	Tetrahydrofuran (THF)	5.0	U
108-88-3	Toluene	1.0	U
87-61-5	1,2,3-Trichlorobenzene	1.0	U
120-82-1	1,2,4-Trichlorobenzene	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
79-01-6	Trichloroethene	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
96-18-4	1,2,3-Trichloropropane	1.0	U
95-63-6	1,2,4-Trimethylbenzene	1.0	U
108-67-8	1,3,5-Trimethylbenzene	1.0	U
75-01-4	Vinyl chloride	1.0	U
95-47-6	o-Xylene	1.0	U
N/A	p- & m-Xylene	1.0	U

Qualifier Definitions:

B - Indicates compound was detected in the Lab Blank as well as in the sample.
D - Indicates value taken from a secondary (diluted) sample analysis.
E - Indicates compound concentration exceeded the range of the standard curve.
J - Indicates an estimated value for tentatively identified compounds, or for compounds detected and identified but present at a concentration less than the quantitation limit.
N - Indicates that more than one peak was used for quantitation.
U - Indicates compound was analyzed for, but not detected above the concentration listed (Quantitation Limit).

QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

METHOD BLANK: A laboratory method blank was analyzed along with this sample to assure the absence of interfering contaminants from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

(Continued on page 4.)

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Fluorobenzene	25.0 ppb	99.
2-Bromo-1-chloropropane	15.0 ppb	111.

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
Vinyl chloride	25. ppb	72.4

Analyst: Gary C. Eden
Gary C. Eden
Analyst, Organic Chemistry

Reviewed By: Richard F. Meyerhein 03/08/91
Richard F. Meyerhein
Supervisor, Organic Chemistry Section

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT
SCIENTIFIC LABORATORY DIVISION
P.O. Box 4700 700 Camino de Salud, NE
Albuquerque, NM 87196-4700 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

March 11, 1991

Request
ID No. 009908

ANALYTICAL REPORT
SLD Accession No. OR-91-0725

Distribution
(_) User 55211
(■) Submitter 303
(※) SLD Files

To: Richard Renn
Albuq. Environ Health & Energy
Environmental Services Div.
P.O.Box 1293
Albuquerque, NM 87103

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A water, purgeable sample submitted to this laboratory on March 5, 1991**

DEMOGRAPHIC DATA

COLLECTION	*LOCATION*
On: 5-Mar-91 *By:* Ren . . .	Barelas Bridge-152, MW#3
At: 10:50 hrs. *In/Near:* Albuquerque	

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable [EPA-601/2] Screen (754)

Parameter	Value	Note	MDL	Units
EPA 601/2 Volatiles (60)	0.00	N	1.00	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed[X]; Intact: No[ ], Yes[ ] & Broken By: _____ Date: _____

Laboratory Remarks:

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Water Lab Sample ID: OR-91-0725
Sample wt/vol: 5.0 (g/mL) mL Lab File ID: _____
Level: (low/med) Low Date Received: 3/5/91
% Moisture: not dec. N/A dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 3/6/91
GPC Cleanup: (Y/N) No pH: _____ Dilution Factor: 1
CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/L

This sample was analyzed for the following compounds
using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER

(Continued on page 2.)

67-64-1	Acetone	5.0	U
71-43-2	Benzene	1.0	U
108-86-1	Bromobenzene	1.0	U
74-97-5	Bromochloromethane	1.0	U
75-27-4	Bromodichloromethane	1.0	U
75-25-2	Bromoform	1.0	U
78-93-3	2-Butanone (MEK)	5.0	U
104-51-8	n-Butylbenzene	1.0	U
135-98-8	sec-Butylbenzene	1.0	U
98-06-6	tert-Butylbenzene	1.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	5.0	U
56-23-5	Carbon tetrachloride	1.0	U
108-90-7	Chlorobenzene	1.0	U
67-66-3	Chloroform	1.0	U
95-49-8	2-Chlorotoluene	1.0	U
106-43-4	4-Chlorotoluene	1.0	U
96-12-8	1,2-Dibromo-3-chloropropane	1.0	U
124-48-1	Dibromochloromethane	1.0	U
106-93-4	1,2-Dibromoethane	1.0	U
74-95-3	Dibromomethane	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	U
75-71-8	Dichlorodifluoromethane	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
75-35-4	1,1-Dichloroethene	1.0	U
156-59-4	cis-1,2-Dichloroethene	1.0	U
156-60-5	trans-1,2-Dichloroethene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
142-28-9	1,3-Dichloropropane	1.0	U
590-20-7	2,2-Dichloropropane	1.0	U
563-58-6	1,1-Dichloropropene	1.0	U
1006-01-5	cis-1,3-Dichloropropene	1.0	U
1006-02-6	trans-1,3-Dichloropropene	1.0	U
100-41-4	Ethylbenzene	1.0	U
87-68-3	Hexachlorobutadiene	1.0	U
98-82-8	Isopropylbenzene	1.0	U
99-87-6	4-Isopropyltoluene	1.0	U
75-09-2	Methylene chloride	5.0	U
91-20-3	Naphthalene	1.0	U
103-65-1	Propylbenzene	1.0	U

(Continued on page 3.)

100-42-5	Styrene	1.0	U
630-20-6	1,1,1,2-Tetrachloroethane	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
127-18-4	Tetrachloroethene	1.0	U
109-99-9	Tetrahydrofuran (THF)	5.0	U
108-88-3	Toluene	1.0	U
87-61-5	1,2,3-Trichlorobenzene	1.0	U
120-82-1	1,2,4-Trichlorobenzene	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
79-01-6	Trichloroethene	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
96-18-4	1,2,3-Trichloropropane	1.0	U
95-63-6	1,2,4-Trimethylbenzene	1.0	U
108-67-8	1,3,5-Trimethylbenzene	1.0	U
75-01-4	Vinyl chloride	1.0	U
95-47-6	o-Xylene	1.0	U
N/A	p- & m-Xylene	1.0	U

Qualifier Definitions:
B - Indicates compound was detected in the Lab Blank as well as in the sample.
D - Indicates value taken from a secondary (diluted) sample analysis.
E - Indicates compound concentration exceeded the range of the standard curve.
J - Indicates an estimated value for tentatively identified compounds, or for compounds detected and identified but present at a concentration less than the quantitation limit.
N - Indicates that more than one peak was used for quantitation.
U - Indicates compound was analyzed for, but not detected above the concentration listed (Quantitation Limit).

QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

METHOD BLANK: A laboratory method blank was analyzed along with this sample to assure the absence of interfering contaminants from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

(Continued on page 4.)

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Fluorobenzene	25.0 ppb	88.
2-Bromo-1-chloropropane	15.0 ppb	103.

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
Vinyl chloride	25. ppb	72.4

Analyst: Gary C. Eden
Analyst, Organic Chemistry

Reviewed By: Richard F. Meyerhein 03/08/91
Supervisor, Organic Chemistry Section

STATE OF NEW MEXICO DEPARTMENT OF HEALTH
SCIENTIFIC LABORATORY DIVISION
P.O. Box 4700 700 Camino de Salud, NE
Albuquerque, NM 87196-4700 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

August 26, 1991

Requested Priority 2
ID No. 009541

ANALYTICAL REPORT
SLD Accession No. OR-91-2782

Distribution
(_) User 55211
(■) Submitter 303
(※) SLD Files

To: Richard Renn
Albuq. Environ Health & Energy
Environmental Services Div.
P.O.Box 1293
Albuquerque, NM 87103

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A water, purgeable sample submitted to this laboratory on August 21, 1991**

DEMOGRAPHIC DATA

COLLECTION
On: 21-Aug-91 *By:* Bro . . .
At: 13:58 hrs. *In/Near:* Albuquerque

LOCATION
Borrales Bridge, Sanchez Well

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable [EPA-601/2] Screen {754}

Parameter	Value	Note	MDL	Units
EPA 601/2 Volatiles (60)	0.00	N	1.00	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:
MDL = Minimal Detectable Level.
A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.
Evidentiary Seals: Not Sealed☐; Intact: No☐, Yes☒ & Broken By: Gary Eden Date: 8/21/91

Laboratory Remarks:

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Water Lab Sample ID: OR-91-2782
Sample wt/vol: 5.0 (g/mL) mL Lab File ID:
Level: (low/med) Low Date Received: 8/21/91
% Moisture: not dec. N/A dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 8/21/91
GPC Cleanup: (Y/N) No pH: Dilution Factor: 1
CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/L

This sample was analyzed for the following compounds using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER

(Continued on page 2.)

67-64-1	Acetone	5.0	U
71-43-2	Benzene	1.0	U
108-86-1	Bromobenzene	1.0	U
74-97-5	Bromochloromethane	1.0	U
75-27-4	Bromodichloromethane	1.0	U
75-25-2	Bromoform	1.0	U
78-93-3	2-Butanone (MEK)	5.0	U
104-51-8	n-Butylbenzene	1.0	U
135-98-8	sec-Butylbenzene	1.0	U
98-06-6	tert-Butylbenzene	1.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	5.0	U
56-23-5	Carbon tetrachloride	1.0	U
108-90-7	Chlorobenzene	1.0	U
67-66-3	Chloroform	1.0	U
95-49-8	2-Chlorotoluene	1.0	U
106-43-4	4-Chlorotoluene	1.0	U
96-12-8	1,2-Dibromo-3-chloropropane	1.0	U
124-48-1	Dibromochloromethane	1.0	U
106-93-4	1,2-Dibromoethane	1.0	U
74-95-3	Dibromomethane	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	U
75-71-8	Dichlorodifluoromethane	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
75-35-4	1,1-Dichloroethene	1.0	U
156-59-4	cis-1,2-Dichloroethene	1.0	U
156-60-5	trans-1,2-Dichloroethene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
142-28-9	1,3-Dichloropropane	1.0	U
590-20-7	2,2-Dichloropropane	1.0	U
563-58-6	1,1-Dichloropropene	1.0	U
1006-01-5	cis-1,3-Dichloropropene	1.0	U
1006-02-6	trans-1,3-Dichloropropene	1.0	U
100-41-4	Ethylbenzene	1.0	U
87-68-3	Hexachlorobutadiene	1.0	U
98-82-8	Isopropylbenzene	1.0	U
99-87-6	4-Isopropyltoluene	1.0	U
75-09-2	Methylene chloride	5.0	U
90-12-0	1-Methylnaphthalene	1.0	U
91-57-6	2-Methylnaphthalene	1.0	U

(Continued on page 3.)

91-20-3	Naphthalene	1.0	U
103-65-1	Propylbenzene	1.0	U
100-42-5	Styrene	1.0	U
630-20-6	1,1,1,2-Tetrachloroethane	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
127-18-4	Tetrachloroethene	1.0	U
109-99-9	Tetrahydrofuran (THF)	5.0	U
108-88-3	Toluene	1.0	U
87-61-5	1,2,3-Trichlorobenzene	1.0	U
120-82-1	1,2,4-Trichlorobenzene	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
79-01-6	Trichloroethene	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
96-18-4	1,2,3-Trichloropropane	1.0	U
95-63-6	1,2,4-Trimethylbenzene	1.0	U
108-67-8	1,3,5-Trimethylbenzene	1.0	U
75-01-4	Vinyl chloride	1.0	U
95-47-6	o-Xylene	1.0	U
N/A	p- & m-Xylene	1.0	U

Qualifier Definitions:

B - Indicates compound was detected in the Lab Blank as well as in the sample.
D - Indicates value taken from a secondary (diluted) sample analysis.
E - Indicates compound concentration exceeded the range of the standard curve.
J - Indicates an estimated value for tentatively identified compounds, or for compounds detected and identified but present at a concentration less than the quantitation limit.
N - Indicates that more than one peak was used for quantitation.
U - Indicates compound was analyzed for, but not detected above the concentration listed (Quantitation Limit).

QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

METHOD BLANK: A laboratory method blank was analyzed along with this sample to assure the absence of interfering contaminants from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

(Continued on page 4.)

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Fluorobenzene	50.0 ppb	91.8
2-Bromo-1-chloropropane	30.0 ppb	95.

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
Vinyl chloride	25. ppb	71.6

Analyst: Gary C. Eden
Analyst, Organic Chemistry

Reviewed By: Richard F. Meyerhein 08/26/91
Supervisor, Organic Chemistry Section

STATE OF NEW MEXICO

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700
Albuquerque, NM 87196-4700
700 Camino de Salud, NE
[505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

November 26, 1991

Requested Priority 2
ID No. 024594

ANALYTICAL REPORT
SLD Accession No. OR-91-3554

Distribution
(_) User 55211
(■) Submitter 303
(※) SLD Files

To: Richard Renn
Albuq. Environ. Health Dept.
Environmental Services Div.
P.O.Box 1293
Albuquerque, NM 87103

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A water, purgeable sample submitted to this laboratory on November 21, 1991**

DEMOGRAPHIC DATA

COLLECTION
On: 21-Nov-91 *By:* Ren . . .
At: 11:20 hrs. *In/Near:* Albuquerque

LOCATION
153 Lavega SW

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable [EPA-601/2] Screen {754}

Parameter	Value	Note	MDL	Units
EPA 601/2 Volatiles (60)	0.00	N	1.00	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.
A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.
Evidentiary Seals: Not Sealed[X]; Intact: No[ ], Yes[ ] & Broken By: _____ Date: _____

Laboratory Remarks:

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Water Lab Sample ID: OR-91-3554
Sample wt/vol: 5.0 (g/mL) mL SLD Batch No: 80
Level: (low/med) Low Date Received: 11/21/91
% Moisture: not dec. N/A dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 11/22/91
GPC Cleanup: (Y/N) No pH: _____ Dilution Factor: 1
CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/L

This sample was analyzed for the following compounds using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER
67-64-1	Acetone	5.0	U

(Continued on page 2.)

71-43-2	Benzene	1.0	U
108-86-1	Bromobenzene	1.0	U
74-97-5	Bromochloromethane	1.0	U
75-27-4	Bromodichloromethane	1.0	U
75-25-2	Bromoform	1.0	U
78-93-3	2-Butanone (MEK)	5.0	U
104-51-8	n-Butylbenzene	1.0	U
135-98-8	sec-Butylbenzene	1.0	U
98-06-6	tert-Butylbenzene	1.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	5.0	U
56-23-5	Carbon tetrachloride	1.0	U
108-90-7	Chlorobenzene	1.0	U
67-66-3	Chloroform	1.0	U
95-49-8	2-Chlorotoluene	1.0	U
106-43-4	4-Chlorotoluene	1.0	U
96-12-8	1,2-Dibromo-3-chloropropane	1.0	U
124-48-1	Dibromochloromethane	1.0	U
106-93-4	1,2-Dibromoethane	1.0	U
74-95-3	Dibromomethane	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	U
75-71-8	Dichlorodifluoromethane	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
75-35-4	1,1-Dichloroethene	1.0	U
156-59-4	cis-1,2-Dichloroethene	1.0	U
156-60-5	trans-1,2-Dichloroethene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
142-28-9	1,3-Dichloropropane	1.0	U
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563-58-6	1,1-Dichloropropene	1.0	U
1006-01-5	cis-1,3-Dichloropropene	1.0	U
1006-02-6	trans-1,3-Dichloropropene	1.0	U
100-41-4	Ethylbenzene	1.0	U
87-68-3	Hexachlorobutadiene	1.0	U
98-82-8	Isopropylbenzene	1.0	U
99-87-6	4-Isopropyltoluene	1.0	U
75-09-2	Methylene chloride	1.0	U
90-12-0	1-Methylnaphthalene	1.0	U
91-57-6	2-Methylnaphthalene	1.0	U
91-20-3	Naphthalene	1.0	U

(Continued on page 3.)

103-65-1	Propylbenzene	1.0	U
100-42-5	Styrene	1.0	U
630-20-6	1,1,1,2-Tetrachloroethane	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
127-18-4	Tetrachloroethene	1.0	U
109-99-9	Tetrahydrofuran (THF)	5.0	U
108-88-3	Toluene	1.0	U
87-61-5	1,2,3-Trichlorobenzene	1.0	U
120-82-1	1,2,4-Trichlorobenzene	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
79-01-6	Trichloroethene	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
96-18-4	1,2,3-Trichloropropane	1.0	U
95-63-6	1,2,4-Trimethylbenzene	1.0	U
108-67-8	1,3,5-Trimethylbenzene	1.0	U
75-01-4	Vinyl chloride	1.0	U
95-47-6	o-Xylene	1.0	U
N/A	p- & m-Xylene	1.0	U

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E - Indicates compound concentration exceeded the range of the standard curve.
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QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

METHOD BLANK: A laboratory method blank was analyzed along with this sample to assure the absence of interfering contaminants from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

(Continued on page 4.)

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Fluorobenzene	50.0 ppb	107.3
2-Bromo-1-chloropropane	30.0 ppb	128.

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
Vinyl chloride	25. ppb	68.4

Analyst: Gary C. Eden
Analyst, Organic Chemistry

Reviewed By: Richard F. Meyerhein 11/26/91
Supervisor, Organic Chemistry Section

APPENDIX D

SOIL SAMPLE LABORATORY CERTIFICATES OF ANALYSIS AND CHAIN-OF-CUSTODY DOCUMENTATION AUGUST 18-20, 1992

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Southwest Region
20000 / 300 Mariner Drive
Torrance, CA 90503
(213) 371-1044
(800) 727-GTEL
Fax (213) 371-8720

GTEL Client Number: 023352875.040664
Project I.D.: Barelas Bridge
Work Order Number: T208182

September 9, 1992

Ms. Terry Tinl
Groundwater Technology, Inc.
2501 Yale Blvd. S.E., Suite 204
Albuquerque, NM 87106

Dear Ms. Tinl,

Enclosed please find the analytical results for the samples received by GTEL Environmental Laboratories, Inc. on 8-21-92 under chain-of-custody record 76-5465.

A formal Quality Assurance/Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria unless otherwise stated in the footnotes.

GTEL is certified by the state of California under Certification #E723.

If you have any questions concerning this analysis or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,

GTEL Environmental Laboratories, Inc.

Minsoon Song
Laboratory Director

GTEL Client Number: 023352875.040664
Project I.D.: Barelas Bridge
Work Order Number: T208182

ANALYTICAL RESULTS

Total Recoverable Petroleum Hydrocarbons in Soil
EPA 418.1/Standard Methods 503E[a]

Sample Identification		Date Sampled	Date Extracted	Date Analyzed	Reporting Limit, mg/kg	Concentration, mg/kg	Percent Solids, %
GTEL No.	Client ID						
08182-4C	COMP	8-20-92	9-2-92	9-3-92	5	1100	86.9

a. EPA 600/4-79-020, March 1983 revision. Extraction by EPA Method 3550. Results are calculated on a wet weight basis.

GTEL Client Number: 023352875.040664
Project I.D.: Barelas Bridge
Work Order Number: T208182

ANALYTICAL RESULTS

Flash Point of Soil
Modified EPA Method 1010[a]

Sample Identification		Date Sampled	Date Analyzed	Flash Point[b], °F	Percent Solids, %
GTEL No.	Client ID				
08182-4	COMP	8-20-92	8-24-92	>160	86.9

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modified to allow determinations on soil.

b < 75 indicates a flash point of less than 75 °F;
> 160 indicates that the test termination point of 160 °F was reached without ignition.

GTEL Client Number: 023352875.040664
Project I.D.: Barelas Bridge
Work Order Number: T208182

ANALYTICAL RESULTS

Metals in TCLP Leachate[a]

GTEL Sample Number			08182-04			
Client Identification			COMP			
Date Sampled			8-20-92			
Date Leached			8-24-92			
Date Analyzed (Method 7420)			8-25-92			
Analyte	Method[b]	Reporting Limit, mg/L	Concentration, mg/L			
Lead	7420	0.50	<0.50			

a. Federal Register, June 29, 1990, 40 CFR, Part 261, Appendix II - Method 1311. These data are corrected for analytical bias as required by Method 1311 by applying a correction determined by matrix spike recovery.

b. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA, November 1986; Digestion by Method 3010 (except for mercury).

GTEL Client Number: 023352875.040664
Project I.D.: Barelas Bridge
Work Order Number: T208182

ANALYTICAL RESULTS

Volatile Organics in Soil
EPA Methods Modified 8020 and Modified 8015[a]

GTEL Sample Number		08182-1A	08182-2A	08182-3A	
Client Identification		PR3-9	VP1-5	MW-9-9	
Date Sampled		8-18-92	8-19-92	8-20-92	
Date Extracted		8-24-92	8-24-92	8-24-92	
Date Analyzed		8-26-92	8-26-92	8-26-92	
Analyte	Reporting Limit, mg/kg	Concentration, mg/kg			
Benzene	0.005	0.78	2.5	1.7	
Toluene	0.005	1.4	1.0	2.2	
Ethylbenzene	0.005	5.1	5.2	7.6	
Xylene, total	0.015	7.6	7.4	23	
BTEX, total	--	15	16	35	
TPH as Gasoline	10	580	340	820	
Dilution Multiplier[b]		5	5	5	
Percent solids, %		80.6	90.0	90.1	

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Board LUFT Manual procedures. Results are calculated on a wet weight basis.

b. Indicates the adjustments made for sample dilution.

GTEL ENVIRONMENTAL LABORATORIES, INC.

20000 Mariner Dr., Suite #300
Torrance, CA 90503

213-371-1044
800-727-GTEL

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST 76-5465

CUSTODY RECORD

Project Manager: TERRY TINL

Phone #: 505-242-3113

FAX #: 505-242-1103

Address: Groundwater Technology 2501 Yale Blvd SE, Ste 204 Albuquerque, NM 87106

Site location: 800 Bridge Blvd SW Albuquerque, NM

Project Number: 023352875.040664

Project Name: Barelas Bridge

I attest that the proper field sampling procedures were used during the collection of these samples.

Sampler Name (Print): TERRY TINL JERRY MAY C. BRISCOE

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# CONTAINERS	Matrix: WATER	SOIL	AIR	SLUDGE	OTHER	Method Preserved: HCl	HNO3	H2SO4	ICE	NONE	OTHER	Sampling: DATE	TIME
PR3-9			1 250ml		X							X			8.18.92	1413
VP1-5			↓		X							X			8.19.92	1405
~~MW~~ MW-9-9			↓		X							X			8.20.92	0620
COMP			3 250ml		X							X			8.20.92	1230

BTEX 602 ☐ 8020 ☐ with MTBE ☐	BTEX/TPH Gas 602/8015 ☐ 8020/8015 ☐ MTBE ☐	TPH as ☐ Gas ☐ Diesel ☐ Jet Fuel	Product I.D. by GC (SIMDIS) ☐	Total Oil & Grease: 413.1 ☐ 413.2 ☐ 503A ☐	Total Petroleum Hydrocarbons: 418.1 ☐ 503E ☐	EPA 601 ☐ 8010 ☐ DCA only ☐	EPA 602 ☐ 8020 ☐	EPA 608 ☐ 8080 ☐ PCBs only ☐	EPA 610 ☐ 8310 ☐	EPA 624 ☐ 8240 ☐ NBS +15 ☐	EPA 625 ☐ 8270 ☐ NBS +25 ☐	EPTOX: Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi VOA ☐	EPA Priority Pollutant Metals ☐ HSL ☐	LEAD 7420 ☐ 7421 ☐ 239.2 ☐ 6010 ☐ Org. Lead ☐	CAM Metals ☐ STLC ☐ TTLC	Corrosivity ☐ Flashpoint ☐ Reactivity ☐	TCLP LEAD	TPH 418.1
	X																X	X

SPECIAL HANDLING

24 HOURS ☐
EXPEDITED 48 Hours ☐
SEVEN DAY ☐
OTHER _____(#) BUSINESS DAYS
QA/QC CLP Level ☐ Blue Level ☐
FAX ☐

Standard TAT

SPECIAL DETECTION LIMITS (Specify)

6

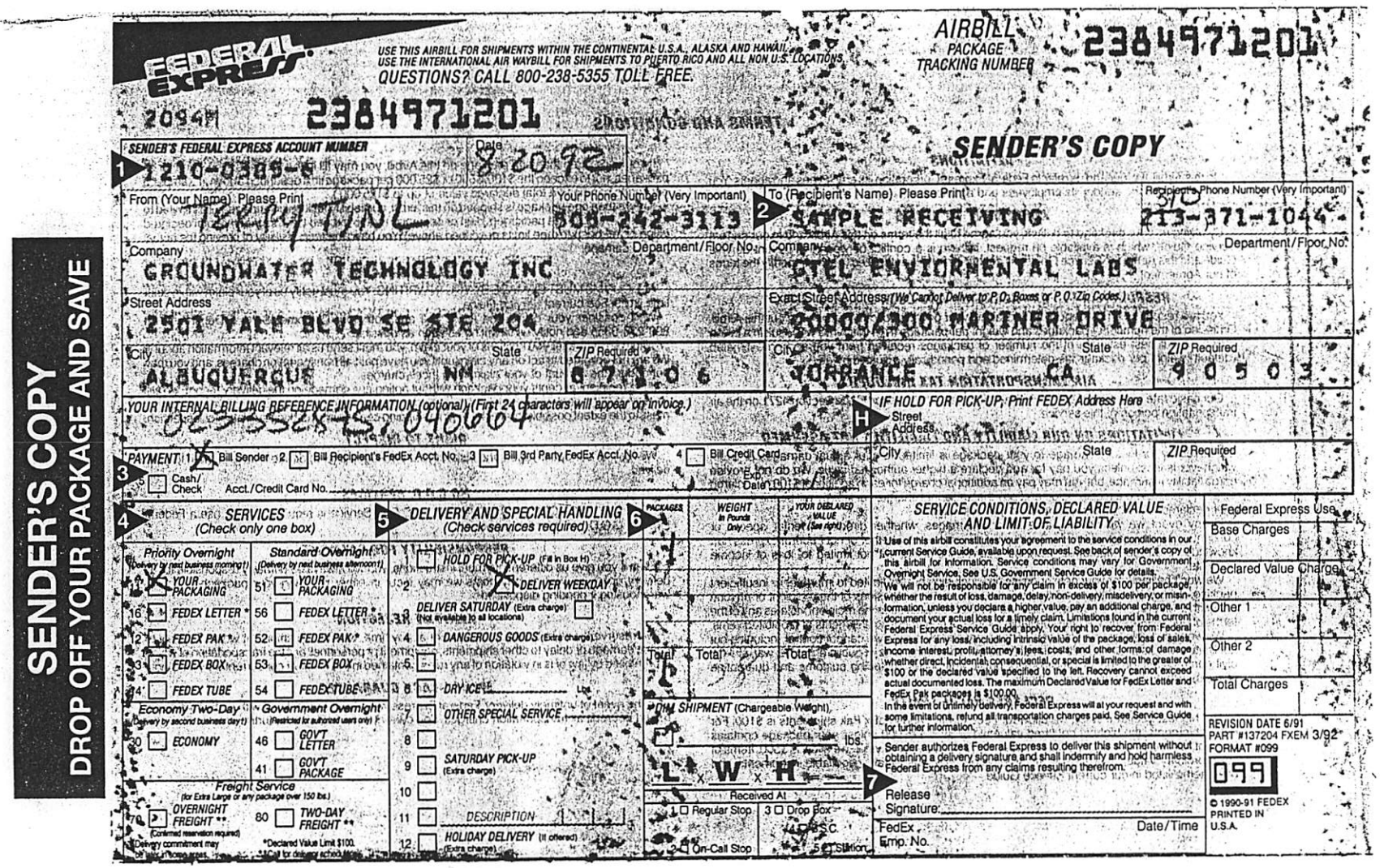
SPECIAL REPORTING REQUIREMENTS (Specify)

REMARKS: Fedex # 238497 1201

Lab Use Only Storage Location

Lot #: Work Order #: T2-08-18

Relinquished by Sampler	Date	Time	Received by:	Date	Time	Received by Laboratory:	Way bill #
Terry Tinl	8.20.92	1353PM					
Relinquished by:	Date	Time	Received by:	Date	Time		
Relinquished by:	Date	Time					
	8-21-92	8:45					



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DROP OFF YOUR PACKAGE AND SAVE

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER: 1210-0389-6 Date: 8-20-92

From (Your Name) Please Print: Terry Tyler
Your Phone Number (Very Important): 505-242-3113
Company: GROUNDWATER TECHNOLOGY INC
Department/Floor No.:
Street Address: 2501 YALE BLVD SE STE 204
City: ALBUQUERQUE State: NM ZIP Required: 8 7 1 0 6

2 To (Recipient's Name) Please Print: SAMPLE RECEIVING
Recipient's Phone Number (Very Important): 213-371-1044
Company: CTEL ENVIRONMENTAL LABS
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 20000/2300 MARINER DRIVE
City: TORRANCE State: CA ZIP Required: 9 0 5 0 3

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice): 023552-57 040664

H IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address:
City: State: ZIP Required:

3 PAYMENT 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card
[ ] Cash/Check Acct./Credit Card No. Exp. Date (mo./yr.)

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning!)
[X] YOUR PACKAGING
[ ] FEDEX LETTER *
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[ ] FEDEX BOX
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Standard Overnight (Delivery by next business afternoon!)
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Economy Two-Day (Delivery by second business day!)
[ ] ECONOMY

Government Overnight (Restricted to authorized users only!)
[ ] GOVT LETTER
[ ] GOVT PACKAGE

Freight Service (for Extra Large or any package over 150 lbs.)
[ ] OVERNIGHT FREIGHT ** (Confirmed reservation required)
[ ] TWO-DAY FREIGHT **
** Delivery commitment may
*Declared Value Limit $100.

5 DELIVERY AND SPECIAL HANDLING (Check services required)
[ ] HOLD FOR PICK-UP (Fill in Box H)
[X] DELIVER WEEKDAY
[ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
[ ] DANGEROUS GOODS (Extra charge)
[ ] DRY ICE _____ kg
[ ] OTHER SPECIAL SERVICE
[ ]
[ ] SATURDAY PICK-UP (Extra charge)
[ ]
[ ] DESCRIPTION
[ ] HOLIDAY DELIVERY (If offered) (Extra charge)

6 PACKAGES: 1
WEIGHT (In Pounds, Only 1 Decimal): 1.0
YOUR DECLARED VALUE (See right): 0
Total: 1.0 Total: 0

DIM SHIPMENT (Chargeable Weight): lbs.
L x W x H
Received At:
[ ] 1 Regular Stop [ ] 3 Drop Box
[ ] On-Call Stop [ ] Station

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY
1. Use of this airbill constitutes your agreement to the service conditions in our current Service Guide, available upon request. See back of sender's copy of this airbill for information. Service conditions may vary for Government, Overnight Service. See U.S. Government Service Guide for details.
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In the event of untimely delivery, Federal Express will at your request and with some limitations, refund all transportation charges paid. See Service Guide for further information.

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Total Charges

REVISION DATE 6/91
PART #137204 FXEM 3/92
FORMAT #099
099

APPENDIX E

AIR SPARGE AND SOIL VENT PILOT TESTS FIELD DATA

SOIL VENTING PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.26.92
Measured by:	T. TINL/C. Briscoe

Vent Test Well: VP-1

Time	Elapsed Time (min.)	Vacuum at Test Well (ins. H2O)	Pre/Post Vacuum at Blower (ins. H2O)	Pre-Blower Anemom. Reading (ft/min.)	Pre/Post Blower Temp (oF)	Pre/Post Carbon Vapor Concentration (Eff) PID (ppmv)	LEL Meter (%LEL)	Vacuum at Observation Wells (ins. H2O) Distance from VP-1								
								19 ft MW-4	10 ft PR3-S	10 ft PR3-D	19 ft PR2-D	19 ft PR2-S	34 ft MW-8	38 ft MW-9	147 ft MW-7	ft Tank Vent
0801	0	0	0	0	64/70	4.1/0.00	0/0	0	.005	0	.01	.005	.01	.005	.01	
	Dilution Valve 100% closed; start Blower 0820															
	Sucking Water; Step blower; Adjust bypass valve to 50% closed 0823; sucking water															
	Adjust Bypass to 20% closed 0826															
0831	5	32	33/40	1500	82/110	1358/11.4/2.8		0.80	1.30	1.50	.80	.75	0.25	.04	0	
0838	12	31	32/40	1250	81/131	1383/1.8	100%+	0.80	1.30	1.55	.85	.85	0.25	.06	.01	
0846	20	30	32/39	1250	84/131	1376/0		0.80	1.35	1.55	.85	.85	.25	.055	.01	
0901	35	30	31/38	1250	83/139	1385/0		0.85	1.35	1.55	.85	.85	.26	.06	.01	
0916	50	30	31/38	1250	84/144	1440/0/0		.85	1.35	1.60	.85	.85	.25	.05	.005	.005
0931	65	30	31/38	1250	81/146	1438/0		.85	1.35	1.60	.85	.85	.25	.055	0.00	
01031	125	30	31/37	1250	78/157	1447/331/0		.85	1.35	1.60	.90	.90	.25	.055	.005	
	Took air sample 1040															
	Open dilution valve 0% closed (100% open) 1045															
1046	1	19.5	19/28	1000	77/154	1337/0		0.60	1.0	1.20	.65	.65	.175	.04		
1104	19	19.5	19/28	1000	80/156	1383/0		0.60	1.0	1.20	.65	.65	.175	.04		
	Crank down to 20% closed again 11:08															
1110	2	31	32/38			1465	685 infl ppm	line								

DTW VP-1 = 9.25' 0708

- Whisperwatt Model DCA-40SSI
52 HP, 23 KW Generator (Diesel)

Air sample 1396 ppm at effluent at 1040
- Destroyed air sample

SOIL VENTING PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8·26·92
Measured by:	T. TINL / C. Briscoe

Vent Test Well:	VP-1

Time	Elapsed Time (min.)	Vacuum at Test Well (ins. H2O)	Pre/Post Vacuum at Blower (ins. H2O)	Pre-Blower Anemom. Reading (ft/min.)	Pre/Post Blower Temp. (oF)	Vapor Concentration (Eff) PID (ppmv)	Vapor Concentration (Eff) LEL Meter (%LEL)	Vacuum at Observation Wells (ins. H2O) Distance from ft PR3-S	ft PR3-D	ft MW-8	ft PR2-D	ft PR2-S	ft MW-4	ft MW-9	ft MW-7	ft
		Closed dilution valve 50% closed 1115														
1116	1	44	47/50	1600	81/167	1496/572/0		1.55	1.85	0.30	1.00	1.00	1.00	0.06	0	
1121	6					1566										
1128	13					1638/0										
1131	16	43	47/49	1500	77/169	1522/0		1.60	1.90	0.30	1.06	1.05	1.05	.07	0	
1142						1613/0										
		Shut blower off momentarily - pipe came apart 1152 —														
		Restart Blower 50% closed 1154														
1200	45	43	46/49	1500	79/170	1672/0		1.55	1.80	0.30	1.00	1.00	1.00	.06		
1213						1740										
		Shut off blower 1214														

Air Sample VP-1 Eff/ 1207 3 bags, 1953 ppm

AIR SPARGE PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.25.92
Measured by:	T. TINL / C. Briscoe

Air Sparge Test Well:	AS-1

Grimmer Schmidt Corp. Model 105; 100 psi 105 cfm Air compressor

Air hose 3/4" x 50'

Oil/water Filter

Distance from sparge well to monitoring point						
39 ft	43 ft	9 ft	14 ft	19.5 ft	5.5 ft	150 ft	ft
MW-8	MW-9	PR3	PR2	MW-4	VP-1	MW-7	

Time	Elapsed Time (min.)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTP/ DTW in MP (ft.)	Vapor Concentration at MP: PID (ppmv)	LEL Meter (%LEL)	O2 (%LEL) O2	Pressure at MP (in H2O)
0740	0	0	0	0	MW-9	0.2	9.32	503			0
					MW-4	0.2	9.25/9.26	230			0
					VP-1	—	9.25	508			0
Start Compressor		warm up			AS-1	1.6	9.06	NA		Do taken at 20-22'	
0836					MW-8	0.2	9.80/9.81	25.7			0
					PR-3S	NA	NA	359			0
					PR-3D	NA	NA	716.6			0
Finish	background measurements				PR-2S	NA	NA	172			0
0830					PR-2D	NA	NA	57.4			0
					MW-7	NA	8.75	35.5			0
Start	air inject at 0901 at			5 psi							
0904	3	5	NA	2.5-7.5							
0914	13	5	NA	2-7.5	VP-1	—	—	2960	>100%	15	.275
					PR3-D			5208			.05
					PR3-S			4773			.05
					PR2-D			1371			.175
					PR2-S			1434			.150
					MW-8			840			.05
					MW-4			1315			.05
					MW-9			428			<.005
end 0934					MW-7			36.1			0.00
0939	38	5	NA	2-6	VP-1			435			1.55
					PR3-S			511			0.15
					PR3-D			371			0.20
					MW-8			723			0.20

AIR SPARGE PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.25.92
Measured by:	T. TINL/C. Briscoe

Air Sparge Test Well: AS-1

Distance from sparge well to monitoring point							
ft	ft	ft	ft	ft	ft	ft	ft

Time	Elapsed Time (min)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTW in MP (ft)	Vapor Concentration at MP			Pressure at MP (in H2O)
								PID (ppmv)	LEL Meter (%LEL)	O2 (%LEL)	
					PR2-D			302			0.35
					PR2-S			421			0.25
					MW-9			639			0.00
end	0946	5	NA	2-6	MW-4			1205			0.10
0959	58				VP-1			376			1.50
					PR3-D			441			0.20
					PR3-S			602			0.15
					MW-8			611			0.25
					PR2-D			359			0.40
					PR2-S			512			0.15
					MW-4			1292			0.05
					MW-9			1120			0.00
1021	80	4.8	4.8	5.5-10.5	VP-1			681			1.0
					PR3-D			566			.25
					PR3-S			2426			.20
					MW-8			261			.35
					PR2-S			535			0.40
					PR2-D			336			0.50
					MW-4			1121			0.15
end 1039		5.1-5.2	NA	6-10.5	MW-9			1385			0
1055	114	5	NA	5-9.5	VP-1			605			2.8
					PR3-D			392			.45
					PR3-S			945			.35
					MW-8			211			.85

AIR SPARGE PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date Measured by	8.25.92 / T. TINL / C. BRISCOE

Air Sparge Test Well	AS-1

Distance from sparge well to monitoring point						
ft	ft	ft	ft	ft	ft	ft

Time	Elapsed Time (min.)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTW in MP (ft)	Vapor Concentration at MP			Pressure at MP (in H2O)
								PID (ppmv)	LEL Meter (%LEL)	O2 (%LEL)	
					PR2-D			381			0.80
					PR2-S			1270			0.65
					MW-4			1125			0.20
end 1113					MW-9			1421			0
1119					MW-4	0.2	9.20				
					MW-9	0.2	9.29				
					MW-8	5.1	9.40				
Adjust	Press to	150%			VP-1	6.2	9.25				
1134		7.2	7.2	14-17							
1149	168	7.5	7.5	13.5-17	VP-1		?	9999+			4.2
					PR3-S		?	9999+			0.60
					PR3-D			313			0.75
					MW-8			203			1.75
					PR2-D			356			1.35
		7.5	7.5	13.5-17	PR2-S			3263			1.10
					MW-4			1145			0.40
					MW-7			40.5			0.02
1207		7.5	7.5		MW-9			FAULT			0.02
recalibrate PID + cleaned lens				13.5-17	"						
1213	192	7.5	7.5	13.5-17	VP-1			210			6.8
					PR3-S			393			0.75
					PR3-D			187			0.95
					PR2-D			381			1.60
					PR2-S			503			1.30

AIR SPARGE PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.25.92
Measured by:	T. TINL / C. Briscoe

Air Sparge Test Well: AS-1

Distance from sparge well to monitoring point						
ft	ft	ft	ft	ft	ft	ft

Time	Elapsed Time (min)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTW in MP (ft)	Vapor Concentration at MP: PID (ppmv)	Vapor Concentration at MP: LEL Meter (%LEL)	Vapor Concentration at MP: O2 (%LEL)	Pressure at MP (in H2O)
					MW-8			281			7.6
					MW-4			769			10.5
					MW-9			1117			0.02
1233		7-8	7-8	13-17	MW-7			102			0.02
1245	224	7-8		13-17	VP-1			214			7.0
					PR3-S			383			.75
					PR3-D			194			1.0
					MW-8			140			6.9
					PR2-D			230			1.60
					PR2-S			340			1.30
					MW-4			751			0.50
					MW-7			107			0.01
1300		7-7.5		15-18	MW-9			1137			0.01
1317	256	7-8		14-16	VP-1			278			6.6
					PR3-S			793			0.825
					PR3-D			184			1.05
					MW-8			204			8.6
					PR2-S			348			1.40
					PR2-D			239			1.75
					MW-4			766			0.50
					MW-7			157			0.005 ÷ 0.01
1334	273	7.5-8		15-16	MW-9			1034			0.02
12 (-					VP-1	7.0	9.10				
					MW-4	0.3	9.25				
					MW-8	6.5	8.70				
	-				MW-9	0.2	9.30				

AIR SPARGE PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.25.92
Measured by:	T. Tiul/C. Briscoe/P.Sevin/C. Stephenson

Air Sparge Test Well: AS-1

Distance from sparge well to monitoring point							
ft	ft	ft	ft	ft	ft	ft	ft

Time	Elapsed Time (min.)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTW in MP (ft)	Vapor Concentration at MP: PID (ppmv)	LEL Meter (%LEL)	O_2 (O_2 %LEL)	Pressure at MP (in H2O)
Adjust	pressure	to 9.6 psi	(200%)	19-22							
1344											
1400	299	9-10	9-10	20-22	VP-1	seal leaking		459			7.0+
					PR3-D			415			1.3
					PR3-S			455			1.0
					MW-8			200			8.8
					PR2-S			345			1.75
					PR2-D			247			2.10
					MW-4			715			0.625
					MW-7			209			0.02
1408	End	9-10		20-22	MW-9			797			0.025
1429	328	9.5-10		20-23	VP-1			402			9.00
					PR3-D			299			1.40
					PR3-S			715			1.10
					MW-8			206			10.6
					PR2-D			258			2.3
					PR2-S			1679			1.8
					MW-4			720			0.70
					MW-7			250			.015
1442					MW-9			733			0.025
1454	353	9.5-10		20-23	VP-1			363	100+	19	9.3
					PR3-D			197			1.6
					PR3-S			274			1.2
					MW-8			221			11.0

AIR SPARGE PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.25.92
Measured by:	T. TINL / C. Briscoe

Air Sparge Test Well: AS-1

Distance from sparge well to monitoring point							
ft	ft	ft	ft	ft	ft	ft	ft

Time	Elapsed Time (min.)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTW in MP (ft)	Vapor Concentration at MP: PID (ppmv)	LEL Meter (%LEL)	O2 (%LEL)	Pressure at MP (in H2O)
					PR2-S			353			2.0
					PR2-D			267			2.4
					MW-4			561			0.75
					MW-7			271			.015
1508					MW-9			689			.020
1513			9.5-10	20-22	VP-1	7.0	9.03				
					MW-4	.2-.3	9.25				
					MW-8	6.9	8.55				
1523					MW-9	.2-.3	9.30				
					MW-7	.2-.3					
Shut down compressor 1523											
Purged 12 gallons VP-1 & sampled - dk grey - HC odor, silty - 1538											
Sampled 1547 - 2 VOAS											
Unhooked sparge piping from AS-1 1556											
1621	440				VP-1			215			0
					MW-8			811			0
					PR2-D			312			0
					PR2-S			513			0
					PR3-S			299			0
					PR3-D			170			0
					MW-4			554			0
					MW-7			345			0
					AS-1	.8					

AIR SPARGE PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.25.92
Measured by:	T. Tiwy / C. Briscoe

Air Sparge Test Well:	AS-1

Distance from sparge well to monitoring point						
ft	ft	ft	ft	ft	ft	ft

Time	Elapsed Time (min.)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTW in MP (ft)	Vapor Concentration at MP			Pressure at MP (in H2O)
								PID (ppmV)	LEL Meter (%LEL)	O2 (%LEL)	
					MW-9			612			0
					VP-1	3.2					
					MW-4		9.35				
					MW-8	2.0	9.93				

AIR SPARGE/SOIL VENTING PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.26.92
Measured by:	T. TINL / C. Briscoe

Air Sparge Test Well:	AS-1
Vent Test Well:	VP-1

Time	Elapsed Time (min.)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Vacuum at Vent Well (ins. H2O)	Pre/Post Vacuum at Blower (ins. H2O)	Pre-Blower Anemom. Reading (ft/min)	Pre/Post Blower Temp (oF)	Vapor Con. at Blower (eff) PID (ppmv)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTW in MP (ft.)	Vapor Concentration at MP: PID (ppmv)	Vapor Concentration at MP: LEL Meter (%LEL)	Vapor Concentration at MP: O2 (%LEL)	Pressure/ Vacuum at MP (in H2O)
1245	0	0	0	0	0	0/0	0	87/80	88.4/0	PR3-S			565			0
										PR3-D			162			0
										MW-8	0.5	9.79	1119			0
										PR2-S			559			0
										PR2-D			860			0
										MW-4	0.2	9.24 / [illegible]	210			0
										MW-9			475			0
										MW-7			549			0
				Start Blower 1310; Dilution valve 50% closed; Start Compressor 1311 - 9.5-10 psi; Shut Blower off 1312; Blower on; 50% bypass 1315; Compression to 7.5 psi											(*) Pressure in wells
1327	12	7-7.5	7-7.5	14-18	44	45/49	1500-1600	74/169	1226/14.8	MW-8			1650			+.20
										PR3-S			0			-.475
										PR3-D			0			-.50
										PR2-S			650			+.10
										PR2-D			777			+.25
										MW-4			7			-.20
										MW-9			445			-.005
										MW-7			640			0
1342									/46	MW-8						+0.85
1348	33	7-7.5	7-7.5	14-17.8	41	42/48	1500	74/172	1549/64	PR3-D			0			-0.50
										PR3-S			512			-0.50
										MW-8			1891			+3.4
										PR2-S			1145			+.35
										PR2-D			1389			+.55
										MW-4			6			-.22
										MW-9			240			-.02
									/151	MW-7			529			+.025
			Charge out carbon 1409; system off Finish						1412							

AIR SPARGE/SOIL VENTING PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.26.92
Measured by:	T. TINL/C. Briscoe

Air Sparge Test Well:	AS-1
Vent Test Well:	VP-1

Time	Elapsed Time (min.)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Vacuum at Vent Well (ins. H2O)	Pre/Post Vacuum at Blower (ins. H2O)	Pre-Blower Anemom. Reading (ft/min)	Pre/Post Blower Temp (oF)	Vapor Con. at Blower (eff) PID (ppmv)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTW in MP (ft.)	Vapor Concentration at MP: PID (ppmv)	LEL Meter (%LEL)	O2 (%LEL)	Pressure/ Vacuum at MP (in H2O)
1421	60	7-7.5	7-7.5	14-18.5	40	41/47	1500	72/166	1610/0	PR3-D			11			-.65
										PR3-S			195			-0.60
										MW-8			626			+11.25
										PR2-D			564			+0.65
										PR2-S			878			+0.40
										MW-4			20.5			-.33
										MW-7			584			+.015
										MW-9			270			-.05
1442									1731							
					Collected air sample at				1443	VP1-Eff2 (1 bag)						
				Adjusted compressor to 4.8-5 psi					1444							
1444			4.9-6.0	2-5.5												
1515	120		5.0	2-5.5	39	39/46	1400	81/172	1851/0	PR3-D			5.5			-1.75
										PR3-S			209			-1.55
										PR2-S			1324			-0.70
										PR2-D			1961			-0.55
										MW-8			410			+1.00
										MW-4			134			-1.0
										MW-9			447			-.06
										MW-7			531			+.005
					Increased vacuum to 60% Closed				1525	(Max possible w/out overheating blower)						
										MW-8						+.55
1527			4.9-5.0													
1531									1863							
1555	160		5.0	2-5.5	43	45/51	1700	88/191	1953/0	MW-8			1210			0.00
										PR3-D			24.5			-1.75
										PR3-S			90.5			-1.50
										PR2-D			34			-.725
										PR2-S			1500+			-.85

AIR SPARGE/SOIL VENTING PILOT TEST FIELD DATA
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

Date:	8.26.92
Measured by:	T. TINL

Air Sparge Test Well:	AS-1
Vent Test Well:	VP-1

Time	Elapsed Time (min.)	Pressure at Regulator (psi)	Pressure at Sparge Well (psi)	Air flow at Sparge Well (scfm)	Vacuum at Vent Well (ins. H2O)	Pre/Post Vacuum at Blower (ins. H2O)	Pre-Blower Anemom. Reading (ft/min)	Pre/Post Blower Temp (oF)	Vapor Con. at Blower (eff) PID (ppmv)	Monitoring Point (MP)	Dissolved Oxygen at MP (mg/l)	DTW in MP (ft.)	Vapor Concentration at MP			Pressure/ Vacuum at MP (in H2O)
													PID (ppmv)	LEL Meter (%LEL)	O2 (%LEL)	
										MW4			308			-1.05
										MW-7			645			
										MW-9			188			-.075
1606										MW-8	7.5	9.95				
1623					Jack air compressor to 10 psi 16N											
1627									1531							
1632	197	10-10.5		21-24	48	49/53	1700	88/195	1602/242	MW-8			1799			+1.50
										PR2-S			1419			+.60
										PR2-D			969			+.90
										MW-4			174			-0.10
										PR3-S			205			-.25
										PR3-D			34.6			-.25
										MW-7			659			
										MW-9			636			
										MW-8	7.3	9.75				-.05
1643																
1650	215								1661							
										VP-1	6.3	9.36				
										PR3-S				4.8 TD TOC 5.10 ground		
										PR3-D				9.15 TD 9.50 grnd TD		
										PR2-S				4.85 TD TOC 5.15 Grnd		
										PR2-D				8.70 TD TOC 9.2 Grnd		

APPENDIX F

AIR SAMPLE LABORATORY CERTIFICATES OF ANALYSIS AND CHAIN-OF-CUSTODY DOCUMENTATION AUGUST 26, 1992

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Southwest Region
20000 / 300 Mariner Drive
Torrance, CA 90503
(310) 371-1044
(800) 727-GTEL
Fax (310) 371-8720

GTEL Client Number: 023352875
Project I.D.: NMED/ Barelas Bridge
Work Order Number: T208215

October 16, 1992

Ms. Terry Tinl
Groundwater Technology, Inc.
2501 Yale Blvd. SE, Suite 204
Albuquerque, NM 87106

Dear Ms. Tinl,

Enclosed please find the analytical results for the samples received by GTEL Environmental Laboratories, Inc. on 8-26-92 under chain-of-custody record 74-6941.

A formal Quality Assurance/Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria unless otherwise stated in the footnotes.

GTEL is certified by the state of California under Certification #E723.

If you have any questions concerning this analysis or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,

GTEL Environmental Laboratories, Inc.

Minsoon Song/SMC
Minsoon Song
Laboratory Director

GTEL Client Number: 023352875
Project I.D.: NMED/ Barelas Bridge
Work Order Number: T208215

ANALYTICAL RESULTS

Volatile Organics in Air
EPA Methods Modified 8020 and Modified 8015[a]

GTEL Sample Number		08215-1A	08215-2A		
Client Identification		VPI-EFF1	VPI-EFF2		
Date Sampled		8-26-92	8-26-92		
Date Analyzed		8-27-92	8-27-92		
Analyte	Reporting Limit, mg/m^3	Concentration, mg/m^3			
Benzene	0.5	220	650		
Toluene	0.5	79	110		
Ethylbenzene	0.5	52	110		
Xylene, total	0.5	52	130		
BTEX, total	--	400	1000		
TPH as Gasoline	50	26000	32000		
Dilution Multiplier[b]		1	1		

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Board LUFT Manual procedures.

b. Indicates the adjustments made for sample dilution.

GTEL ENVIRONMENTAL LABORATORIES, INC.

TORRANCE, CA
~~Midwest Region~~
~~4211 May Avenue~~
~~Wichita, KS 67209~~
800-633-7936
FAX 316-945-0506

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST No. 74-6941

CUSTODY RECORD

Project Manager: TERRY TINL
Phone #: 505-242-3113
FAX #: 505-242-1103
Address: Groundwater Technology 2501 Yale Blvd SE Ste 2000 Albuquerque, NM 87106
Site location: 800 Bridge Blvd SW, Albuquerque NM
Project Number: 023352875.040664
Project Name: NMED/Barelas Bridge
I attest that the proper field sampling procedures were used during the collection of these samples.
Sampler Name (Print): Chuck Briscoe

ANALYSIS REQUEST

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# CONTAINERS	Matrix: WATER	SOIL	AIR	SLUDGE	OTHER	Method Preserved: HCl	HNO_3	H_2SO_4	ICE	NONE	OTHER	Sampling: DATE	TIME
VPI-EFF1			2			X									8.26.92	1207
VPI-EFF2			1			X									8.26.92	1443

BTEX 602 ☐ 8020 ☐ with MTBE ☐
BTEX/TPH Gas. 602/8015 ☐ 8020/8015 ☐ MTBE ☐
TPH as ☐ Gas ☐ Diesel ☐ Jet Fuel
Product I.D. by GC (SIMDIS) ☐
Total Oil & Grease: 413.1 ☐ 413.2 ☐ 503A ☐
Total Petroleum Hydrocarbons: 418.1 ☐ 503E ☐
EPA 601 ☐ 8010 ☐ DCA only ☐
EPA 602 ☐ 8020 ☐
EPA 608 ☐ 8080 ☐ PCBs only ☐
EPA 610 ☐ 8310 ☐
EPA 624 ☐ 8240 ☐ NBS +15 ☐
EPA 625 ☐ 8270 ☐ NBS +25 ☐
EPTOX: Metals ☐ Pesticides ☐ Herbicides ☐
TCLP Metals ☐ VOA ☐ Semi VOA ☐
EPA Priority Pollutant Metals ☐ HSL ☐
LEAD 7420 ☐ 7421 ☐ 239.2 ☐ 6010 ☐ Org. Lead ☐
CAM Metals ☐ STLC ☐ TTLC
Corrosivity ☐ Flashpoint ☐ Reactivity ☐
X X BTEX, TPH-GAS

SPECIAL HANDLING
24 HOURS ☐
EXPEDITED 48 Hours ☐
SEVEN DAY ☐
OTHER _____ (#) BUSINESS DAYS
QA/QC CLP Level ☐ Blue Level ☐
FAX ☐
TAT AS needed to meet holding time

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REMARKS: Fedex # 676898208O

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Lot #: Work Order #: T2-08-215

Relinquished by Sampler	Received by:	Relinquished by Laboratory	Way bill #
Date 8.26.92 Time 1749	Date Time	Date 8/27/92 Time 08:45	676898208O
Relinquished by:	Received by:	Relinquished by:	
Date Time	Date Time	Date Time	

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43M 6768982080

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1 From (Your Name) Please Print: TERRY TINE
Your Phone Number (Very Important): 505-242-3113
Company: GROUNDWATER TECHNOLOGY INC
Department/Floor No.:
Street Address: 2501 YALE BLVD SE STE 204
City: ALBUQUERQUE
State: NM
ZIP Required: 8 7 1 0 6

2 To (Recipient's Name) Please Print: Sample Receiving
Recipient's Phone Number (Very Important): (310) 371-1044
Company: GTEL Environmental Lab
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 20000 Mariner Ave. Ste 300
City: Torrance
State: CA
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*Declared Value Limit $100.
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7 [ ] OTHER SPECIAL SERVICE
8 [ ]
9 [ ] SATURDAY PICK-UP (Extra charge)
10 [ ]
11 [ ] DESCRIPTION
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)	OVER SIZE
1			
Total	Total	Total	
1	10		

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Other 1
Other 2
Total Charges

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GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Northwest Region
4080-C Pike Lane
Concord, CA 94520
(510) 685-7852
(800) 544-3422 *from inside California*
(800) 423-7143 *from outside California*
(510) 825-0720 (FAX)

Client Number: 023352875
Project ID: 800 Bridge Blvd. SW
Albuquerque, NM
Work Order Number: C2-08-679

September 11, 1992

RECEIVED
SEP 14 1992
GTI, NM

Terry Tinl
Groundwater Technology, Inc.
2501 Yale Blvd. SE, #204
Albuquerque, NM 87106

Enclosed please find the analytical results for samples received by GTEL Environmental Laboratories, Inc. on 08/27/92, under chain of custody record 74-2075.

A formal Quality Assurance/Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria, unless otherwise stated in the footnotes.

GTEL is certified by the California State Department of Health Services to perform analyses for drinking water, wastewater, and hazardous waste materials according to EPA protocols.

If you have any questions concerning this analysis or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,
GTEL Environmental Laboratories, Inc.

Eileen F. Bullen/R.M.

Eileen F. Bullen
Laboratory Director

Client Number: 023352875
Project ID: 800 Bridge Blvd. SW
Albuquerque, NM
Work Order Number: C2-08-679

Table 1

ANALYTICAL RESULTS

Methane, Carbon Dioxide, and Oxygen in Air

Method: GC-TCD[a]

GTEL Sample Number		01			
Client Identification		VP1-EFF1			
Date Sampled		08/26/92			
Date Analyzed		08/31/92			
Analyte	Detection Limit, ppm-V	Concentration, ppm-V			
Methane	20	3800			
Carbon dioxide	20	18000			
Oxygen	20	180000			
Quantitation Limit Multiplier		1			

GTEL ENVIRONMENTAL LABORATORIES, INC.

GTEL ENVIRONMENTAL LABORATORIES, INC.

Concord, CA
~~Midwest Region~~
4211 May Avenue
Wichita, KS 67209

800-633-7936
FAX 316-945-0506

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST № 74-2075

CUSTODY RECORD

Project Manager: TERRY TINL
Phone #: 505-242-3113
FAX #: 505-242-1103
Address: Groundwater Technology 2501 Yale Blvd SE, Ste 204 Albuquerque, NM 87106
Site location: 800 Bridge Blvd SW Albuquerque, NM
Project Number: 023352875.040664
Project Name: NMED/Barelas Bridge
I attest that the proper field sampling procedures were used during the collection of these samples.
Sampler Name (Print): C. Briscoe

ANALYSIS REQUEST: BTEX 602 ☐ 8020 ☐ with MTBE ☐; BTEX/TPH Gas. 602/8015 ☐ 8020/8015 ☐ MTBE ☐; TPH as ☐ Gas ☐ Diesel ☐ Jet Fuel; Product I.D. by GC (SIMDIS) ☐; Total Oil & Grease: 413.1 ☐ 413.2 ☐ 503A ☐; Total Petroleum Hydrocarbons: 418.1 ☐ 503E ☐; EPA 601 ☐ 8010 ☐ DCA only ☐; EPA 602 ☐ 8020 ☐; EPA 608 ☐ 8080 ☐ PCBs only ☐; EPA 610 ☐ 8310 ☐; EPA 624 ☐ 8240 ☐ NBS +15 ☐; EPA 625 ☐ 8270 ☐ NBS +25 ☐; EPTOX: Metals ☐ Pesticides ☐ Herbicides ☐; TCLP Metals ☐ VOA ☐ Semi VOA ☐; EPA Priority Pollutant Metals ☐ HSL ☐; LEAD 7420 ☐ 7421 ☐ 239.2 ☐ 6010 ☐ Org. Lead ☐; CAM Metals ☐ STLC ☐ TTLC; Corrosivity ☐ Flashpoint ☐ Reactivity ☐; CO_2, O_2, methane

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# CONTAINERS	Matrix: WATER	SOIL	AIR	SLUDGE	OTHER	Method Preserved: HCl	HNO_3	H_2SO_4	ICE	NONE	OTHER	Sampling: DATE	TIME	CO_2, O_2, methane
VPI-EFF1		01	1			X									8.26.92	1207	X

Received by: | Date 8.26.92 | Time 1748
Received by: | Date | Time
Received by Laboratory: Jamie [illegible] | Date 8/27/92 | Time 11:30
Way bill #

SPECIAL HANDLING
24 HOURS ☐
EXPEDITED 48 Hours ☐
SEVEN DAY ☐
OTHER ______ (#) BUSINESS DAYS
QA/QC CLP Level ☐ Blue Level ☐
FAX ☐
Standard TAT

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Department/Floor No.:
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2	[X]	DELIVER WEEKDAY				
3	[ ]	DELIVER SATURDAY (Extra charge) (Not available to all locations)				
4	[ ]	DANGEROUS GOODS (Extra charge) (CSS not available for Dangerous Goods Shipments)				
5	[X]	CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge) (Release Signature Not Applicable)				
6	[ ]	DRY ICE ____ Lbs.	Total	Total	Total	
7	[ ]	OTHER SPECIAL SERVICE	1	3		
8	[ ]					
9	[ ]	SATURDAY PICK-UP (Extra charge)				
10	[ ]					
11	[ ]	DESCRIPTION				
12	[ ]	HOLIDAY DELIVERY (If offered) (Extra charge)				

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APPENDIX G

AIR EMISSIONS CALCULATIONS

AIR SPARGE/SOIL VENT PILOT TEST
HYDROCARBON MASS EXTRACTION RATE CALCULATIONS
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO
AUGUST 26, 1992

Air sample effluent analytical data were used to calculate maximum extraction rates for the soil vent and the combined air sparge/soil vent pilot tests on well VP-1 (analytical data attached).

$$ER = Q \times C \times \frac{28.32l}{ft^3} \times \frac{lb}{454 \times 10^6 ug} \times \frac{60min}{hr}$$

Where:

ER= Extraction rate (lb/hr)
Q = Air velocity under standard temperature and pressure conditions (scfm)
C = Soil vapor concentration (ug/l) (1 mg/m^3 = 1 ug/l)

and final three terms are conversion factors

$$SCFM = cfm \times \frac{P_{field}}{P_{lab}} \times \frac{(T_{lab} + 460°R)}{(T_{field} + 460°R)}$$

Where:

cfm	=	Air velocity in cubic feet per minute (fpm x π x r^2)
P_{field}	=	Pressure in field (in inches of mercury)
P_{lab}	=	Standard Pressure (29.92 inches Hg at sea level)
T_{field}	=	Average Temperature in field (°F)
T_{lab}	=	Standard Temperature (60°F, standard laboratory temperature)
°R	=	Temperature in Rankin
P_{field}	=	25 inches Hg (average for Albuquerque, NM; National Weather Service)

NMED/BB
bb.rap

GROUNDWATER TECHNOLOGY

AIR SPARGE/SOIL VENT PILOT TEST
HYDROCARBON MASS EXTRACTION RATE CALCULATIONS
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO
AUGUST 26, 1992
(cont.)

I. SVES Extraction Rate Calculations - Well FSY-7-Vent Pilot Test

- Air sample VP1-EFF1 collected 221 minutes (3.7 hours) after start of soil vent test at 43 inches water vacuum.
- Air sample VP1-EFF2 collected 92 minutes (1.5 hrs) after start of combination air sparge/soil vent test at 7 psi and 40 inches water vacuum.

Extraction rates in pounds per hour (lb/hr) were calculated in the following manner:

A. TPH-as-Gasoline Calculations

1. Sample VP1-EFF1

$$(106 scfm) \times (26{,}000 ug/l) \times 3.74 \times 10^{-09} \frac{l\text{-}lb\text{-}min}{ft^3\text{-}ug\text{-}hr}$$

= **10.3 lb/hr TPH-as-Gasoline**

2. Sample VP1-EFF2

$$(107 scfm) \times (32{,}000 ug/l) \times 3.74 \times 10^{-09} \frac{l\text{-}lb\text{-}min}{ft^3\text{-}ug\text{-}hr}$$

= **12.8 lb/hr TPH-as-Gasoline**

B. Benzene Calculations

1. Sample VP1-EFF1

$$(106 scfm) \times (220 ug/l) \times 3.74 \times 10^{-09} \frac{l\text{-}lb\text{-}min}{ft^3\text{-}ug\text{-}hr}$$

= **0.09 lb/hr Benzene**

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GROUNDWATER TECHNOLOGY

AIR SPARGE/SOIL VENT PILOT TEST
HYDROCARBON MASS EXTRACTION RATE CALCULATIONS
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO
AUGUST 26, 1992
(cont.)

2. Sample VP1-EFF2

$$(107 scfm) \times (650 ug/l) \times 3.74 \times 10^{-06} \frac{l\text{-}lb\text{-}\min}{ft^3\text{-}ug\text{-}hr}$$

= 0.26 lb/hr Benzene

C. Toluene Calculations

1. Sample VP1-EFF1

$$(106 scfm) \times (79 ug/l) \times 3.74 \times 10^{-06} \frac{l\text{-}lb\text{-}\min}{ft^3\text{-}ug\text{-}hr}$$

= 0.03 lb/hr Toluene

2. Sample VP1-EFF2

$$(107 scfm) \times (110 ug/l) \times 3.74 \times 10^{-06} \frac{l\text{-}lb\text{-}\min}{ft^3\text{-}ug\text{-}hr}$$

= 0.04 lb/hr Toluene

D. Ethylbenzene Calculations

1. Sample VP1-EFF1

$$(106 scfm) \times (52 ug/l) \times 3.74 \times 10^{-06} \frac{l\text{-}lb\text{-}\min}{ft^3\text{-}ug\text{-}hr}$$

= 0.02 lb/hr Ethylbenzene

AIR SPARGE/SOIL VENT PILOT TEST
HYDROCARBON MASS EXTRACTION RATE CALCULATIONS
BARELAS BRIDGE GWPA SITE
800 BRIDGE BLVD., S.W.
ALBUQUERQUE, NEW MEXICO
AUGUST 26, 1992
(cont.)

2. Sample VP1-EFF2

$$(107 scfm) \times (110 ug/l) \times 3.74 \times 10^{-06} \frac{l\text{-}lb\text{-}min}{ft^3\text{-}ug\text{-}hr}$$

= 0.04 lb/hr Ethylbenzene

E. Total Xylenes Calculations

1. Sample VP1-EFF1

$$(106 scfm) \times (52 ug/l) \times 3.74 \times 10^{-06} \frac{l\text{-}lb\text{-}min}{ft^3\text{-}ug\text{-}hr}$$

= 0.02 lb/hr Total Xylenes

2. Sample VP1-EFF2

$$(107 scfm) \times (130 ug/l) \times 3.74 \times 10^{-06} \frac{l\text{-}lb\text{-}min}{ft^3\text{-}ug\text{-}hr}$$

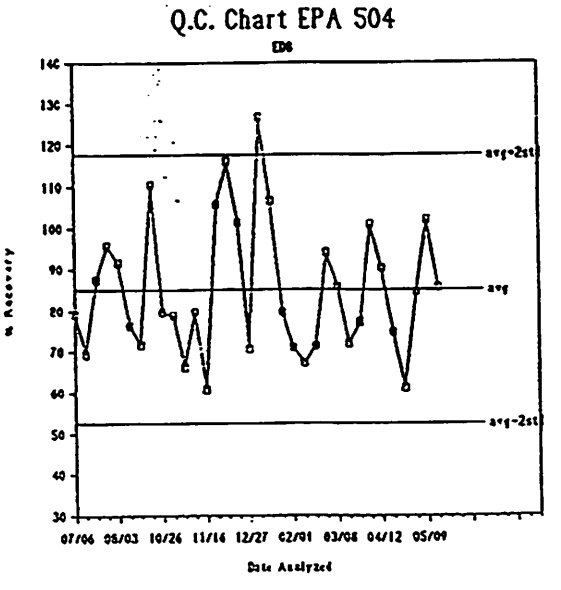
= 0.05 lb/hr Total Xylenes

APPENDIX I

GTEL ENVIRONMENTAL LABORATORIES QA/QC PLAN AND EPA PROFICIENCY TEST RESULTS

GTEL QA/QC Plan Synopsis

Issue Date: August 1, 1990



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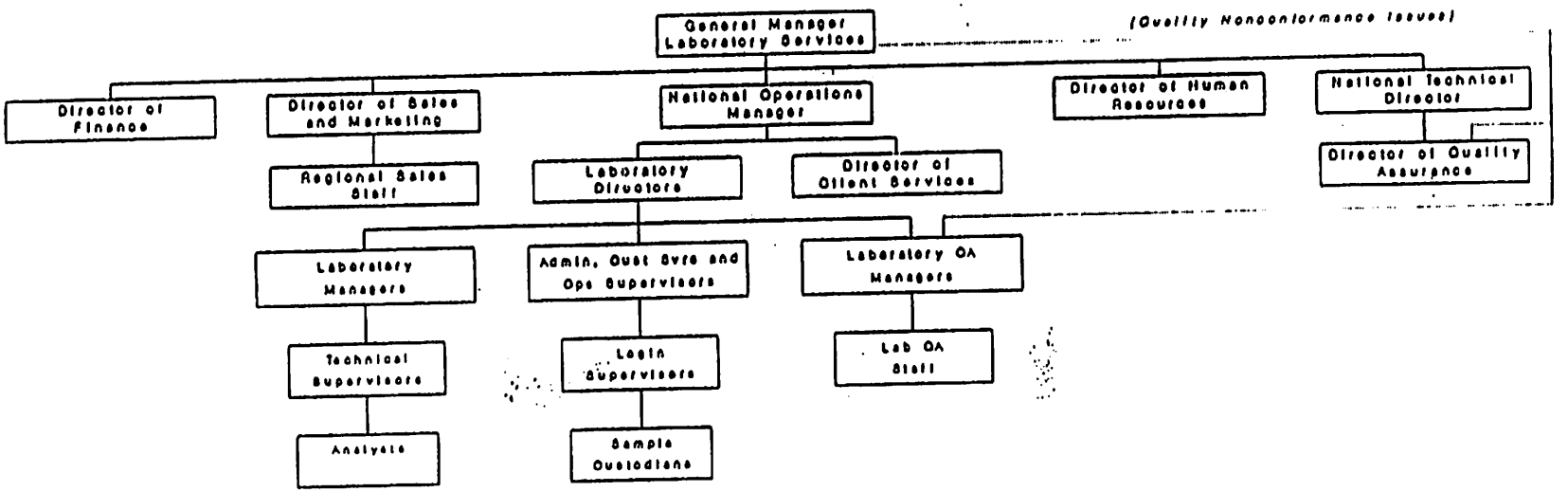
GTEL Environmental Laboratories
Corporate Organizational Structure



3 QUALITY ASSURANCE OBJECTIVES

The following GTEL Environmental Laboratories quality assurance objectives are described below: precision, accuracy, representativeness, completeness, and comparability (PARCC).

Precision

The laboratory objective for precision is to equal or exceed the precision demonstrated for these analytical methods on similar samples and to meet or exceed precision data for these analyses published by the U.S. EPA. Precision is defined as the degree of reproducibility of the measurements under a given set of conditions. Precision is documented on the basis of replicate analyses.

Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for these analytical methods on similar samples and to perform better than the recovery data published by the U.S. EPA. Accuracy is defined as the bias in a measurement system. Accuracy is documented on the basis of recovery of matrix spikes, and spiked reference materials introduced into selected samples of a particular matrix.

Representativeness

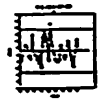
The laboratory objective for representativeness is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a set of samples. The representativeness of the analytical data is a function of the procedures and carefulness used in processing the samples. The representativeness can be documented by the difference between separately procured, but otherwise identical samples or sample aliquots.

Completeness

The completeness objective for an analysis is to provide sufficient data of acceptable quality such that the goals of the analytical project can be achieved within the time frame required. The overall project completeness is expressed as the percentage of unqualified data for the entire project.

Comparability

The comparability objective is to provide analytical data for which the accuracy, precision, representativeness, completeness and detection limit are similar to these quality indicators for data generated by other laboratories for similar samples, and for data generated by GTEL over time. The comparability objective is documented by interlaboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, and by comparison of periodically generated statements of accuracy, precision and detection limits.



4 SYSTEMS QUALITY ASSURANCE

This section is concerned with the quality of the laboratory support systems, the infrastructure which supports the analytical equipment and processes, sample integrity and sample handling processes, and the clients' sampling programs.

Required Equipment

Overall analytical system quality begins with the timely acquisition of high quality equipment to assure efficient operation of the laboratory. GTEL purchases equipment and supplies that meet or exceed the specifications of the analytical methods. Glassware, reagents, gases and replacement parts for analytical instruments are purchased from reputable suppliers with a history of quality customer service. All supplies

meet or exceed the specifications set forth in the method or of recognized professional groups such as the American Chemical Society (ACS), American Society for Testing and Materials (ASTM), and the Association of Official Analytical Chemists (AOAC).

Facilities, Safety, and Environmental Factors

Factors in the environment of the laboratory affect the proper and safe functioning of equipment, and chemical procedures. Every GTEL facility is designed and maintained such that the environmental specifications of the respective instrument manufacturers are met. Safety and design features provide an environment conducive to efficient and effective work on the part of analysts.

Prevention of Cross-Contamination

Design features which are intended to control cross contamination include, where feasible, the physical separation of extractable and volatile organics operations, the installation of hoods and air handling equipment in order to vent vapors out of solvent and sample handling areas, and segregated sample storage areas.

Sample and Reagent Storage Temperature Monitoring

For storage of aqueous reagents and samples requiring refrigeration, all refrigerators normally maintain an internal temperature of 1° to 4°C (34° to 40°F) throughout the compartment. For storage of organics dissolved in flammable materials, an explosion proof model is used. Freezers used to store volatile organic standards maintain an internal temperature of -10° to -20°C (14° to -4°F) throughout their compartments. The temperature of each refrigeration unit is recorded daily from in-place thermometers or thermocouples.

Reagent Water Quality

Reagent, analyte-free or laboratory pure water means distilled or deionized water meeting the specifications of ASTM Type II reagent water. This water will be free of contaminants that may interfere with the analytical test in question. The metals analysis laboratory has more restrictive requirements, where reagent deionized water shall have a resistivity of 18 megohm-cm.

Glassware Cleaning

Glassware cleaning procedures are posted in the glassware cleaning area. The glassware cleaning procedure is documented in an SOP and meets EPA requirements. Only phosphate free, laboratory grade detergents are used for the cleaning of glassware.

Cleaning of Sampling Containers

GTEL Laboratories normally purchases pre-cleaned sampling containers for use by clients. These are obtained from reputable container manufacturers. All sampling containers and sampling container cleaning procedures meet EPA criteria.

Sampling Quality Assurance

The overall quality of data can be no better than the quality of the sample provided to the analyst. GTEL takes particular care to help clients document and to assure that analysts maintain and document the quality of the samples they handle. The laboratory cannot accept responsibility for improper sampling of client-procured samples and will analyze the samples as delivered. However, the detailed analysis request and custody documentation procedures developed by GTEL provide a means for keeping track of preservation and sample handling factors which affect sample integrity. Recommended quality assurance practices for sampling and preservation, along with the holding time criteria to be met in the laboratory, are outlined in the QA/QC Plan.

Recommended Containers, Preservation, Holding Times

The preservation and holding criteria specified in Tables 1, 2, 3, and 4 come from a variety of regulatory sources. The tables are organized by analysis type as follows: water and wastewater; soil and waste; groundwater regulated under the federal Resource Conservation and Recovery Act (RCRA); and air. The information contained in these tables is subject to regulatory revision at irregular intervals. GTEL

Laboratories makes every effort to update and circulate any revisions as soon as they are announced. However, it is the responsibility of the individual to confirm the information contained in these tables. A telephone call to the local GTEL laboratory customer service representative is recommended.

TABLE 1

Recommended Containers, Preservation, Storage, and Holding Times for Water and Wastewater

Description	Method	Matrix	Sample Container[1]	Preservation[2]	Prep/Analysis Holding Time	Volume
GC-Purgeable Halocarbons	601	H_2O	G (b) TefSep	Cool 4°C[2]	14 days	40 mL[3,4]
Ethylene Dibromide (EDB)	504	H_2O	G (b) TefSep	Cool 4°C	28 days	40 mL[3,4]
GC-Purgeable Aromatics	602	H_2O	G (b) TefSep	Cool 4°C HCl pH<2[2,5]	14 days[5]	40 mL[3,4]
GC-Pest. & PCBs	608	H_2O	AG (a) TefSep	Cool 4°C 5<pH<9[2]	7/40 days[6]	1L[3,4]
HPLC or GC -PAHs	610	H_2O	AG (a) TefCap	Cool 4°C[2]	7/40 days[6]	1L[3,4]
GC/MS Purgeables	624	H_2O	G (b) TefSep	Cool 4°C HCl pH<2[2,5]	14 days[5]	40 mL[3,4]
GC/MS Semivolatiles	625	H_2O	AG (a) TefCap	Cool 4°C	7/40 days[6]	1L[2,3]
Oil and Grease	413.1, 413.2	H_2O	AG (a) TefCap	Cool 4°C, H_2SO_4 pH<2	28 days[7]	1L[3]
Total Recoverable Petroleum Hydrocarbons	418.1	H_2O	AG (a) TefCap	Cool 4°C HCl pH<2	28 days[7]	1L[3]
Gasoline Hydrocarbons	Mod. 602	H_2O	G (b) TefSep	Cool 4°C HCl pH<2	14 days[5]	40 mL[3,4]
Gasoline Hydrocarbons	CA LUFT	H_2O	G (b) TefSep	Cool 4°C HCl pH <2	14 days[5]	40 mL[3,4]
Diesel Hydrocarbons	Mod. CA LUFT	H_2O	G (a) TefCap	Cool 4°C	14/40 days[6]	1L[3]
Hydrocarbon Screen	GTEL	H_2O	G (a) TefCap	Cool 4°C	14/40 days[6]	1 L[3]
Petroleum Profile	Mod. ASTM D2887	H_2O	G (a) TefCap	Cool 4°C	14/40 days[6]	1L[3]
AAS Metals	200 series	H_2O	P or G (c)	HNO_3 pH<2	6 mos	500 mL
ICP Metals	200.7	H_2O	P or G (c)	HNO_3 pH<2	6 mos	500 mL
Mercury	245.1	H_2O	P or G (c)	HNO_3 pH<2	28 days[8]	500 mL
Lead, Organic	CA LUFT	H_2O	G (a) TefCap	Cool 4°C	Analyze immediately	1L[3]
Acidity	305.1 SM 402	H_2O	P or G	Cool 4°C	14 days	500 mL
Alkalinity	310.1 SM 403	H_2O	P or G	Cool 4°C	14 days	500 mL
Ammonia	350.1, 350.3	H_2O	P or G	Cool 4°C H_2SO_4 pH<2	28 days	500 mL
Ion Chromatography Anions	300.0	H_2O	P or G (b)	Cool 4°C	28 days[9]	500 mL
BOD	405.1	H_2O	P or G	Cool 4°C	48 hrs.	500 mL
Bromide	320.1	H_2O	P or G	N/A	28 days	500 mL
Chloride	325. 9250	H_2O	P or G	None	28 days	500 mL
Chlorine, total residual	330.1 SM 408	H_2O	P or G	None	Analyze immediately	500 mL
Chromium VI	7196 SM 3128	H_2O	P or G	Cool 4°C	24 hrs.	500 mL
COD	410.1	H_2O	P or G	Cool 4°C H_2SO_4 pH<2	28 days	500 mL

TABLE 1 (Continued)

Recommended Containers, Preservation, Storage, and Holding Times for Water and Wastewater

Description	Method	Matrix	Sample Container[1]	Preservation[2]	Prep/Analysis Holding Time	Volume
Color	110.3	H_2O	P or G	Cool 4°C	48 hrs.	500 mL
Cyanide, total	335.2	H_2O	P or G(a)	Cool 4°C $NaOH$ pH>12[2]	14 days	1 L
Cyanide, free	SM 412H	H_2O	AG (a)	Cool 4°C $NaOH$ pH >12[2]	14 days	1 L
Fluoride	340.2 SM 413	H_2O	P	None	28 days	500 mL
Hardness	242.1, 200.7	H_2O	P or G	HNO_3 pH<2, H_2SO_4 pH<2	6 mos.	500 mL
Kjeldahl nitrogen	351.2	H_2O	P or G	Cool 4°C H_2SO_4 pH<2	28 days	1 L
Nitrate	353.2, 9200	H_2O	P or G	Cool 4°C	48 hrs.	500 mL
Nitrate-nitrite	352.1	H_2O	P or G	Cool 4°C H_2SO_4 pH<2	28 days	500 mL
Nitrite	354.1	H_2O	P or G	Cool 4°C	48 hrs.	500 mL
Orthophosphate	365.2	H_2O	P or G	Filter immediately, Cool 4°C	48 hrs.	500 mL
Oxygen, Dissolved	360.2	H_2O	G Bottle and top	None	Analyze immediately	250 mL
pH	150.1	H_2O	P or G	None	Analyze immediately	500 mL
Phenols	420.1, 9065	H_2O	G	Cool 4°C H_2SO_4 pH<2	28 days	1 L[3]
Phosphorus (total)	365.2	H_2O	P or G	Cool 4°C H_2SO_4 pH<2	28 days	500 mL
Residue, Filterable (TDS)	160.1	H_2O	P or G	Cool 4°C	7 days	500 mL
Residue, Nonfilterable (TSS)	160.2	H_2O	P or G	Cool 4°C	7 days	500 mL
Residue, total	160.3	H_2O	P or G	Cool 4°C	7 days	500 mL
Specific conductance	120.1	H_2O	P or G	Cool 4°C	28 days	500 mL
Standard Plate Count	SM 907C[10]	H_2O	P or G	Cool 4°C	6 hrs.	500 mL[2]
Sulfate	375.2, 9035	H_2O	P or G	Cool 4°C	28 days	500 mL
Sulfide	376, 9030	H_2O	P or G	Cool 4°C pH>9[11]	7 days	500 mL
Sulfite	377.1	H_2O	P or G	None	Analyze immediately	500 mL
Surfactants	425.1	H_2O	P or G	Cool 4°C	48 hrs.	500 mL
Temperature	170.1	H_2O	P or G	None	Analyze immediately	N/A
TOC	415.1	H_2O	AG(a)	Cool 4°C H_2SO_4 pH<2	28 days	500 mL
Total Coliform	SM 909A[10]	H_2O	P or G	Cool 4°C	6 hrs.	500 mL[2]
Turbidity	180.1	H_2O	P or G	Cool 4°C	48 hrs.	500 mL

1 G(x) = glass; AG(x) = amber glass; P(x) = plastic; TefSep = Teflon septum; TefCap = Teflon lined cap; x = cleaning protocol as follows: a = acid wash + solvent wash + oven dry; b = oven dry; c = acid wash.

2 For organics and bacteriological analysis, sodium thiosulfate is required for all chlorinated waters. For cyanide, use 0.6g ascorbic acid.

3 Samples must be provided in duplicate to cover for breakage and provide sufficient sample for QC procedures. Labs using whole-sample autosamplers for volatiles, GC or GC/MS, will require vials in triplicate. Extractable organics with matrix spike/matrix spike duplicate QC protocols require a triplicate sample.

4 Fill completely to avoid volatile loss.

5 Samples with purgeable aromatics must be acidified with HCl to <pH2 in order to have a 14 day holding time, unacidified samples potentially with purgeable aromatics have only a 7 day holding time. GC/MS analysis not including aromatics has the 14 day holding time without acidification.

6 7 days from sampling date for extraction, 40 days from extraction date for analysis of the extract. 14 days until extraction if listed as 14/40.

7 EPA has not recommended petroleum hydrocarbon holding times. The holding time given is the laboratory practice by analogy with Oil and Grease. State of NJ holding time is 7 days. California LUFT is 14 days.

8 EPA allows only 14 days holding time for mercury in plastic bottles for drinking water analysis.

9 Certain anions require special handling. Holding times and preservation for a particular sample will be determined by the requirement for the anion of interest with the shortest holding time, e.g. nitrate and nitrite - 48 hours; O - phosphate - filter and - 48 hours.

10 Standard Methods for the Examination of Water and Wastewater, 16th Edition, 1985.

11 Zinc Acetate and $NaOH$ to pH>9.

TABLE 2
Recommended Containers, Preservation, Storage, and Holding Times
for Soils, Solids, and Wastes

Description	Method	Matrix	Sample Container[1]	Preservation	Prep/Analysis Holding Time	Volume
GC-Purgeables	8010-8020	Soil/Waste	G (b) TefSep or TefCap	Cool 4°C	14 days	100g or 4oz. Jar[2]
GC/MS-Purgeables	8240	Soil/Waste	G (b) TefSep or TefCap	Cool 4°C	14 days	100g or 4oz. Jar[2]
GC/Pest. & PCBs	8080	Soil/Waste	AG (a) TefCap	Cool 4°C	14/40[3] days	100g or 8oz. Jar
GC/MS-Semivolatiles	8270	Soil/Waste	AG(a) TefCap	Cool 4°C	14/40[3] days	100g or 8oz. Jar
HPLC (PAH)	8310	Soil	AG(a) TefCap	Cool 4°C	14/40[3] days	100g or 8oz. Jar
Oil and Grease	Mod. 413.2	Soil	G (a) TefCap	Cool 4°C	14/40[3,4] days	100g or 8oz. Jar
Total Recoverable Petroleum Hydrocarbons	Mod. 418.1	Soil	G (a) TefCap	Cool 4°C	14/40[3,4] days	100g or 8oz. Jar
Gasoline Hydrocarbons	Mod. 8020	Soil	G (b) TefSep or G (a) TefCap	Cool 4°C	14 days	100g or 4oz. Jar
Gasoline Hydrocarbons	CA LUFT	Soil	G (b) TefSep or G (a) TefCap	Cool 4°C	14/40[3,4] days	100g or 4oz. Jar
Diesel Hydrocarbons	Mod. CA LUFT	Soil	G (a) TefCap	Cool 4°C	14/40[3,4] days	100g or 8oz. Jar
Hydrocarbon Screen	GTEL	Soil	G (b) TefSep or G (a) TefCap	Cool 4°C	14/40[3,4] days	100g or 8oz. Jar
Petroleum Profile	ASTM D2887	Product	G (b) TefSep or G (a) TefCap	Cool 4°C	14/40[3,4] days	100g or 8oz. Jar
Total Halide	Parr Bomb & EPA 300.0	Oil or Soil	G (a) TefCap	None	14 days	100g or 8oz. Jar
Metals-AA	7000	Soil	P or G (c)	Cool 4°C	6 mos.	100g or 8oz. Jar
ICP Metals	6010	Soil	P or G (c)	Cool 4°C	6 mos.	100g or 8oz. Jar
Mercury	7471	Soil	P or G (c)	Cool 4°C	28 days	100g or 8oz. Jar
Lead, Organic	CA LUFT	Soil	G (a) TefCap	Cool 4°C[2]	Analyze immediately	200g or 8oz. Jar
General Inorganics	9000 Series	Soil	P or G (c)[5]	Cool 4°C	not to exceed Table 1 specification in water	100g or 8oz. Jar
Cyanide	335.2-CLPM	Soil	P or G (c)	Cool 4°C	14 days	100g or 4oz. Jar
TOC	Mod. 9060	Soil	G (a) TefCap	Cool 4°C	14 days	100g or 8oz. Jar
TOX	Draft EPA	Soil	G (a) TefCap	Cool 4°C	14 days	100g or 8oz. Jar
Ignitability	EPA 1010	Soil/Liquid	G (b) TefSep or G (a) TefCap	Cool 4°C	14 days	100g or 8oz. Jar[6]
Corrosivity	EPA 9040/9045	Waste	P or G	Cool 4°C	ASAP[7]	100g or 8oz. Jar
Reactivity	SW 846, Section 7.3	Waste	P or G	Cool 4°C	ASAP[7]	100g or 8oz. Jar

TABLE 2 (Continued)
Recommended Containers, Preservation, Storage, and Holding Times
for Soils, Solids, and Wastes

Description	Method	Matrix	Sample Container[1]	Preservation	Prep/Analysis Holding Time	Volume
EPTOX/TCLP	EPA 1310/1311	Soil/Waste	inorganics only: P or G(c) or (a) w/organics: G(a)	Cool 4°C if appropriate	14 days/analysis variable by method	500g or 32oz. Jar[8]
Standard Plate Count	SM 907C	Soil/Solid/ Waste	P or G (sterile)	Cool 4°C	6 hrs.	100g or 8oz. Jar
Total Coliform	EPA 9132	Soil/Solid	P or G (sterile)	Cool 4°C	6 hrs.	100g or 8oz. Jar
Asbestos (Bulk)	EPA Interim Method	Bulk	G (b) TefSep or G (a) TefCap	None	indefinite	40 mL minimum

[1]G(x) = glass; AG(x) = amber glass; P(x) = plastic; TefSep = Teflon septum; TefCap = Teflon lined cap; x = cleaning protocol as follows: a = acid wash + solvent wash + oven dry; b = oven dry; c = acid wash.
[2]Fill completely to avoid volatile loss; if pre-weighed VOA vials are used, sample cannot exceed half the volume of the vial.
[3]14 days from sampling, 40 days from extraction date for analysis of extract.
[4]EPA has not recommended oil and grease or, petroleum hydrocarbons or EDB holding times in soil. The holding time given is by analogy to extractable organics.
[5]Acid washed containers are not appropriate for nitrate and other N analyses. Use glass container ordered with cleaning protocol (I-Chem V220-0250, or equivalent).
[6]Fill completely to avoid volatile loss. If vials are used, a minimum of 4 are required.
[7]Not to exceed 14 days. If sulfide reactivity is sought, then not to exceed 7 days.
[8]TCLP samples with liquid require more. For example, a sample with 10% solids requires a minimum of 2000g. Aqueous samples should routinely be provided as 3 liters in order to cover for breakage and provide enough sample for laboratory QC.

TABLE 3
Recommended Containers, Preservation, Storage, and Holding Times
for Water for RCRA Programs

Description	Method	Matrix	Sample Container[1]	Preservation[2]	Prep/Analysis Holding Time	Volume
GC-Purgeables	8010-8020	H_2O	G (b) TefSep	Cool 4°C HCl pH<2[2]	14 days	40mL[3,4]
GC/MS-Purgeables	8240	H_2O	G (b) TefSep	Cool 4°C HCl pH<2[2]	14 days	40mL[3,4]
GC/Pest. & PCBs	8080	H_2O	AG (a) TefCap	Cool4°C/ dark[2]	7/40 days[5]	2 L[3]
GC/MS-Semivolatiles	8270	H_2O	AG(a) TefCap	Cool 4°C/ dark[2]	7/40 days[5]	2 L[3]
HPLC (PAH)	8310	H_2O	AG(a) TefCap	Cool 4°C/ dark[2]	7/40 days[5]	2 L[3]
Total Recoverable Petroleum Hydrocarbons	418.1	H_2O	AG (a) TefCap	Cool 4°C HCl pH<2[2]	28 days[6]	1L[3]
Metals-AA	7000	H_2O	P or G(c)	HNO_3 pH<2	6 mos.	500 mL
ICP Metals	6010	H_2O	P or G(c)	HNO_3 pH<2	6 mos.	500 mL
Mercury	7470	H_2O	P or G(c)	HNO_3 pH<2	28 days	500 mL
Cyanide and other inorganics	9000 Series	H_2O	P or G(c)	as per Table 1	not to exceed Table 1	1L[3]
TOX, TOC	9020,9060	H_2O	P or G(a) TefCap	Cool 4°C H_2SO_4 pH<2	28 days	1L
Standard Plate Count	SM 907C	H_2O	P or G	Cool 4°C[2]	6 hrs.	500 mL
Total Coliform	EPA 9132	H_2O	P or G	Cool 4°C[2]	6 hrs.	500 mL

1 G(x) = glass; AG(x) = amber glass; P(x) = plastic; TefSep = Teflon septum; TefCap = Teflon lined cap; x = cleaning protocol as follows: a = acid wash + solvent wash + oven dry; b = oven dry; c = acid wash.
2 For organics and bacteriological analysis, sodium thiosulfate is required for all chlorinated waters. For cyanide, use 0.6g ascorbic acid.
3 Samples must be provided in duplicate to cover for breakage and provide sufficient sample for QC procedures. Labs using whole-sample autosamplers for volatiles, GC or GC/MS, will require vials in triplicate.
4 Fill completely to avoid volatile loss.
5 7 days from sampling date for extraction, 40 days from extraction date for analysis of the extract.
6 EPA has not recommended petroleum hydrocarbon holding times. The holding time given is the laboratory practice by analogy with Oil and Grease. State of NJ holding time is 7 days. California LUFT is 14 days.

TABLE 4

Recommended Containers, Preservation, Storage, and Holding Times for Air Analysis

Description	Method	Matrix	Sample Container	Preservation	Prep/Analysis Holding Time	Volume
Volatiles in Air	EPA Method 18	Air	Tenax or Tedlar Bag[1]	Tenax: Cool 4°C; Bags: ambient temperature[2]	Tenax: 14 days Bags: 72 hrs.	variable[3]
Gasoline Hydrocarbons	GC/FID	Air	Tenax or Tedlar Bag[1]	Tenax: Cool 4°C Bags: ambient temperature[2]	Tenax: 14 days Bags: 72 hrs.	variable[3]
Volatiles in Air	EPA TO1	Air	Tenax[1]/glass	Cool 4°C	14 days	variable[3]
Asbestos (Air)	NIOSH 7400	Air	Millipore aerosol monitor case or equivalent (permanent slide mount)	None	indefinite	variable

1 Tenax tubes must be sealed and both tubes and bags must be packaged with activated carbon, and segregated from sources of organics.
2 Keep bags out of direct sunlight and minimize temperature variation in order to prevent condensation.
3 Caution must be taken to avoid exceeding breakthrough volume of Tenax tubes. Recommendation: take replicate samples at different volumes to demonstrate that breakthrough has not occurred.

5 SAMPLE CUSTODY AND HANDLING

The sample handling procedures discussed below are intended to maintain the integrity of both the samples and the documentation necessary to support the analytical data for evidenciary purposes should the need arise.

Chain of Custody

All client samples analyzed by GTEL are handled as if they are of an evidenciary nature. The possession of samples must be traceable from the time samples are collected in the field until the analysis is completed and samples are released for disposal.

Custody is defined as:

a) In actual physical possession;
b) In the view after being in physical possession;
c) In a locked area after being in physical possession; and
d) In a designated, locked storage area.

GTEL provides sample labels and a Chain of Custody (COC)/Analysis Request Form for use by clients. Additional documents described below are used by the laboratory to document sample custody within the laboratory and to formalize the procedures for sample distribution, sub-sampling, and disposal.

The COC and all other forms used to document the proper handling of the samples contain a location(s) for appropriate signatures. All individuals who have custody of the sample are required to sign the forms in black ink and date the entry.

Sample Receiving

Samples are received by the Login Staff, who are laboratory personnel properly trained to handle samples of evidenciary nature. The two following custody related steps occur in the sample receipt procedure and care is taken to document them properly.

a) Transfer of samples to the laboratory by use of a common carrier is documented on the COC form. The shipping documents become part of the permanent project file.

b) A Sample Custodian (a member of the Login Staff) is responsible for maintaining custody of the samples during the login and distribution processes and for assuring that all records documenting that possession are properly completed.

Sample integrity upon receipt is documented by the Login Staff. Primary factors such as sample temperature and record of preservation are checked. Proper sampling and preservation in the field is the responsibility of the client. The GTEL Chain of Custody/Analysis Request Form contains a sampling validation statement for the sampler to initial, thereby verifying that proper sampling and preservation was carried out.

Documentation

The primary custody elements which are completed and retained are as follows:

a) Chain of Custody/Analysis Request Form
b) Shipping documents, for example the bill of lading or air bill; and
c) Internal Chain of Custody Record.

Sample Identification

Every sample container received by GTEL and every sample generated by sub-sampling in order to allow different analyses to be performed on the same sample are individually identified by a GTEL sample number as follows:

L9-04-123-01A

where:

L = Lab identifier:

N = Milford U = Torrance X = Wichita C = Concord F = Florida

9 = year 04 = month

L9-04-123 = work order number which identifies a batch of samples to be analyzed by a particular test listed on the COC.

-01 = sequential number (01 to 99) identifying each client sample in the batch.

A = a sequential letter code (A,B,C...) which identifies each replicate sample container for each client sample.

Sample Tracking and Management

GTEL maintains sample information records in a laboratory information management system computer system. This chronological record contains all samples received or generated by sub-sampling in order to allow a single sample to be analyzed by different analyses. All identifying information and cross referencing data described above is maintained in the computer for tracking purposes. A written Login Record, which contains cross referencing information for all sets of samples received and distributed, is kept if a computerized system is not functional.

Any sample sets which have special handling or urgent analysis or holding time requirements are immediately recorded into a tracking record, assuring that all projects get handled and completed as requested by the client or required by the circumstances. Project folders which have a special handling status are color coded.

Confidentiality

Each laboratory has the GTEL standard operating procedure (SOP), readily available to all personnel, concerning confidentiality and security. The following items are covered by the SOP and listed in the personnel manual:

1. No client's name, neither a person's name or a company's name, or site location will go on analytical reports unless specifically requested.

2. No client's name, neither a person's nor a company's name, will be written on correspondence or be verbally transmitted in reference to a particular project except to the client, persons named on the Chain of Custody (COC)/Analysis Request Form, or their designated representative.

3. Any request for analytical data or project information by anyone, other than those noted on the COC/Analysis Request Form, will not be fulfilled without a written release by one of the people so designated.

4. Information not on the COC/Analysis Request Form associated with a specific work order will not be incorporated into an analytical report, except by instruction in writing by the client or the client's designated representative.

Security of Project Data and Samples

The SOP on confidentiality and security also includes the following security items:

1. Visitors to GTEL must sign in at the reception area and be escorted while inside the facility.

2. Sample storage refrigerators, freezers, or the rooms containing them and data storage areas are kept locked when not supervised.

3. Samples will remain in locked sample storage areas until removed for sample preparation or analysis. Each supervisor maintains a list of the location of all sample storage area keys or maintains personal possession of them.

4. The location of the stored samples is recorded in the sample tracking computer or in the internal COC record.

5. Only the Sample Custodians and supervisory personnel have keys to the sample storage areas.

6. Managers are responsible for knowing which employees are in the building after hours.

7. Employees are responsible for registering all guests accompanying them.

8. Keys are issued to individual employees only upon written approval by the employee's immediate supervisor. Keys are returned by terminating employees during an exit interview.

9. All new employees are indoctrinated concerning confidentiality and security procedures within the first week of employment.

Sample Disposal

The laboratory information management computer can be used to identify and locate all samples older than thirty days beyond the date that the analytical report was mailed. Assigned laboratory personnel are given the responsibility for removing all old samples from the secure storage and assuring of their proper disposition. Hazardous samples are explicitly handled as hazardous waste.

6 CALIBRATION PROCEDURES

Tolerances maintained in calibration are specific to the analytical methods used for particular regulatory purposes. Specific procedures for individual instruments and analytical methods are not delineated in this document. Two types of calibration are discussed, operational and periodic. Operational calibration is carried out routinely as part of instrument usage. The operational calibration program involves initial calibration, QC check samples, and continuing calibration verification. Periodic calibration is a distinct process carried out for general purpose equipment, such as analytical balances.

Operational Calibration Records

A bound notebook is kept by the analyst for every instrument. This notebook contains a record of each analysis, calibration, sample analysis and QC performed. Each of the following is assembled chronologically by instrument and stored together as a laboratory working record or entered in its entirety into the instrument notebook:

a) calibration data;
b) calibration verification data; and
c) method blank data.

Corrective action resulting in a recalibration requires the approval by the supervisor upon completion.

Periodic Calibration Records

Periodic calibrations, and a discussion of any adjustments made, are maintained in a bound notebook for each piece of equipment which receives periodic calibration. Corrective action resulting in a recalibration requires the approval by the supervisor upon completion.

Traceability of Calibration Reference Materials

Calibration reference materials for organic analysis are a minimum of 97% purity from a reputable supplier. Reference materials used to generate quality control samples (used to verify calibration) are from a source independent of the calibration standards, or if not available from a reliable independent source, are from stock standards prepared separately from calibration standards.

Low ppb level calibration standards for metals are prepared fresh daily with dilutions of ppm level standards. These stock standards are prepared by dilution of commercially available 1000 ppm stock solutions. Standards from a source independent from the calibration standards are used for initial calibration verification.

Records of the source of the calibration standards and QC reference materials, are maintained.

Standards Preparation

Standards are prepared as specified in the respective methods. In order to assure the accuracy of standards the following guidelines are followed:

a) The best available solvent is used. A reagent blank analysis on the solvent (by lot number) is on file, verifying the absence of analytes of interest;
b) ACS reagent grade or better chemicals are used;
c) Only Class A volumetric glassware are used;
d) Only properly calibrated balances, pipettors and other general laboratory equipment are used; and
e) Only dedicated glassware, pipets, and syringes are used for standards preparation.

Generation and Acceptance of a Standard Curve

The standard curve is generated by the analysis of a reagent or method blank and a series of standard solutions over a concentration range appropriate for the samples to be analyzed and plotting the

instrument response versus the known concentration. The number and concentration of calibration standards required is specific to the method and is given in the method SOP. A minimum of three standards is necessary to demonstrate linearity.

The key characteristics evaluated for acceptance of the curve are as follows:

a) the degree of variation of the response factor with concentration (i.e. curvature);
b) the working range of the curve;
c) the consistency of the response factor with past experience;
d) the sensitivity of the response as it relates to detection limit and system performance; and
e) the blank bias.

7 ANALYTICAL PROCEDURES

The analytical procedures used by the laboratory fulfill the precision and accuracy objectives of Section 3. The major methods and method categories covered by this document are described in Table 5.

Table 5
Method Descriptions

Method (Reference)	Analytes	Instrumentation	Description/Application
EPA 5030/8020 (C), 602 (A)	Volatile Aromatics	GC/PID, P&T, capillary or packed column	Sensitive to benzene, substituted benzenes, and oxygenated compounds, e.g. MTBE, less so to interfering aliphatics. Solids generally performed by methanol extraction (high level 5030).
EPA 5030/8010 (C), 601 (A)	Volatile Halocarbons	GC/ELCD, P&T, capillary or packed column	Specific to halogenated compounds: subject to interference only by unknown halocarbons. Solids generally performed by methanol extraction (high level).
EPA 8240, 8260 (C), 624 (A)	Volatile Organics	GC/MS, P&T, capillary or packed column	Discerns most volatile organics, with specific ID by mass spectrometry (MS). Can provide tentatively identified compounds (TICs); slightly less sensitive than by GC.
EPA 504 (F)	EDB	GC/ECD, micro-extraction	504 water only. A volatile organics technique for water, with 20ppt detection limit. Susceptible to interferences. A non-standard technique must be used for soils.
EPA 8270 (C), 625 (A)	Semi-volatile Organics	GC/MS, capillary column	Discerns most organics, with specific ID by mass spectrometry (MS). Can provide tentatively identified compounds (TICs). Less sensitive than by GC or HPLC.
EPA 3550[1]/8310 (C), 610 (A)	Polycyclic Aromatic Hydrocarbons (PAH) or Polynuclear Aromatics (PNA)	HPLC/UV and fluorescence	Very sensitive to high molecular weight aromatics which fluoresce (10 ppt in water for some). Susceptible to interferences. Very useful for fuel oil spills.
EPA 3550/8080 (C), 608 (A)	Pesticides and PCBs	GC/ECD	Very sensitive to halogenated compounds, sometimes needs special cleanup to remove interferences.
EPA 3050[2]/6010 (C), 200.7 (B)	Metals	ICP	Sensitive to wide variety of metals, some to the ppb level in water. Interference check samples are used to monitor degree of Fe, Al, etc. interference.
EPA 3050[2]/7000 series (C), 200 series (B)	Metals	AA Spectrometry, Flame, Furnace, Manual Cold Vapor	Graphite Furnace and Cold Vapor techniques sensitive to ppb level in water. Zeeman background correction necessary for As, Se in certain matrices.
EPA 9000 series (C), 300 series (B) (9010, 335.2)	Various Inorganic Parameters, (Total Cyanide in Water)	method specific, (Colorimetric)	Colorimetric, etc., techniques dependent on various sample prep and treatment methods to separate samples from matrix and prevent interferences.
EPA 335.2 CLP-M (K)	Total Cyanide in Soil	UV/VIS Spectro-photometry	Colorimetric technique following strong acid distillation.

1 3550 is a sonication extraction for solids; 3510, a liquid/liquid extraction followed with concentration, is available for waters

2 3050 is a vigorous acid digestion for soils and sludges; 3010 and 3020 digestion is available for total metals in waters, and simple nitric acid digestion (3005)is available for total recoverable metals in clean water matrices and dissolved metals for waters filtered at the time of sampling.

Table 5 (Continued)
Method Descriptions

EPA 9020 (C)	Total Organic Halides (TOX) in Water	Cosa or Dohrmann TOX Analyzer	Activated carbon adsorption followed by high temperature reduction with microcoulimetric detection.
Draft EPA Method, Contract # 68-03-2984(V)	Extractable Organic Halides (EOX) in Soil	Dohrmann TOX Analyzer	Extraction of soils by sonication followed by pyrolysis/microcoulometry. Fluorine containing species are not detected.
EPA 9060 (C), 415.1 (B)	Total Organic Carbon (TOC) in Water	FID or IR	Organic/inorganic carbon separation followed by oxidation and detection as CO_2 by IR or as CH_4 by FID.
EPA 418.1 (B), 3550/418.1 (GTEL)	Total Recoverable Petroleum Hydrocarbons (TPH) in water and soil	IR Spectrometry	0.5 ppm detection level for water. For petroleum contaminated soils, 3550 sonication extraction (high level method, 10 ppm detection limit) adapted to 418.1. Silica gel used to remove biogenic material from the freon extract. Some loss of volatiles expected.
EPA 413.1 (B), EPA 9071 (C)	Total Recoverable Oil and Grease	Gravimetric	For use at greater than 5 ppm in water and 200 ppm in soil. Total of all freon extractable organics.
EPA 413.2 (B), SM503 B&D (D)	Total Recoverable Oil and Grease	IR Spectrometry	Same methodology as EPA 418.2 except without silica gel to remove biogenic material.
SM503 D&E (D)	Total Recoverable Petroleum Hydrocarbons (Soil)	IR Spectrometry	An exhaustive extraction of soils or sludges by Soxhlet extractor. Otherwise the same as TPH (418.1). Significant loss of volatiles expected; 5 ppm detection level if specified.
CA LUFT (G)	Gasoline Hydrocarbons	GC/FID, P&T	Purge and trap with chromatography adapted for quantitation of gasoline in soils and dissolved in water as per California LUFT protocol.
CA LUFT (E,G)	Diesel Hydrocarbons	GC/FID, capillary column	California LUFT protocol for waters and soils, modified for soils by use of 3550 sonication extraction.
GTEL	Simulated Distillation Petroleum Profile	GC/FID, capillary column	Product identification and matching technique for product samples, dependent on unique composition of boiling point profile of various products. Modification of ASTM 2887.
GTEL	Hydrocarbon Screen	GC/FID, capillary column	Product identification and quantitation in water and soil based on a source product profile. Some loss of volatiles expected
EPA Method 18 (H)	Volatile Organics in Air	GC/PID/FID	Source monitoring method utilizing solid absorbents or Tedlar bag. Susceptible to usual GC interferences.

Table 5 (Continued)
Method Descriptions

EPA TO1 (I)	Volatile Organics in Air	GC/PID/ELCD	Ambient monitoring method utilizing Tenax solid adsorbent. Advantages of selective detectors configured in series to cover all analytes of interest, with very low detection limits.
EPA 1010 (C)	Ignitability	Pensky-Martens Flash Point	Closed-Cup technique for liquids. Can be extended to 200° for DOT classification tests.
EPA 1010 (C), modified	Flash Point of Soil	Pensky-Martens Flash Point, modified	Closed-Cup technique for soils, taken to 160°F. Flashpoint of soils is not regulated by EPA and there is no standard test for Ignitability for soils.
EPA SW-846 Section 7.3	Sulfide and Cyanide Reactivity	Colorimetric (9010) and Tritrametric (9030)	Applicable to solid and liquid wastes. Results in value less than or equal to total cyanide and sulfide. Total cyanide and sulfide are acceptable methods for showing wastes are below the regulatory limit.
EPA 1311 (W)	TCLP (Toxicity Characteristic Leaching Procedure)	EPA SW-846 methods as required	Leachate procedure followed by analyte specific analysis of the mobility extract to characterize hazardous waste, as of September 1990. Special QA and data reduction as per June 29, 1990 Federal Register. For unique analytes and limits for Land Disposal Restrictions (CCWE) prior notification is required.
EPA 9040, 9045 (C)	pH, Corrosivity	pH Electrode	Direct reading electrode method; 1:1 reagent water paste for soils.
SM 907C (D)	Standard Plate Count	Membrane Filter Technique	Filters retaining bacteria are cultured and counted.
EPA 9132 (C)	Total Coliform in Water	Membrane Filter Technique	Filters retaining bacteria are selectively enriched and cultured, followed by colony count.
EPA 300.0 (B)	Inorganic Anions in Water, (Total Halide in Oil and Soil)	Ion Chromatography (IC), (Parr Bomb-IC)	Aqueous solutions are prepared and evaluated directly with suppressed IC. (Parr Bomb prep for oils and petroleum contaminated soil, with summing of Cl^-, Br^-, and I^- by IC.).
EPA (I) Interim Method	Bulk Asbestos in Building Materials	Polarized Light Microscopy - Dispersion Staining (PLM-DS)	Positive identification of asbestos, by morphology, color and pleochroism, index of refraction, birefringence, and/or extinction characteristics of elongation. Estimation of % content.
NIOSH 7400 (U)	Asbestos in Air	Phase Contrast Microscopy	Quantitation by count of asbestos and other fibers greater than 0.25um in diameter collected on filters.

Laboratory Reference Documents

The following documents are the primary references from which the GTEL standard methods are derived. Each is preceded with a brief outline of the type of methods covered. These documents are to be available in the laboratory. At a minimum, the Quality Assurance Manager will keep a copy.

A. Organics in water EPA Methods 601, 602, 608, 610, 624 and 625: "Test Procedures for Analysis of Organic Pollutants", Code of Federal Regulations, 40CFR Section 136, Appendix A, July 1988 edition.

B. Metals in water, inorganic parameters, oil and grease, and petroleum hydrocarbons: Methods for Chemical Analysis of Water and Waste, EPA-600/4-79-020, USEPA EMSL, Cincinnati, OH, Revised, March 1983, including Method 300.0, EPA-600/4-84-017, March 1984.

C. Metals and organics in soils and mobility extracts; metals and organics in groundwater for RCRA compliance; hazardous material characterization: Test Methods for Evaluating Solid Waste, SW-846, 3rd edition, USEPA OSW, Washington, D.C., November 1986, including Revision 1, December 1987.

D. Pesticides, wet chemistry, and petroleum hydrocarbons in waters, soils and sludges: Standard Methods for Examination of Water and Wastewater. 16th edition, American Public Health Association, 1985.

E. General organic, inorganic, and physical methods: Annual Book of ASTM Standards, Vols.11.01 and 11.02 for water, Vols. 5.01, 5.02, 5.03, 5.04 for petroleum products, Vol. 11.03 for Occupational Health and Safety. American Society for Testing and Materials, Philadelphia, PA. The most current version is usually cited.

F. Organics in water (drinking water): Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water, USEPA EMSL, Cincinnati, OH, September 1986.

G. Organics, TPH by gas chromatography, and toxics in soil and groundwater: Leaking Underground Fuel Tank (LUFT) Manual, State of California Water Resources Control Board, May 1988 Revision.

H. Air sampling and analysis methods organics and toxics, ambient air and stationary sources: Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, II, and III, including Section 3.16, EPA/600/4-77/027a,b,c, USEPA EMSL, Research Triangle Park, NC, August 1986.

I. Organics in ambient air: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA-600/4-84-041, USEPA EMSL, Research Triangle Park, NC, April 1984, including Supplements, September 1986.

J. Organics in water and soil: USEPA Contract Laboratory Program Statement of Work for Organics Analysis, February 1988.

K. Inorganics in water and soil: USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis, SOW 788, July, 1988.

L. Microbiological analysis of water and wastes: Microbiological Methods for Monitoring the Environment, EPA-600/8-78-017, USEPA EMSL, Cincinnati, OH, December 1878.

M. General and clinical analytical practices: Good Laboratory Practices Manual, PB88-180708, USFDA, St. Louis, MO, November 1987

N. Toxics research laboratory practices: Good Laboratory Practice Standards, 40 CFR, Part 792, USEPA, 1988 edition.

O. Laboratory QA/QC practices: Handbook for Analytical Quality Control in Water and Wastewater Laboratories, EPA-600/4-79-019, USEPA EMSL, Cincinnati, OH, March 1979.

P. Calibration for organics in air: Standard Operating Procedure for the Preparation and Use of Standard Organic Mixtures in a Static Dilution Bottle, EMSL/RTP-SOP-MDAD-036, USEPA EMSL, Research Triangle Park, NC, September 1987.

Q. General analytical practices and specifications: Manual for the Certification of Laboratories Analyzing Drinking Water, EPA-570/9-82-002, USEPA EMSL, Cincinnati, OH, October 1982.

R. QA practices, organics in soil and water: Laboratory Data Validation, Functional Guidelines for Evaluating Organics Analysis, USEPA Hazardous Site Evaluation Division, Washington, D.C., February 1988.

S. QA practices, inorganics in soil and water: Laboratory Data Validation, Functional Guidelines for Evaluating Inorganics Analysis, USEPA Hazardous Site Evaluation Division, Washington, D.C., July 1988.

T. Analytical techniques for bulk asbestos in building materials: 40 CFR, Part 763 (F), App. A.

U. Analytical techniques for occupational health and OSHA compliance: NIOSH Manual of Analytical Methods, 3rd Edition, February 1984, NIOSH, Cincinnati, OH, including 1985 and 1987 supplements.

V. Extractable Organic Halides in Solids: Development and Evaluation of Methods for Total Organic Halide and Purgeable Organic Halide in Wastewater, App. D, R.M. Riggin, et al, US EPA Contract #68-03-2984, 600/4/84-008, June 1983.

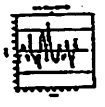
W. TCLP: Federal Register, June 29, 1990, 40 CFR Part 261, Appendix II.

Standard Operating Procedures

Standard operating procedures are generated through a formalized process involving: draft generation by analyses; peer review for accuracy and completeness; management review by the Lab Director and National Operations Manager; and final review by the lab QA Director. Completed and approved SOPs are available in the laboratory for the analysts. The Quality Assurance Manager is responsible for carrying out the record keeping and document control procedures for the SOPs.

Method Start-up QC

As a minimum, when a new instrument is brought into service, a new standard method is implemented, and after a new analyst receives training, four spikes of known concentration are analyzed in reagent water or a blank solid matrix and the results approved by the Quality Assurance Manager. All calibration and QC procedures specified by the SOP are in place before sample analysis begins.



8 DATA COLLECTION, REDUCTION, AND REPORTING

Data collection protocols are critical to the quality assurance program and are described below. The data validation practices described are followed to insure that data is not altered and that an audit trail is developed in the data reduction and reporting process. The data flow is summarized in Figure 2.

Data Collection

All analyses are recorded in a bound notebook. The following information is included for each analysis:

a) Analyst's signature (once per analytical batch)
b) Date
c) GTEL laboratory sample number (the work order number and dash number)
d) Any undocumented or non-standard analysis set-up conditions, e.g. dilutions, auto-sampler position number, or other instrument conditions not covered by an SOP or instrument printout.

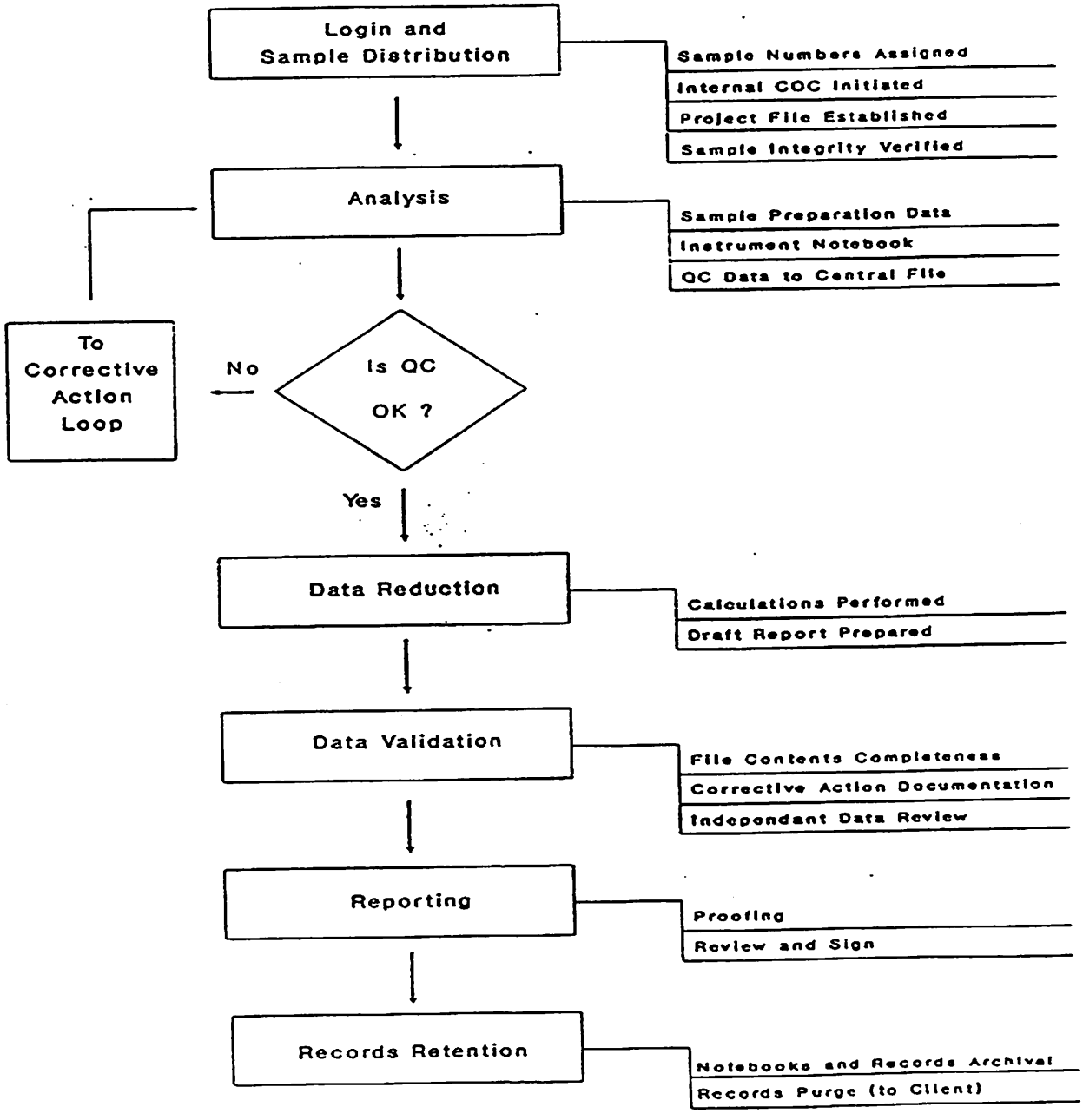
For instrumental analysis, the analysis notebook is instrument-specific and referred to as an instrument log. For other types of analysis, this logbook also contains all raw data collected by the analyst. Any blank sections left open on a page are crossed out. All logbook entries are signed and dated by the individual making the entry.

Blank Correction

In projects for which a QA deliverables package (including a blank summary) is being prepared, data will not be blank-corrected and will be flagged if blanks do not meet acceptability criteria. The blank results reported will be in the same units as the samples and will be discussed in the quality assurance narrative in such a manner, including the effect of dilution factors, such that the data user can evaluate the relative effect of the blank contamination on each sample. Any result that is less than ten times the value of the blank will be considered biased. Routine analyses are normally blank corrected. For blank correction, the systematic bias is removed from the sample analytical data by subtracting the amount contributed by the blank from the total sample result.

Figure 2

GTEL DATA FLOW



Data Validation

Data validation involves the checking of data quality and documentation. Data validation requires the use of the following:

a) Dated and signed entries on worksheets and in log books used for all samples;
b) The use of sample tracking and numbering systems to logically follow the progress of samples through the laboratory; and
c) The use of quality control criteria to reject or accept specific data.

The supervisor, or an analyst designated by the supervisor, recalculates a minimum of 5 percent of the results on each report. These individuals are responsible for determining whether or not the results are acceptable using the quality control criteria set forth in the method and this plan. Every project file has a project log into which the analysts and persons validating data enter descriptions of problems encountered in the course of analysis and validation, along with corrective actions taken. All entries into the project log are signed and dated.

Documentation Reported

Standard laboratory reports contain, as a minimum, the following information:

a) Identification of the laboratory;
b) GTEL sample ID number;
c) Client sample identification;
d) Date sampled (it is on the Chain of Custody Form attached to the report);
e) Date analyzed;
f) Date of extraction, if applicable to the verification of sample integrity;
g) The name(s) (first initial, last name) of the analyst(s) performing the analysis, if required;
h) Parameters measured;
i) Units in which each parameter is reported;
j) Analytical methods used;
k) Detection limits;
l) Certification statement by the person responsible for validation of the data concerning sample integrity and QA acceptance; and
m) A copy of the Chain of Custody form.

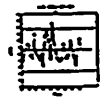
Reporting limits, referred to as quantitation limits, which are above the detection limits, are utilized for applications where the detection limits are not of importance to the application. When analytical data are to be used to determine whether a regulatory limit is exceeded, the critical issue is whether the data are above the lower limit of reliability. The term "quantitation limit" describes this lower limit above which the data are of predictable accuracy. The quantitation limit is often substantially above the method detection limit. Reports using a quantitation limit indicate the quantitation limits used rather than the detection limits. Both levels are indicated for certain applications.

Report Revisions

For all report revisions and reissues involving a change in a datum value, the revised/reissued reports are accordingly labelled and the date of the previous revision is referenced. All reissues involving a change in a datum value are reviewed by the Quality Assurance Manager, or designee, and noted in the Reports to Management. A written justification for the change is included in the project file.

Records Retention

The data worksheets, copies of all hardcopy data output, and other project records are stored together in a secure location. The retention period is not less than one year and as governed by local, state and government agencies.



9 QUALITY CONTROL

The internal quality control checks routinely implemented by the laboratory are described in this section. This outline includes the minimum required degree of effort (the amount of quality control samples expressed as a percentage of the total number of client samples), and the control limits applied to maintain method control.

QC Frequency

The required frequency of QC samples is a function of the particular method, the particular regulatory program under which the results will be evaluated, or particular contract requirements. The frequencies indicated in the program description which follows are the absolute minimum requirements for the various categories of analysis listed. Table 9.1 defines frequency requirements for particular analyses and regulatory programs.

Quality Control Program Elements

The quality control program elements cover both instrument and method quality control. The frequency of instrument control checks are based on the analytical batch as introduced to the instrument. For example, QC check samples and mid-range standards used for instrument calibration verification may be specified by certain methods to be introduced at the beginning, after every ten samples, and at the end of an analytical run. The frequency of method control checks, on the other hand, is based on the analytical batch as handled in the sample preparation, digestion, or extraction process.

The analytical batch is limited to the client's samples for projects for which the client is paying for the method quality control results. Hence, the method quality control samples will be selected from this batch and the minimum number of matrix spikes and laboratory duplicates associated with the samples for that particular project set is one per analytical batch per matrix regardless of the size of the sample set.

The control limits for instrument control are set at levels published in the source method, or are set by laboratory practice if an authoritative source is not available. These tolerances for instrument operation are absolute and are not to be abrogated without the approval of the Laboratory Director and the Corporate Quality Assurance Officer.

For method control elements (blank, matrix spike, laboratory duplicate or matrix spike duplicate, surrogate spike, laboratory control sample, QC check sample, and method detection limit) statistical evaluation is often the source for the control limits.

Method Detection Limit

The method detection limit (MDL) is determined for all analyses annually. As the blank acceptance criteria are affected by the MDL, it is critical that the detection limit study be performed properly and regularly.

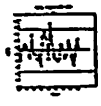


TABLE 9.1
Frequency of Method Quality Control Samples[1]

Analytes	Methods	Method Blanks	Duplicate	Matrix Spike	Surrogates	QC Check
GC-Purgeables	601-602	Daily	5%[2]	10%	100%	1%[4]
GC/MS-Purgeables	624	Daily	5%[2,3]	5%	100%	1%[4]
GC-Pest. PCBs	608	EAB	5%[2,3]	10%	100%	1%[4]
HPLC (PAH)	610	EAB	5%[2,3]	10%	N/A	1%[4]
GC/MS-Semi-volatiles	625	EAB	5%[2,3]	5%	100%	1%[4]
Oil and Grease	413.1, 413.2	EAB	5%[2]	10%[2]	N/A	10%
Petroleum Hydrocarbons	418.1	EAB	5%[2]	10%[2]	N/A	10%
AAS Metals	200+ Series	EAB	5%[2]	10%	N/A	EAB/5%[5]
ICP Metals	200.7	EAB	5%[2]	10%	N/A	EAB/5%[6]
Cyanide, Ion chromatography and other Inorganics	300+ Series	EAB	5%[2]	10%	N/A	10%
TOC, COD	415.1, 410.2	EAB	5%[2]	5%	N/A	10%
BOD	405.1	EAB	5%	N/A	N/A	10%
Hydrogen Ion (pH), alkalinity	150.1, 310.1	N/A	5%	N/A	N/A	10%
Residue - TSS, TDS	160.2, 160.1	EAB	5%	N/A	N/A	10%
Standard Plate Count	SM 907C	EAB	100%	N/A[6]	N/A	N/A[6]
Total Coliform	EPA 9132, SM 909	EAB	10%	N/A[6]	N/A	N/A[6]
Safe Drinking Water Act Organic 500 Series, including EDB	502.1-504	Daily	10%	EAB/5%	100%[7]	EAB
GC-Purgeables	8010-8020	Daily	EAB/5%	EAB/5%	100%	EAB/5%[4]
GC/MS-Purgeables	8240	Daily	EAB/5%[3]	EAB /5%	100%	EAB/5%[4]
GC-Pest. & PCBs	8080	EAB	EAB/5%[3]	EAB/5%	100%	EAB/5%[4]
GC/MS Semi-volatiles	8270	EAB	EAB/5%[3]	EAB/5%	100%	EAB/5%[4]
HPLC-PAH	8310	EAB	EAB/5%[3]	EAB/5%	N/A	EAB/5%[4]

1 EAB/5% = one QC sample for each analytical batch or 5%, which ever is larger.

2 A 10% frequency will be used at a particular laboratory if required by applicable state certification programs, which specify adherence to the Handbook for Analytical Quality Control for Water and Wastewater Laboratories, EPA 600/4-79-019.

3 Duplicate matrix spikes may replace duplicate samples.

4 QC Check Samples will also be analyzed after every matrix spike outside of control limits.

5 Laboratory control samples for method QC; these methods also require one QC check sample, which does not go through digestion, per initial calibration.

6 Quantitative checks (spikes) are not possible. However, qualitative checks are necessary as follows: confirmation of identity is required on the basis of multiple-tube fermentation or other confirmation at the rate of 10%. Media QC is performed with both positive and negative organisms for each stock prepared and at least once per month.

7 Method 504 for EDB does not require a surrogate spike.

N/A Not Applicable.

TABLE 9.1 (continued)
Frequency of Method Quality Control Samples[1]

Analytes	Methods	Method Blanks	Duplicate	Matrix Spike	Surrogates	QC Check
AAS Metals	7000+	EAB	EAB/5%	EAB/5%	N/A	EAB/5%[5]
ICP Metals	6010	EAB	EAB/5%	EAB/5%	N/A	EAB/5%[5]
Cyanide, Ion chromatography and other inorganics	9000 Series	EAB	EAB/5%	EAB/5%	N/A	EAB/5%[4]
TOX, TOC	9020,9060	EAB	EAB/5%	EAB/5%	N/A	EAB/5%[4]
Gasoline Hydrocarbons	Mod. 5030/8020	EAB	EAB/5%	EAB/5%	100%	EAB/5%[4]
Diesel Hydrocarbons	Mod. CA LUFT	EAB	EAB/5%	EAB/5%	100%	EAB/5%[4]
Petroleum Hydrocarbons	3550 + 418.1 of SM 503 D+E	EAB	EAB/5%	EAB/5%	N/A	EAB/5%[4]
Petroleum Profile	ASTM D2887	EAB	EAB/5%	N/A	100%	EAB/5%
Volatiles In Air	EPA Method 18	Daily	EAB/5%[7]	N/A	100%	EAB/5%
Volatiles In Air	EPA TO1	Daily	EAB/5%[7]	N/A	100%	EAB/5%
Ignitability	EPA 1010	N/A	EAB/5%	N/A	N/A	EAB/5%
Corrosivity	EPA 9040/9045	EAB	EAB/5%	N/A	N/A	EAB/5%
Reactivity	SW 846, Sec. 7.3	EAB	EAB/5%	N/A	N/A	EAB/5%
EPTOX/TCLP	EPA 1310	EAB	5%	N/A	N/A	N/A
Asbestos (Bulk)	EPA Interim Method	N/A	10%[8]	N/A	N/A	weekly[9]
Asbestos (Air)	NIOSH 7400	EAB	10%[8]	N/A	EAB/5%	N/A
GC/MS Purgeables	624-CLP	Daily	EAB/5%[3]	EAB/5%	100%	EAB/5%[4]
GC-Pest & PCBs	608-CLP	EAB	EAB/5%[3]	EAB/5%	100%	EAB/5%[4]
GC/MS Semi-volatiles	625-CLP	EAB	EAB/5%[3]	EAB/5%	100%	EAB/5%[4]
AAS Metals	200-CLP	EAB	EAB/5%	EAB/5%	N/A	EAB/5%[5]
ICP Metals	200.7-CLP	EAB	EAB/5%	EAB/5%	N/A	EAB/5%[5]
Cyanide	335.2-CLP	EAB	EAB/5%	EAB/5%	N/A	EAB/5%[5]

1 EAB/5% = one QC sample for each analytical batch or 5%, which ever is larger.
2 A 10% frequency will be used at a particular laboratory if required by applicable state certification programs, which specify adherence to the Handbook for Analytical Quality Control for Water and Wastewater Laboratories, EPA 600/4-79-019.
3 Duplicate matrix spikes may replace duplicate samples.
4 QC Check Samples will also be analyzed after every matrix spike outside of control limits.
5 Laboratory control samples for method QC; these methods also require one QC check sample, which does not go through digestion, per initial calibration.
6 QC sample in duplicate each analytical batch.
7 Duplicate Tenax tubes must be supplied from the field.
8 Duplicate counts by second analyst.
9 Quantitative determination not applicable. Refractive Index 1.68 with Amosite permanently mounted serves as a QC check for color dispersion weekly. Other permanently mounted asbestos types must be available for comparison with types found in each analytical batch.
N/A Not Applicable.

10 AUDITS

Audits measure laboratory performance and insure compliance with certification programs. Audits may be of four main types: external, system, report, and blind sample audits.

External Audits

External audits are performed when certifying agencies or clients submit samples for analysis and/or conduct on-site inspections. It is GTEL's policy to cooperate fully with certifying agencies. It is also GTEL's policy to comply fully with system audits conducted by regulatory agencies and clients. The laboratory is involved in external performance audits conducted semi-annually by the EPA in which EPA performance evaluation samples are analyzed. Additional performance audits are conducted as required by clients and state certifying agencies.

Systems Audits

Systems audits are a primary responsibility of the Laboratory QA Manager. Systems audits are also be performed by the corporate QA office. Systems audits evaluate procedures and documentation in the laboratory. Systems audits encompass all aspects of the analysis, checking for adherence to criteria in this QA plan and in the method SOP. As a minimum, items covered are sample custody, calibration history, quality control, instrument control, data reduction and validation, method start-up QC, and records. Representative analytical projects are reviewed from inception to completion. Representative methods of each type of analysis are done at least annually by the Laboratory QA Manager.

Report Audit

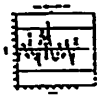
Report audits which evaluate the correctness and appearance of the laboratory reports are performed routinely by the Laboratory QA Manager. Routine analytical reports are audited at a minimum rate of 1 in 20. Audits of all GTEL reports containing extended QC data (e.g."CLP" and "Blue" level) are conducted before the report is issued. Report audits are performed by the corporate QA Director to assure that consistent quality and content is being delivered to clients from all of the laboratories.

Blind Sample Audits

Blind sample audits are performed by submitting a sample of known characteristics through ordinary sample handling procedures and comparing the reported concentrations with the known values. Blind sample audits are carried out annually.

11 PREVENTATIVE MAINTENANCE

The objective of preventative maintenance is to produce stability and predictability in the laboratory operation. It is a management tool which has a direct bearing on the efficiency and productivity of the laboratory. Preventative maintenance procedures are specified in each method SOP.



12 PROCEDURES TO ASSESS DATA QUALITY

The procedures and formulas required to assess data quality and overall method performance are described in this section.

Precision

The precision of laboratory test results will be expressed as the percent relative standard deviation (RSD) or relative percent difference (RPD). RPD is derived from the absolute difference between duplicate results, D_1 and D_2, divided by the mean value of the duplicates.

$$RPD = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \times 100$$

Accuracy

Accuracy for the laboratory is expressed as the average percent recovery of spiked samples.

$$R = \frac{SSR - SR}{SA} \times 100$$

where:

R = % Recovery

SSR = spiked sample result

SR = sample result

SA = amount of spike

Representativeness

Representativeness is evaluated by comparison of duplicate analyses and by the results of audits which establish that the procedures to protect the integrity of samples are being followed.

Completeness

Completeness (C) is evaluated by dividing the total number of verifiable data points by the maximum number of data points possible and expressing the ratio as a percent.

Comparability

Comparability is evaluated for most of the common analyses in the inter-laboratory performance evaluations carried out by the EPA, state agencies, and GTEL clients. Split samples are another form of inter-laboratory study carried out by GTEL clients. The laboratory, in its audit program, also collects comparability data for the various GTEL facilities. This information is in the form of accuracy and precision statements, detection limit study results, and summaries of specified variations of standard methods found in the individual method SOP's used in each laboratory.

Detection Limit

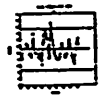
For methods operating under this document the Method Detection Limit (MDL) is defined according to Test Methods For Evaluating Solid Waste, SW-846, Third Edition, Revision 1, December, 1987.

"The minimum concentration that can be measured
and reported with 99% confidence that the value is above zero."

It is approximately 3 times the standard deviation of a set of seven replicates at a concentration very near (within 5 times) the detection limit. The MDL is used to judge the significance of a single measurement of a future sample, and defines a limit above which false positives are very unlikely.

Method Control

Method control is based on published EPA performance criteria, on a statistical evaluation of quality control results or on provisional limits set while statistical evaluation is pending. Method control is documented as a quality control chart or tabulation. In certain instances where the method explicitly references a control limit, the referenced control limit is used unless the evaluation of the statistical control indicates that laboratory performance is significantly better than the referenced limit. As a minimum, GTEL maintains control charts or tabulations for matrix spikes for accuracy, and either duplicate matrix spikes or duplicate samples for precision.



13 CORRECTIVE ACTION

The corrective action scheme for investigating suspected data quality problems is presented in this section. The means by which the laboratory discovers, tracks, and completes the investigation of problems is discussed.

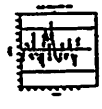
Initiation and Completion of Corrective Action

The investigation of suspected data quality problems is initiated as a result of quality control criteria being exceeded, audit findings indicating systematic problems, or as a result of client inquiries.

Feedback Systems

The Laboratory Quality Assurance Manager serves as a focal point for feedback concerning problems. By means of accuracy and precision statements and the system report audits, problems which may have been overlooked by the laboratory supervisors in the course of daily work can be detected and corrected. All client complaints regarding data quality and operational quality (for example turn-around times) are reported to the Laboratory Director and to the quality assurance office.

All problems, internal and client related, handled by the quality assurance office are documented by means of a quality assurance action report (QAAR). A QAAR form is filled out at the time of receipt of a complaint or discovery of a problem. All actions taken and the status of in-process actions are reported to the Laboratory Director on a bi-weekly basis.



14 QUALITY ASSURANCE REPORTING

Quality assurance reporting documents the quality control and quality assurance activities in the laboratory and provides a communication and accountability link among analysts, management and clients.

Report QA Deliverables

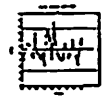
The standard analytical report includes no quality control documentation. However, a certification that all QC requirements were met is signed by the manager responsible for the report. The elements of reports for clients needing quality control documentation are determined by the application. Two examples are the categories of Blue or CLP Level packages. Other types of client required QC deliverables have elements similar to these packages, but the specific requirements should be determined prior to the initiation of sampling and analysis.

Periodic Reports

Certain projects under regulatory review require establishment of explicit quality assurance objectives and quarterly summaries of QA conformance and corrective action. The laboratory technical and quality assurance staff provide any information required to establish and document achievement of the quality assurance objectives for particular projects.

Reports to Management

The Quality Assurance Manager submits a bi-weekly summary of QA activities to the Laboratory Managers, Laboratory Director, and Corporate Quality Assurance Director.



GTEL ENVIRONMENTAL LABORATORIES, INC.
20000 Mariner Dr., Suite #300
Torrance, CA 90503
213-371-1044
800-727-GTEL

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

76- 5462

Project Manager:

Phone #:

FAX #:

Address:

Site location:

Project Number:

Project Name:

I attest that the proper field sampling procedures were used during the collection of these samples.

Sampler Name (Print):

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# CONTAINERS	Matrix					Method Preserved						Sampling		ANALYSIS REQUEST																				
				WATER	SOIL	AIR	SLUDGE	OTHER	HCl	HNO_3	H_2SO_4	ICE	NONE	OTHER	DATE	TIME	BTEX 602 ☐ 8020 ☐ with MTBE ☐	BTEX/TPH Gas. 602/8015 ☐ 8020/8015 ☐ MTBE ☐	TPH as ☐ Gas ☐ Diesel ☐ Jet Fuel	Product I.D. by GC (SIMDIS) ☐	Total Oil & Grease: 413.1 ☐ 413.2 ☐ 503A ☐	Total Petroleum Hydrocarbons: 418.1 ☐ 503E ☐	EPA 601 ☐ 8010 ☐ DCA only ☐	EPA 602 ☐ 8020 ☐	EPA 608 ☐ 8080 ☐ PCBs only ☐	EPA 610 ☐ 8310 ☐	EPA 624 ☐ 8240 ☐ NBS +15 ☐	EPA 625 ☐ 8270 ☐ NBS +25 ☐	EPTOX: Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi VOA ☐	EPA Priority Pollutant Metals ☐ HSL ☐	LEAD 7420 ☐ 7421 ☐ 239.2 ☐ 6010 ☐ Org. Lead ☐	CAM Metals ☐ STLC ☐ TTLC	Corrosivity ☐ Flashpoint ☐ Reactivity ☐			

SPECIAL HANDLING

24 HOURS ☐
EXPEDITED 48 Hours ☐
SEVEN DAY ☐
OTHER ________(#) BUSINESS DAYS
QA/QC CLP Level ☐ Blue Level ☐
FAX ☐

SPECIAL DETECTION LIMITS (Specify)

SPECIAL REPORTING REQUIREMENTS (Specify)

REMARKS:

Lab Use Only
Lot #:
Storage Location
Work Order #:

CUSTODY RECORD

Relinquished by Sampler:	Date	Time
Received by:		
Relinquished by:	Date	Time
Received by:		
Relinquished by:	Date	Time
Received by Laboratory:	Way bill #	

PERFORMANCE EVALUATION REPORT DATE: 12/21/90

WATER POLLUTION STUDY NUMBER WP025

ATORY: CA070

TES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
MINUM	1	1420	1428	1150- 1680	1220- 1620	ACCEPTABLE
	2	44.5	45.7	20.6- 85.7	28.6- 77.4	ACCEPTABLE
NIC	1	326	312	252- 373	267- 358	ACCEPTABLE
	2	52.8	51.9	39.4- 61.9	42.3- 59.1	ACCEPTABLE
LLIUM	1	800	806	660- 917	693- 884	ACCEPTABLE
	2	20.1	20.9	16.2- 25.5	17.4- 24.4	ACCEPTABLE
IUM	1	12.2	6.35	4.20- 8.85	4.76- 8.27	NOT ACCEPTABLE
	2	68.7	72.0	60.4- 82.5	63.2- 79.7	ACCEPTABLE
LT	1	431	452	382- 509	398- 493	ACCEPTABLE
	2	27.1	27.2	22.6- 32.2	23.6- 30.9	ACCEPTABLE
MIUM	1	11.4	11.0	5.67- 16.3	7.00- 14.9	ACCEPTABLE
	2	105	106	82.0- 124	87.3- 119	ACCEPTABLE
ER	1	715	720	638- 789	657- 770	ACCEPTABLE
	2	31.0	25.2	19.9- 31.0	21.3- 29.6	CHECK FOR ERROR
	1	31.8	32.5	22.5- 48.9	25.8- 45.6	ACCEPTABLE
	2	1220	1230	1070- 1390	1110- 1350	ACCEPTABLE
ANESE	1	522	551	468- 628	488- 606	ACCEPTABLE
	2	18.5	19.3	15.4- 23.6	16.4- 22.6	ACCEPTABLE
KEL	1	906	940	820- 1050	849- 1020	ACCEPTABLE
	2	42.5	41.8	33.8- 49.5	35.8- 47.5	ACCEPTABLE
AD	1	31.4	32.2	24.7- 40.7	26.7- 38.7	ACCEPTABLE
	2	1280	1344	1140- 1550	1190- 1500	ACCEPTABLE
LENIUM	1	29.3	30.0	20.1- 36.8	22.2- 34.7	ACCEPTABLE
	2	127	130	90.7- 155	98.9- 147	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/21/

WATER POLLUTION STUDY NUMBER WP025

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
VANADIUM	1	57.4	58.1	46.6- 69.8	49.7- 66.7	ACCEPTABL
	2	252	255	218- 291	226- 281	ACCEPTAB
ZINC	1	30.1	25.4	17.6- 36.9	20.1- 34.5	ACCEPTABL
	2	730	768	671- 853	694- 831	ACCEPTAB
ANTIMONY	3	22.7	24.0	14.4- 31.6	16.6- 29.4	ACCEPTABL
	4	150	157	110- 201	122- 189	ACCEPTABL
SILVER	3	1.21	1.20	0.748- 1.61	0.856- 1.50	ACCEPTABL
	4	12.6	12.4	9.58- 15.2	10.3- 14.5	ACCEPTABL
THALLIUM	3	11.0	11.0	6.79- 15.9	7.96- 14.7	ACCEPTAB
	4	59.8	67.9	51.1- 85.1	55.7- 80.5	ACCEPTABL
MOLYBDENUM	3	10.5	9.56	4.74- 14.3	6.09- 12.9	ACCEPTAB
	4	57.5	56.0	33.8- 74.7	39.6- 68.9	ACCEPTABL
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	4.58	4.60	4.52- 4.68	4.54- 4.66	ACCEPTABL
	4	8.19	8.33	7.96- 8.50	8.03- 8.44	ACCEPTAB
SPEC. COND. (UMHOS/CM AT 25 C)	1	66.1	67.8	57.5- 76.4	59.8- 74.0	ACCEPTABLE
	2	679	770	676- 838	696- 818	CHECK FOR ERR
TDS AT 180 C	1	41.0	32.8	11.0- 58.8	16.9- 52.9	ACCEPTABLE
	2	452	412	294- 542	325- 511	ACCEPTABLE
TOTAL HARDNESS (AS CACO3)	1	13.8	12.0	8.28- 15.6	9.19- 14.6	ACCEPTABL
	2	212	200	183- 216	187- 212	ACCEPTABLE
CALCIUM	1	3.28	3.00	2.49- 3.58	2.63- 3.44	ACCEPTAB
	2	60.2	55.4	48.1- 62.1	49.8- 60.3	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/21/9C

WATER POLLUTION STUDY NUMBER WP025

ABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
AGNESIUM	1	1.38	1.10	0.929- 1.31	0.978- 1.26	NOT ACCEPTABLE
	2	17.9	15.0	12.9- 17.1	13.4- 16.6	NOT ACCEPTABLE
DIUM	1	6.91	5.45	4.47- 6.60	4.74- 6.33	NOT ACCEPTABLE
	2	62.4	50.7	44.7- 56.0	46.1- 54.5	NOT ACCEPTABLE
TASSIUM	1	6.74	3.00	2.41- 3.44	2.54- 3.31	NOT ACCEPTABLE
	2	31.7	26.0	21.6- 30.9	22.8- 29.8	NOT ACCEPTABLE
TAL ALKALINITY	1	8.56	6.69	2.62- 9.74	3.51- 8.85	ACCEPTABLE
AS CACO3)	2	50.0	47.3	39.5- 50.4	40.6- 49.1	CHECK FOR ERRO
LORIDE	1	8.80	8.66	7.19- 11.7	7.75- 11.1	ACCEPTABLE
	2	137	142	131- 154	134- 151	ACCEPTABLE
UORIDE	1	0.165	0.180	0.110-0.256	0.126-0.238	ACCEPTABLE
	2	0.828	0.910	0.772- 1.03	0.804-0.997	ACCEPTABLE
LFATE	1	6.89	8.00	5.00- 10.5	5.70- 9.88	ACCEPTABLE
	2	87.1	90.0	74.7- 102	78.1- 98.6	ACCEPTABLE
NUTRIENTS IN MILLIGRAMS PER LITER:						
MONIA-NITROGEN	1	8.59	8.76	6.97- 10.4	7.38- 10.0	ACCEPTABLE
	2	1.70	1.60	1.20- 1.99	1.29- 1.90	ACCEPTABLE
TRATE-NITROGEN	1	2.87	3.20	2.52- 3.85	2.66- 3.69	ACCEPTABLE
	2	0.540	0.650	0.473-0.828	0.515-0.786	ACCEPTABLE
THOPHOSPHATE	1	0.205	0.190	0.145-0.235	0.155-0.225	ACCEPTABLE
	2	5.09	5.30	4.48- 6.10	4.67- 5.90	ACCEPTABLE
TAL PHOSPHORUS	3	7.78	8.20	6.32- 9.62	6.72- 9.23	ACCEPTABLE
	4	0.593	0.625	0.449-0.772	0.488-0.733	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 12/21/9

WATER POLLUTION STUDY NUMBER WP025

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
DEMANDS IN MILLIGRAMS PER LITER:						
COD	1	104	121	96.0- 138	101- 133	ACCEPTABLE
	2	16.6	18.2	9.16- 26.3	10.7- 25.8	ACCEPTABLE
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1016/1242	2	4.60	6.50	2.29- 8.85	3.13- 9.01	ACCEPTABLE
PCB-AROCLOR 1248	2	3.62	-	D.L.- D.L.	D.L.- D.L.	NOT ACCEPTABLE
PCB-AROCLOR 1260	1	4.15	4.27	1.22- 6.16	1.85- 5.52	ACCEPTABLE
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1254	1	30.2	26.3	4.04- 46.7	9.50- 41.2	ACCEPTABLE
PCB IN OIL- 1260	2	55.0	50.0	1.58- 82.7	12.0- 72.3	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	1.55	1.50	0.744- 1.98	0.902- 1.82	ACCEPTABLE
	4	7.25	6.73	3.36- 8.78	4.06- 8.09	ACCEPTABLE
ALDRIN	1	0.113	0.158	.0409-0.224	.0643-0.201	ACCEPTABLE
	2	0.381	0.483	.0955-0.654	0.166-0.583	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
D.L. STANDS FOR DETECTION LIMIT

PERFORMANCE EVALUATION REPORT DATE: 12/21/9

WATER POLLUTION STUDY NUMBER WP025

ABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PESTICIDES IN MICROGRAMS PER LITER:						
DIELDRIN	1	0.115	0.142	.0478-0.218	.0694-0.196	ACCEPTABLE
	2	0.438	0.508	0.211-0.716	0.275-0.652	ACCEPTABLE
DDD	1	0.135	0.181	.0585-0.311	.0907-0.279	ACCEPTABLE
	2	0.624	0.773	0.406- 1.08	0.491-0.991	ACCEPTABLE
DDE	1	0.162	0.217	.0902-0.308	0.118-0.280	ACCEPTABLE
	2	0.348	0.425	0.173-0.602	0.226-0.547	ACCEPTABLE
DDT	1	0.207	0.173	.0421-0.306	.0756-0.273	ACCEPTABLE
	2	0.701	0.553	0.252-0.812	0.323-0.740	ACCEPTABLE
EPTACHLOR	1	0.166	0.193	.0680-0.255	.0917-0.232	ACCEPTABLE
	2	0.544	0.623	0.125-0.920	0.226-0.814	ACCEPTABL
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	9.52	13.3	8.79- 18.3	10.0- 17.1	CHECK FOR ERR
	2	27.9	25.7	18.3- 36.0	20.5- 33.7	ACCEPTABL
CHLOROFORM	1	7.67	9.74	6.16- 13.4	7.08- 12.5	ACCEPTABL
	2	32.7	37.4	24.4- 49.7	27.6- 46.5	ACCEPTABL
1,1,1 TRICHLOROETHANE	1	6.20	7.86	4.44- 11.7	5.37- 10.7	ACCEPTABLE
	2	46.8	58.3	35.9- 77.2	41.1- 72.0	ACCEPTABLE
TRICHLOROETHENE	1	6.10	10.5	6.43- 13.7	7.36- 12.8	NOT ACCEPTABLE
	2	31.6	47.4	30.1- 60.8	34.0- 56.9	CHECK FOR ERRO
CARBONTETRACHLORIDE	1	4.62	6.81	3.72- 9.98	4.52- 9.18	ACCEPTABLE
	2	49.1	54.7	34.1- 77.0	39.6- 71.6	ACCEPTABLE
TETRACHLOROETHENE	1	8.41	11.7	6.64- 16.4	7.88- 15.2	ACCEPTABLE
	2	40.4	54.0	32.1- 74.1	37.4- 68.8	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/21/90

WATER POLLUTION STUDY NUMBER WP025

BORATORY: CA070

ALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
OMODICHLOROMETHANE	1	6.56	10.1	6.59- 13.8	7.51- 12.9	NOT ACCEPTABLE
	2	52.6	62.5	43.3- 83.7	48.5- 78.5	ACCEPTABLE
BROMOCHLOROMETHANE	1	8.83	12.6	7.63- 17.8	8.93- 16.5	CHECK FOR ERROR
	2	35.2	44.7	29.1- 61.1	33.2- 57.0	ACCEPTABLE
OROFORM	1	9.67	14.4	7.78- 19.5	9.26- 18.0	ACCEPTABLE
	2	56.5	66.1	40.4- 95.6	47.5- 88.5	ACCEPTABLE
THYLENE CHLORIDE	1	9.51	12.3	6.29- 17.4	7.70- 16.0	ACCEPTABLE
	2	34.1	42.6	23.1- 58.1	27.5- 53.7	ACCEPTABLE
LOROBENZENE	1	10.1	13.9	8.97- 18.7	10.2- 17.4	CHECK FOR ERROR
	2	49.8	63.0	43.1- 79.7	47.8- 75.0	ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
NZENE	1	19.3	17.8	11.9- 23.7	13.4- 22.2	ACCEPTABLE
	2	86.2	82.0	55.7- 107	62.2- 100	ACCEPTABLE
HYLBENZENE	1	10.7	9.60	5.43- 12.9	6.38- 12.0	ACCEPTABLE
	2	60.4	58.4	39.1- 76.6	43.9- 71.8	ACCEPTABLE
LUENE	1	14.0	12.9	8.80- 16.8	9.83- 15.8	ACCEPTABLE
	2	96.2	93.8	62.5- 119	69.8- 112	ACCEPTABLE
2-DICHLOROBENZENE	1	17.0	13.5	8.69- 17.9	9.90- 16.7	CHECK FOR ERROR
	2	56.2	59.2	39.1- 77.2	44.1- 72.2	ACCEPTABLE
3-DICHLOROBENZENE	1	21.8	19.7	12.1- 26.0	13.9- 24.2	ACCEPTABLE
	2	49.0	52.5	34.0- 67.5	38.4- 63.1	ACCEPTABLE
4-DICHLOROBENZENE	1	18.8	15.3	9.55- 21.1	11.1- 19.6	ACCEPTABLE
	2	47.1	48.4	31.8- 65.7	36.2- 61.2	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/21/90

WATER POLLUTION STUDY NUMBER WP025

ORATORY: CA070

LYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MISCELLANEOUS PARAMETERS:						
TAL CYANIDE	1	0.250	0.540	0.392-0.681	0.428-0.645	NOT ACCEPTABLE
MG/L)	2	0.049	0.110	.0613-0.146	.0720-0.135	NOT ACCEPTABLE
N-FILTERABLE RESIDUE	1	15.7	16.6	11.9- 21.2	13.1- 20.0	ACCEPTABLE
MG/L)	2	43.2	42.4	34.9- 50.0	36.7- 48.1	ACCEPTABLE
AND GREASE	1	30.2	38.0	23.9- 45.1	26.6- 42.5	ACCEPTABLE
MG/L)	2	15.4	20.0	10.6- 25.4	12.4- 23.6	ACCEPTABLE
AL PHENOLICS	1	3.52	3.14	1.63- 4.66	2.01- 4.27	ACCEPTABLE
MG/L)	2	0.386	0.372	0.149-0.596	0.205-0.539	ACCEPTABLE
AL RESIDUAL CHLORINE	1	0.150	0.175	D.L.-0.351	.0376-0.308	ACCEPTABLE
MG/L)	2	1.25	1.65	1.07- 1.99	1.19- 1.87	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
.. STANDS FOR DETECTION LIMIT

PERFORMANCE EVALUATION REPORT DATE: 6/13/90

WATER POLLUTION STUDY NUMBER WP024

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
LUMINUM	1	1000	1200	949- 1440	1010- 1380	CHECK FOR ERRO
	2	610	750	587- 910	628- 869	CHECK FOR ERRO
RSENIC	1	17.0	30.0	20.6- 37.6	22.7- 35.5	NOT ACCEPTABLE
	2	147	180	139- 215	149- 205	CHECK FOR ERROR
ERYLLIUM	1	71.9	75.6	53.4- 87.3	66.4- 84.3	ACCEPTABLE
	2	172	190	153- 206	159- 199	ACCEPTABLE
ADMIUM	1	274	300	244- 343	257- 331	ACCEPTABLE
	2	104	110	92.9- 124	96.7- 120	ACCEPTABLE
OBALT	1	716	750	651- 851	677- 825	ACCEPTABLE
	2	269	300	259- 342	270- 332	ACCEPTABLE
HROMIUM	1	41.2	50.0	37.2- 61.0	40.2- 58.0	ACCEPTABLE
	2	590	700	562- 819	595- 787	CHECK FOR ERRO
OPPER	1	85.0	95.0	72.9- 94.5	75.6- 91.8	ACCEPTABLE
	2	507	500	444- 547	457- 534	ACCEPTABLE
RON	1	598	650	559- 737	581- 715	ACCEPTABLE
	2	1530	1650	1420- 1860	1480- 1810	ACCEPTABLE
ERCURY	1	3.25	7.00	5.19- 8.74	5.64- 8.30	NOT ACCEPTABLE
	2	0.75	1.25	0.729- 1.98	0.873- 1.74	CHECK FOR ERRO
ANGANESE	1	186	200	173- 217	183- 212	ACCEPTABLE
	2	604	650	535- 707	601- 692	ACCEPTABLE
ICKEL	1	205	200	172- 227	179- 220	ACCEPTABLE
	2	743	800	695- 909	721- 874	ACCEPTABLE
EAD	1	98.4	100	76.0- 121	81.5- 115	ACCEPTABLE
	2	278	275	234- 309	243- 299	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 6/18/90

WATER POLLUTION STUDY NUMBER WP024

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
LENIUM	1	60.8	70.0	47.8- 81.1	52.0- 77.0	ACCEPTABLE
	2	11.5	16.0	9.71- 19.7	11.0- 18.5	ACCEPTABLE
NADIUM	1	1130	1150	995- 1300	1040- 1260	ACCEPTABLE
	2	1880	1900	1650- 2150	1710- 2080	ACCEPTABLE
NC	1	845	900	783- 1000	810- 976	ACCEPTABLE
	2	517	550	477- 614	494- 597	ACCEPTABLE
TIMONY	3	14.4	19.6	10.5- 27.2	12.6- 25.1	ACCEPTABLE
	4	56.6	70.4	45.4- 87.7	50.7- 82.3	ACCEPTABLE
LVER	3	3.08	4.43	3.27- 5.58	3.57- 5.28	NOT ACCEPTABLE
	4	1.19	1.68	1.14- 2.24	1.28- 2.11	CHECK FOR ERROR
ALLIUM	3	6.93	4.75	2.65- 6.58	3.15- 6.08	NOT ACCEPTABLE
	4	54.3	84.6	63.1- 107	69.1- 101	NOT ACCEPTABLE
OLYBDENUM	3	54.9	73.5	42.7- 98.3	50.5- 90.4	ACCEPTABLE
	4	2.00	3.20	0.608- 6.07	1.33- 5.35	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
-UNITS	3	5.97	6.00	5.36- 6.12	5.89- 6.09	ACCEPTABLE
	4	8.47	8.50	8.19- 8.84	8.27- 8.76	ACCEPTABLE
C. COND. MHOS/CM AT 25 C)	1	710	729	645- 789	663- 771	ACCEPTABLE
	2	682	715	629- 788	649- 758	ACCEPTABLE
AT 180 C	1	386	441	216- 628	267- 577	ACCEPTABLE
	2	390	395	287- 515	316- 486	ACCEPTABLE
AL HARDNESS CACO3)	1	270	267	242- 293	247- 278	ACCEPTABLE
	2	55.0	56.1	47.8- 61.4	49.5- 59.7	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 6/1

WATER POLLUTION STUDY NUMBER WP024

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMA EVALUATI
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
CALCIUM	1	34.9	41.0	34.0- 42.2	35.0- 41.2	CHECK FOR
	2	10.8	12.9	10.8- 14.0	11.2- 13.6	CHECK FOR E
MAGNESIUM	1	38.6	40.0	34.0- 45.8	35.5- 44.3	ACCEPT
	2	5.25	5.80	4.91- 6.66	5.13- 6.44	ACCEPTA
SODIUM	1	7.69	6.72	5.73- 7.94	6.01- 7.66	CHECK FOR
	2	112	123	109- 135	112- 132	ACCEPTA
POTASSIUM	1	23.6	24.0	20.0- 27.2	20.9- 26.3	ACCEPT
	2	6.85	7.00	5.73- 8.46	6.07- 8.12	ACCEPT
TOTAL ALKALINITY (AS CACO3)	1	28.3	9.10	6.69- 13.9	7.58- 13.0	NOT ACCEPT
	2	93.5	87.5	91.6- 93.7	83.1- 92.2	CHECK FOR
CHLORIDE	1	185	194	177- 205	180- 201	ACCEPT
	2	102	95.0	86.4- 101	88.2- 99.2	NOT ACCEPT
FLUORIDE	1	0.67	0.58	0.472-0.682	0.499-0.656	CHECK FOR
	2	2.52	2.30	2.03- 2.52	2.09- 2.46	CHECK FOR
SULFATE	1	25.0	25.0	19.0- 29.3	20.2- 28.0	ACCEPT
	2	97.0	100	93.4- 113	87.2- 110	ACCEPT
DEMANDS IN MILLIGRAMS PER LITER:						
COD	1	80.7	76.2	58.3- 93.6	62.7- 89.2	ACCEPT
	2	51.1	50.0	35.8- 62.4	39.1- 59.1	ACCEPT
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1248	2	2.18	2.70	1.10- 3.89	1.45- 3.54	ACCEPTA

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSA

PERFORMANCE EVALUATION REPORT DATE: 6/18/90

WATER POLLUTION STUDY NUMBER WP024

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PCB'S IN MICROGRAMS PER LITER:						
B-AROCLOR 1254	1	9.22	10.2	4.79- 13.5	5.87- 12.4	ACCEPTABLE
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
CB IN OIL- 1016/1242	1	44.9	45.0	7.35- 69.3	15.2- 61.5	ACCEPTABLE
CB IN OIL- 1254	2	58.3	50.0	3.77- 63.4	11.3- 55.9	CHECK FOR ERROR
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	11.9	8.17	3.65- 11.3	4.60- 10.3	NOT ACCEPTABLE
	4	1.46	1.09	0.599- 1.47	0.708- 1.36	CHECK FOR ERROR
DIELDRIN	1	0.352	0.567	0.194-0.773	0.266-0.701	ACCEPTABLE
	2	0.148	0.192	.0349-0.270	.0643-0.241	ACCEPTABLE
ENDRIN	1	0.498	0.650	0.350-0.978	0.428-0.900	ACCEPTABLE
	2	0.223	0.267	0.137-0.389	0.169-0.358	ACCEPTABLE
HCH	1	0.705	1.13	0.582- 1.63	0.713- 1.50	CHECK FOR ERROR
	2	0.109	0.133	.0353-0.227	.0597-0.203	ACCEPTABLE
HEPTACHLOR	1	0.457	0.603	0.282-0.902	0.360-0.825	ACCEPTABLE
	2	0.241	0.292	.0961-0.443	0.140-0.400	ACCEPTABLE
LINDANE	1	0.761	0.375	0.410- 1.38	0.531- 1.26	ACCEPTABLE
	2	0.227	0.250	.0659-0.438	0.112-0.391	ACCEPTABLE
METHOXYCHLOR	1	0.293	0.467	0.163-0.636	0.228-0.621	ACCEPTABLE
	2	0.064	0.093	.0131-0.140	.0290-0.125	ACCEPTABLE

*BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PESTICIDES IN MICROGRAMS PER LITER:						
HEPTACHLOR EPOXIDE	1	0.279	0.417	0.230-0.590	0.275-0.545	ACCEPTA
	2	0.250	0.283	0.149-0.400	0.180-0.369	ACCEPTA
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	49.4	50.5	32.5- 69.9	37.3- 65.1	ACCEPTA
	2	6.44	6.73	4.78- 9.81	5.41- 9.18	ACCEPTA
CHLOROFORM	1	37.7	42.1	28.8- 53.7	32.0- 50.6	ACCEPTA
	2	8.11	8.57	4.81- 12.8	5.83- 11.8	ACCEPTA
1,1,1 TRICHLOROETHANE	1	47.2	66.0	38.9- 97.2	46.4- 89.7	ACCEPTA
	2	6.29	12.1	6.21- 17.3	7.60- 15.9	CHECK FOR E
TRICHLOROETHENE	1	43.8	54.7	34.9- 72.5	39.7- 67.7	ACCEPTA
	2	9.70	11.5	6.97- 15.8	9.10- 14.7	ACCEPTA
CARBONTETRACHLORIDE	1	40.4	60.8	36.4- 88.1	43.0- 81.5	CHECK FOR E
	2	4.16	14.7	8.47- 21.5	10.1- 19.8	NOT ACCEPTA
TETRACHLORCETHENE	1	36.0	47.6	27.7- 65.4	32.5- 60.6	ACCEPTA
	2	2.49	4.42	2.42- 6.73	2.96- 6.19	CHECK FOR E
BROMODICHLOROMETHANE	1	45.0	49.2	34.3- 63.1	38.0- 59.5	ACCEPTA
	2	11.1	14.2	9.14- 19.2	10.4- 17.9	ACCEPTA
DIBROMOCHLOROMETHANE	1	55.6	58.1	38.2- 79.4	43.5- 74.1	ACCEPTA
	2	6.94	9.35	5.39- 13.1	6.36- 12.1	ACCEPTA
BROMOFORM	1	35.8	37.1	20.9- 54.3	25.1- 50.1	ACCEPTA
	2	3.73	5.33	2.25- 8.36	3.01- 7.59	ACCEPTA
METHYLENE CHLORIDE	1	36.7	37.1	21.6- 53.3	25.7- 49.2	ACCEPTA
	2	6.53	6.36	2.29- 10.9	3.37- 9.77	ACCEPTA

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

PERFORMANCE EVALUATION REPORT DATE: 6/13/90

WATER POLLUTION STUDY NUMBER WP024

BORATORY: CA070

ALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
OROBENZENE	1	45.2	51.1	35.1- 67.4	39.3- 63.3	ACCEPTABLE
	2	11.0	12.1	7.81- 16.3	8.90- 15.2	ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
NZENE	1	13.2	13.0	8.44- 17.7	9.62- 16.5	ACCEPTABLE
	2	53.3	53.0	36.5- 70.2	40.7- 66.0	ACCEPTABLE
HYLBENZENE	1	21.6	21.0	14.7- 27.4	16.3- 25.8	ACCEPTABLE
	2	93.0	93.1	62.9- 120	70.1- 113	ACCEPTABLE
LUENE	1	16.4	15.3	11.2- 21.1	12.5- 19.8	ACCEPTABLE
	2	65.6	67.1	45.4- 88.1	50.8- 82.8	ACCEPTABLE
2-DICHLOROBENZENE	1	17.7	17.0	10.9- 22.9	12.3- 21.2	ACCEPTABLE
	2	70.3	65.1	42.1- 86.1	47.9- 80.3	ACCEPTABLE
3-DICHLOROBENZENE	1	11.5	11.1	6.23- 15.1	7.39- 14.0	ACCEPTABLE
	2	84.6	79.1	51.5- 101	58.0- 94.3	ACCEPTABLE
4-DICHLOROBENZENE	1	23.5	23.0	14.4- 32.3	16.8- 30.0	ACCEPTABLE
	2	88.0	84.0	54.9- 117	63.0- 109	ACCEPTABLE
MISCELLANEOUS PARAMETERS:						
N-FILTERABLE RESIDUE	1	69.1	73.0	61.3- 78.0	63.3- 75.9	ACCEPTABLE
MG/L)	2	56.2	60.0	48.5- 62.0	50.2- 60.3	ACCEPTABLE
L AND GREASE	1	22.3	18.0	10.6- 23.2	12.2- 21.7	CHECK FOR ERROR
MG/L)	2	13.6	10.0	3.51- 15.2	4.97- 13.8	ACCEPTABLE
TAL PHENOLICS	1	0.180	0.162	.0776-0.261	0.101-0.237	ACCEPTABLE
MG/L)	2	0.58	0.531	0.287-0.795	0.351-0.731	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 6

WATER POLLUTION STUDY NUMBER WP024

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORM EVALUA
MISCELLANEOUS PARAMETERS:						
TOTAL RESIDUAL CHLORINE (IN MG/L)	1	0.715	1.50	0.896- 1.82	1.02- 1.70	NOT ACCEP
	2	0.175	0.220	.0828-0.333	0.116-0.300	ACCEP

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECES

PERFORMANCE EVALUATION REPORT DATE: 12/21/79

WATER POLLUTION STUDY NUMBER WP023

BORATORY: CA070

ALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ENIC	1	198	152	118- 181	126- 173	NOT ACCEPTABLE
	2	8.06	7.20	4.06- 10.1	4.81- 9.30	ACCEPTABLE
RYLLIUM	1	514	500	434- 553	450- 538	ACCEPTABLE
	2	11.8	13.9	8.16- 20.0	9.68- 18.5	ACCEPTABLE
DMIUM	1	124	133	112- 149	117- 144	ACCEPTABLE
	2	3.54	3.55	1.42- 5.43	1.92- 4.93	ACCEPTABLE
OBALT	1	3.30	9.48	2.73- 14.9	4.30- 13.3	ACCEPTABLE
	2	154	150	101- 175	128- 168	ACCEPTABLE
HROMIUM	1	842	834	596- 974	731- 940	ACCEPTABLE
	2	6.09	6.55	2.17- 10.5	3.21- 9.43	ACCEPTABLE
OPPER	1	565	579	497- 633	514- 616	ACCEPTABLE
	2	16.0	15.0	11.6- 20.5	12.7- 19.4	ACCEPTABLE
RON	1	1570	1704	1500- 1890	1550- 1340	ACCEPTABLE
	2	13.5	14.0	2.76- 25.8	5.63- 22.9	ACCEPTABLE
ANGANESE	1	690	700	630- 752	645- 737	ACCEPTABLE
	2	16.2	16.3	9.00- 22.2	10.7- 20.6	ACCEPTABLE
CKEL	1	648	606	532- 675	550- 657	ACCEPTABLE
	2	27.5	12.4	3.93- 21.5	6.04- 19.3	NOT ACCEPTABLE
AD	1	1120	1108	942- 1270	983- 1230	ACCEPTABLE
	2	15.7	16.3	10.6- 23.7	12.2- 22.1	ACCEPTABLE
LENIUM	1	161	140	99.4- 160	107- 152	NOT ACCEPTABLE
	2	10.3	11.1	5.81- 15.2	6.99- 14.0	ACCEPTABLE
NC	1	1230	1267	1110- 1420	1150- 1380	ACCEPTABLE
	2	12.7	12.6	7.71- 16.8	8.84- 15.7	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/21/6

WATER POLLUTION STUDY NUMBER WP023

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ANTIMONY	3	147	135	83.5- 169	94.6- 158	ACCEPTABLE
	4	15.0	15.0	7.57- 20.4	9.24- 18.7	ACCEPTABLE
SILVER	3	0.600	0.560	0.250-0.827	0.324-0.753	ACCEPTABLE
	4	8.00	8.12	6.16- 10.0	6.65- 9.55	ACCEPTABLE
THALLIUM	3	14.5	13.8	9.25- 19.5	10.6- 18.1	ACCEPTABLE
	4	40.5	40.0	30.1- 51.7	32.9- 48.9	ACCEPTABLE
MOLYBDENUM	3	22.0	28.2	15.5- 38.4	18.6- 35.3	ACCEPTABLE
	4	5.05	5.79	2.12- 9.19	3.09- 8.22	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	7.68	7.9	7.62- 8.12	7.68- 8.06	ACCEPTABLE
	4	4.17	4.2	4.12- 4.28	4.14- 4.26	ACCEPTABLE
SPEC. COND. (UMHOS/CM AT 25 C)	1	234	234	214- 257	220- 252	ACCEPTABLE
	2	1020	1030	922- 1140	949- 1110	ACCEPTABLE
TDS AT 180 C	1	133	133	90.2- 179	101- 168	ACCEPTABLE
	2	712	647	380- 967	453- 894	ACCEPTABLE
TOTAL HARDNESS (AS CACO3)	1	50.0	50.6	43.4- 58.0	45.2- 56.2	ACCEPTABLE
	2	352	342	312- 368	319- 361	ACCEPTABLE
CALCIUM	1	17.2	19.0	15.5- 22.2	17.2- 21.5	ACCEPTABLE
	2	84.0	93.3	80.9- 108	84.2- 104	CHECK FOR ERROR
MAGNESIUM	1	1.69	0.771	0.599-0.934	0.641-0.892	NOT ACCEPTABLE
	2	36.7	26.5	22.5- 30.5	23.5- 29.5	NOT ACCEPTABLE
SODIUM	1	17.7	14.9	12.9- 16.9	13.4- 16.4	NOT ACCEPTABLE
	2	77.6	35.2	31.3- 39.2	32.3- 38.2	NOT ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/31/8

WATER POLLUTION STUDY NUMBER WP023

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
POTASSIUM	1	17.0	14.0	11.7- 15.9	12.2- 15.3	NOT ACCEPTABLE
	2	45.0	36.6	30.9- 41.7	32.2- 40.3	NOT ACCEPTABLE
TOTAL ALKALINITY (AS CACO3)	1	23.0	23.4	20.4- 27.9	21.3- 27.0	ACCEPTABLE
	2	70.0	69.0	63.4- 77.1	65.1- 75.4	ACCEPTABLE
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1232	2	19.3		D.L.- D.L.	D.L.- D.L.	NOT ACCEPTABLE
PCB-AROCLOR 1260	1	1.15	1.20	0.558- 1.79	0.716- 1.63	ACCEPTABLE
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1016/1242	2	12.6	21.2	1.99- 30.9	5.53- 27.1	ACCEPTABLE
PCB IN OIL- 1260	1	7.85	8.20	0.727- 12.2	2.20- 10.7	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	3.52	2.83	1.38- 3.74	1.68- 3.44	CHECK FOR ERRO.
	4	17.9	13.7	6.07- 19.5	7.66- 16.9	CHECK FOR ERROR
ALDRIN	1	0.082	0.100	.0171-0.155	.0347-0.137	ACCEPTABLE
	2	0.455	0.450	0.132-0.621	0.194-0.558	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
D.L. STANDS FOR DETECTION LIMIT

PERFORMANCE EVALUATION REPORT DATE: 12/21/89

WATER POLLUTION STUDY NUMBER WP023

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PESTICIDES IN MICROGRAMS PER LITER:						
DIELDRIN	1	0.110	0.117	.0531-0.187	.0702-0.170	ACCEPTABLE
	2	0.393	0.400	0.178-0.633	0.236-0.575	ACCEPTABLE
DDD	1	0.202	0.250	0.100-0.396	0.139-0.358	ACCEPTABLE
	2	0.567	0.625	0.286-0.975	0.361-0.800	ACCEPTABLE
DDE	1	0.114	0.142	.0501-0.223	.0720-0.201	ACCEPTABLE
	2	0.453	0.492	0.232-0.678	0.289-0.621	ACCEPTABLE
DDT	1	0.119	0.133	.0349-0.237	.0607-0.211	ACCEPTABLE
	2	0.598	0.633	0.279-0.915	0.360-0.834	ACCEPTABLE
HEPTACHLOR	1	0.168	0.233	.0757-0.328	0.108-0.295	ACCEPTABLE
	2	0.440	0.517	0.149-0.747	0.226-0.670	ACCEPTABLE
HEPTACHLOR EPOXIDE	1	0.151	0.175	.0916-0.241	0.111-0.222	ACCEPTABLE
	2	0.630	0.625	0.360-0.825	0.420-0.766	ACCEPTABLE
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
CHLOROFORM	1	10.7	15.9	10.1- 22.1	11.6- 20.6	CHECK FOR ERR
	2	48.9	52.0	35.8- 68.1	39.9- 64.0	ACCEPTABLE
1,1,1 TRICHLOROETHANE	1	8.03	6.74	3.59- 10.6	4.49- 9.72	ACCEPTABLE
	2	52.0	42.0	29.4- 57.4	28.6- 53.2	ACCEPTABLE
TRICHLOROETHENE	1	11.1	7.55	4.24- 10.9	5.07- 9.94	NOT ACCEPTABLE
	2	42.9	28.1	17.2- 38.8	20.0- 36.1	NOT ACCEPTABLE
CARBONTETRACHLORIDE	1	17.4	4.89	2.33- 7.53	3.00- 6.87	NOT ACCEPTABLE
	2	60.0	52.1	30.3- 76.6	36.2- 70.7	ACCEPTABLE
TETRACHLOROETHENE	1	12.5	10.2	5.68- 14.6	6.82- 13.5	ACCEPTABLE
	2	43.6	39.1	21.7- 51.7	25.5- 47.9	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 12/21/3?

WATER POLLUTION STUDY NUMBER WP023

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
BROMODICHLOROMETHANE	1	12.9	8.48	5.20- 11.1	6.32- 10.3	NOT ACCEPTABLE
	2	46.8	37.0	24.3- 46.3	27.1- 43.6	NOT ACCEPTABLE
DIBROMOCHLOROMETHANE	1	10.4	5.30	2.68- 8.10	3.37- 7.41	NOT ACCEPTABLE
	2	56.4	42.3	27.3- 59.0	31.2- 54.1	CHECK FOR ERROR
BROMOFORM	1	12.2	8.63	4.16- 12.9	5.28- 11.8	CHECK FOR ERROR
	2	96.6	58.0	31.0- 86.4	38.0- 79.4	NOT ACCEPTABLE
METHYLENE CHLORIDE	1	18.0	9.24	4.29- 15.3	5.70- 13.9	NOT ACCEPTABLE
	2	60.5	64.0	36.9- 92.5	42.0- 85.4	ACCEPTABLE
CHLOROBENZENE	1	10.9	6.95	4.12- 9.70	4.83- 8.98	NOT ACCEPTABLE
	2	50.6	36.0	21.8- 48.7	25.2- 45.3	NOT ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
BENZENE	1	65.3	66.1	42.9- 87.5	49.6- 81.9	ACCEPTABLE
	2	3.67	4.27	2.31- 5.48	2.84- 5.94	ACCEPTABLE
ETHYLBENZENE	1	91.8	87.0	54.4- 115	62.0- 107	ACCEPTABLE
	2	14.9	15.0	8.41- 23.7	10.4- 21.8	ACCEPTABLE
TOLUENE	1	83.1	85.1	60.8- 107	66.7- 101	ACCEPTABLE
	2	8.78	10.1	6.21- 13.9	7.19- 13.0	ACCEPTABLE
1,2-DICHLOROBENZENE	1	100	84.0	49.2- 115	57.6- 107	ACCEPTABLE
	2	23.2	22.2	13.4- 30.7	15.7- 28.4	ACCEPTABLE
1,3-DICHLOROBENZENE	1	91.2	63.2	36.8- 87.9	43.3- 81.4	NOT ACCEPTABLE
	2	19.3	15.0	8.69- 20.2	10.2- 18.7	CHECK FOR ERROR
1,4-DICHLOROBENZENE	1	76.0	78.0	47.1- 109	55.0- 101	ACCEPTABLE
	2	15.6	18.0	10.7- 26.3	12.8- 24.2	ACCEPTABLE

BASED UPON THEORITICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/21/

WATER POLLUTION STUDY NUMBER WP023

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MISCELLANEOUS PARAMETERS:						
OIL AND GREASE (IN MG/L)	1	44.0	43.9	29.9- 54.5	25.1- 59.3	ACCEPTABLE
	2	19.0	15.3	6.97- 21.5	8.79- 19.7	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

PERFORMANCE EVALUATION REPORT

DATE: 6/24/91

WATER POLLUTION STUDY NUMBER WP026

ORATORY: CA070

ALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
MINUM Al	1	879	870	720- 999	755- 964	ACCEPTABLE
	2	3240	3200	2730- 3630	2840- 3510	ACCEPTABLE
ENIC As	1	66.3	69.9	55.5- 82.8	58.9- 79.4	ACCEPTABLE
	2	184	200	158- 234	168- 225	ACCEPTABLE
YLLIUM Be	1	9.15	11.1	7.73- 14.7	8.63- 13.8	ACCEPTABLE
	2	123	130	104- 159	111- 152	ACCEPTABLE
MIUM Cd	1	4.71	5.07	3.42- 6.82	3.85- 6.40	ACCEPTABLE
	2	183	190	161- 218	168- 211	ACCEPTABLE
ALT Co	1	784	815	706- 915	733- 888	ACCEPTABLE
	2	172	180	154- 205	161- 198	ACCEPTABLE
OMIUM Cr	1	73.7	74.0	56.7- 90.2	60.8- 86.0	ACCEPTABLE
	2	402	410	334- 477	352- 459	ACCEPTABLE
PER Cu	1	42.8	43.0	34.9- 50.2	36.8- 48.3	ACCEPTABLE
	2	727	730	656- 817	676- 797	ACCEPTABLE
N Fe	1	339	340	293- 391	305- 379	ACCEPTABLE
	2	983	1000	887- 1140	918- 1110	ACCEPTABLE
CURY Hg	1	0.550	0.543	0.246-0.903	0.329-0.820	ACCEPTABLE
	2	3.69	3.40	2.54- 4.41	2.78- 4.18	ACCEPTABLE
ANESE Mn	1	408	420	385- 460	394- 451	ACCEPTABLE
	2	897	920	850- 1010	869- 986	ACCEPTABLE
EL Ni	1	1610	1600	1420- 1770	1460- 1720	ACCEPTABLE
	2	430	430	383- 485	396- 472	ACCEPTABLE
Pb	1	306	320	271- 369	283- 357	ACCEPTABLE
	2	45.2	47.9	38.3- 58.3	40.8- 55.8	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 6/24/91

WATER POLLUTION STUDY NUMBER WP026

ABORATORY: CA070

NALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ELENIUM Se	1	10.2	10.0	5.92- 13.1	6.82- 12.2	ACCEPTABLE
	2	82.7	86.0	60.7- 105	66.1- 99.1	ACCEPTABLE
ANADIUM V	1	1960	2000	1760- 2240	1820- 2180	ACCEPTABLE
	2	4600	4600	4130- 5160	4260- 5020	ACCEPTABLE
INC Zn	1	1840	1900	1670- 2110	1720- 2060	ACCEPTABLE
	2	107	110	88.5- 133	94.1- 128	ACCEPTABLE
NTIMONY Sb	3	16.6	17.1	8.31- 26.0	10.5- 23.8	ACCEPTABLE
	4	95.5	97.0	55.9- 128	64.9- 118	ACCEPTABLE
ILVER Ag	3	1.01	0.806	0.460- 1.16	0.550- 1.07	ACCEPTABLE
	4	6.48	6.80	5.14- 8.34	5.54- 7.94	ACCEPTABLE
HALLIUM Tl	3	7.75	6.75	4.11- 9.43	4.81- 8.73	ACCEPTABLE
	4	94.8	97.1	76.6- 118	81.9- 112	ACCEPTABLE
OLYBDENUM Mo	3	26.9	27.3	17.0- 36.6	19.8- 33.9	ACCEPTABLE
	4	4.25	4.01	1.21- 6.99	2.03- 6.17	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
-UNITS	3	8.92	8.80	8.46- 9.24	8.55- 9.14	ACCEPTABLE
	4	5.57	5.52	5.42- 5.66	5.45- 5.64	ACCEPTABLE
EC. COND.	1	89.7	119	104- 128	107- 125	NOT ACCEPTABLE
MHOS/CM AT 25 C)	2	705	901	799- 986	822- 963	NOT ACCEPTABLE
S AT 180 C TDS	1	75.7	59.1	31.9- 90.0	39.2- 82.7	ACCEPTABLE
	2	525	521	387- 671	422- 636	ACCEPTABLE
TAL HARDNESS	1	20.2	18.5	14.7- 22.4	15.6- 21.5	ACCEPTABLE
S CACO3)	2	260	253	233- 270	237- 266	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 6/24/91

WATER POLLUTION STUDY NUMBER WP026

ATORY: CA070

ITES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
UM Ca	1	1.22	1.30	0.909- 1.61	0.997- 1.52	ACCEPTABLE
	2	69.2	71.0	61.8- 80.3	64.1- 77.9	ACCEPTABLE
SIUM Mg	1	3.68	3.70	3.16- 4.25	3.29- 4.11	ACCEPTABLE
	2	18.2	18.5	16.0- 21.0	16.6- 20.4	ACCEPTABLE
M Na	1	9.14	9.44	8.29- 10.8	8.60- 10.5	ACCEPTABLE
	2	59.0	55.6	49.3- 61.8	50.9- 60.3	ACCEPTABLE
SIUM K	1	8.79	8.95	7.43- 10.3	7.80- 9.97	ACCEPTABLE
	2	28.3	28.9	24.8- 33.2	25.9- 32.1	ACCEPTABLE
ALKALINITY	1	20.8	18.2	14.7- 23.0	15.7- 22.0	ACCEPTABLE
ACO3)	2	108	112	96.7- 116	99.1- 114	ACCEPTABLE
RIDE Cl	1	12.9	13.4	10.6- 15.5	11.2- 14.9	ACCEPTABLE
	2	182	181	164- 201	169- 196	ACCEPTABLE
RIDE TOF F	*1	0.500	0.750	0.636-0.852	0.664-0.825	NOT ACCEPTABLE
	2	2.77	2.90	2.38- 3.27	2.50- 3.16	ACCEPTABLE
ATE SO4	1	9.51	11.0	8.35- 13.4	8.98- 12.8	ACCEPTABLE
	2	34.0	35.5	28.0- 41.9	29.8- 40.1	ACCEPTABLE
NUTRIENTS IN MILLIGRAMS PER LITER:						
IA-NITROGEN	1	15.4	18.0	14.4- 21.3	15.2- 20.4	ACCEPTABLE
	2	3.43	4.20	3.30- 5.09	3.51- 4.88	CHECK FOR ERROR
TE-NITROGEN	1	7.90	8.00	6.47- 9.52	6.83- 9.15	ACCEPTABLE
	2	10.2	10.0	8.09- 11.9	8.55- 11.4	ACCEPTABLE
PHOSPHATE	1	1.16	1.40	1.15- 1.63	1.20- 1.57	CHECK FOR ERROR
	2	0.300	0.320	0.251-0.385	0.267-0.369	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 6/24/91

WATER POLLUTION STUDY NUMBER WP026

ABORATORY: CA070

NALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
NUTRIENTS IN MILLIGRAMS PER LITER:						
OTAL PHOSPHORUS	3	3.32	3.60	2.84- 4.28	3.02- 4.11	ACCEPTABLE
	4	1.47	1.80	1.38- 2.13	1.47- 2.04	ACCEPTABLE
DEMANDS IN MILLIGRAMS PER LITER:						
OD	1	40.4	46.6	32.5- 57.1	35.6- 54.0	ACCEPTABLE
	2	59.7	65.4	49.3- 75.8	52.7- 72.5	ACCEPTABLE
PCB'S IN MICROGRAMS PER LITER:						
CB-AROCLOR 1232	1	3.39	3.77	1.93- 5.06	2.33- 4.66	ACCEPTABLE
CB-AROCLOR 1254	2	6.67	8.37	3.86- 11.0	4.76- 10.1	ACCEPTABLE
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
CB IN OIL- 1016/1242	1	15.2	32.4	5.93- 45.6	11.6- 40.5	ACCEPTABLE
CB IN OIL- 1260	2	15.5	18.6	2.82- 29.5	6.25- 26.0	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
LORDANE	3	0.791	1.13	0.543- 1.49	0.661- 1.37	ACCEPTABLE
	4	5.57	8.88	4.60- 11.5	5.48- 10.6	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 6/24/91

WATER POLLUTION STUDY NUMBER WP026

LABORATORY: CA070

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PESTICIDES IN MICROGRAMS PER LITER:						
DRIN	1	0.169	0.227	.0496-0.315	.0628-0.282	ACCEPTABLE
	2	0.523	0.606	0.134-0.891	0.229-0.797	ACCEPTABLE
ELDRIN	1	0.146	0.208	0.104-0.300	0.129-0.275	ACCEPTABLE
	2	0.390	0.467	0.2o9-0.650	0.317-0.603	ACCEPTABLE
D	1	0.172	0.157	.0504-0.272	.0767-0.244	ACCEPTABLE
	2	0.639	0.862	0.436- 1.13	0.523- 1.04	ACCEPTABLE
E	1	0.127	0.183	.0715-0.274	.0974-0.249	ACCEPTABLE
	2	0.329	0.417	0.170-0.626	0.227-0.569	ACCEPTABLE
	1	0.214	0.217	.0782-0.352	0.113-0.317	ACCEPTABLE
	2	0.663	0.780	0.383- 1.13	0.476- 1.04	ACCEPTABLE
TACHLOR	1	0.067	0.119	.0284-0.174	.0456-0.155	ACCEPTABLE
	2	0.373	0.587	0.214-0.796	0.287-0.723	ACCEPTABLE
TACHLOR EPOXIDE	1	0.076	0.108	.0568-0.148	.0682-0.137	ACCEPTABLE
	2	0.285	0.350	0.192-0.490	0.229-0.453	ACCEPTABLE
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
2 DICHLOROETHANE	1	23.1	17.2	10.5- 23.1	12.1- 21.5	CHECK FOR ERROR
	2	49.3	38.9	26.8- 52.3	30.0- 49.1	CHECK FOR ERROR
LOROFORM	1	16.0	13.3	8.35- 17.4	9.49- 16.3	NOT ACCEPTABLE
	2	64.3	64.4	41.1- 82.8	46.4- 77.6	ACCEPTABLE
.1 TRICHLOROETHANE	1	17.5	14.3	8.15- 18.5	9.44- 17.2	CHECK FOR ERROR
	2	42.5	36.6	21.5- 48.6	24.9- 45.2	ACCEPTABLE
CHLOROETHENE	1	17.9	13.9	8.68- 18.6	9.94- 17.3	CHECK FOR ERROR
	2	46.4	38.9	25.9- 50.2	29.0- 47.1	CHECK FOR ERROR

*BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 6/24/91

WATER POLLUTION STUDY NUMBER WP026

ABORATORY: CA07C

NALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
ARBONTETRACHLORIDE	1	14.8	11.7	6.46- 16.2	7.68- 15.0	ACCEPTABLE
	2	53.3	46.6	28.6- 64.2	33.0- 59.7	ACCEPTABLE
ETRACHLOROETHENE	1	19.0	15.1	9.27- 20.4	10.7- 19.0	ACCEPTABLE
	2	61.6	63.9	40.5- 85.0	46.2- 79.3	ACCEPTABLE
ROMODICHLOROMETHANE	1	17.0	16.1	10.5- 20.7	11.8- 19.4	ACCEPTABLE
	2	54.8	53.8	37.0- 70.5	41.3- 66.2	ACCEPTABLE
BROMOCHLOROMETHANE	1	15.1	15.2	9.76- 20.6	11.1- 19.2	ACCEPTABLE
	2	52.2	52.5	36.0- 69.7	40.3- 65.4	ACCEPTABLE
ROMOFORM	1	16.4	17.8	9.79- 25.1	11.7- 23.1	ACCEPTABLE
	2	49.9	54.0	32.8- 76.2	38.3- 70.7	ACCEPTABLE
ETHYLENE CHLORIDE	1	20.3	17.5	9.11- 25.1	11.1- 23.1	ACCEPTABLE
	2	56.6	54.6	29.0- 77.3	35.1- 71.2	ACCEPTABLE
HLOROBENZENE	1	16.1	16.5	11.1- 21.6	12.4- 20.3	ACCEPTABLE
	2	70.8	68.4	45.5- 90.2	51.2- 84.5	ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
NZENE	1	13.6	11.8	7.72- 16.1	8.78- 15.0	ACCEPTABLE
	2	52.0	46.5	31.3- 61.0	35.1- 57.2	ACCEPTABLE
HYLBENZENE	1	18.0	15.3	9.78- 20.0	11.1- 18.7	ACCEPTABLE
	2	75.0	66.2	43.8- 86.2	49.2- 80.8	ACCEPTABLE
LUENE	1	21.1	18.9	12.8- 24.6	14.3- 23.1	ACCEPTABLE
	2	58.1	52.7	39.4- 65.9	42.7- 62.6	ACCEPTABLE
2-DICHLOROBENZENE	1	14.6	15.5	10.9- 20.4	12.1- 19.2	ACCEPTABLE
	2	76.1	71.8	49.4- 90.9	54.7- 85.6	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 6/24/91

WATER POLLUTION STUDY NUMBER WP026

RATORY: CA070

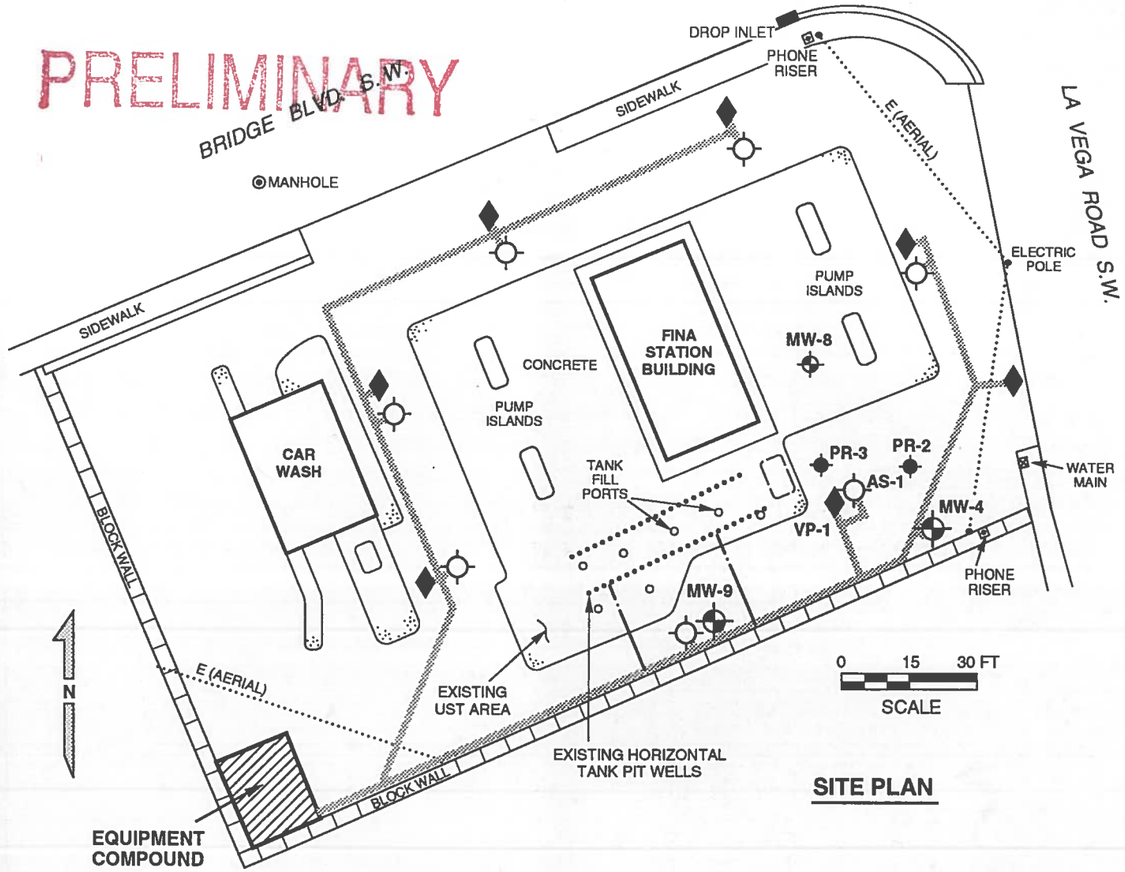
YTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
-DICHLOROBENZENE	1	12.9	14.3	10.5- 18.3	11.5- 17.4	ACCEPTABLE
	2	49.1	47.2	31.8- 60.3	35.4- 56.6	ACCEPTABLE
DICHLOROBENZENE	1	17.4	17.2	11.4- 23.0	12.9- 21.5	ACCEPTABLE
	2	58.4	55.4	38.1- 71.5	42.3- 67.2	ACCEPTABLE
MISCELLANEOUS PARAMETERS:						
AL CYANIDE MACRO	1	0.051	0.020	D.L.-.0352	.0020-.0304	NOT ACCEPTABLE
MG/L)	2	0.570	0.530	0.365-0.676	0.404-0.637	ACCEPTABLE
-FILTERABLE RESIDUE	1	48.3	63.3	46.1- 67.2	48.7- 64.5	CHECK FOR ERROR
MG/L)	2	16.8	23.9	14.8- 26.5	16.3- 25.0	ACCEPTABLE
AND GREASE	1	14.2	13.0	6.48- 17.7	7.86- 16.3	ACCEPTABLE
MG/L)	2	16.9	17.0	9.07- 22.1	10.7- 20.5	ACCEPTABLE
AL PHENOLICS	1	0.431	0.455	0.195-0.714	0.261-0.648	ACCEPTABLE
MG/L)	2	0.014	.0146	.0025-.0266	.0056-.0236	ACCEPTABLE
AL RESIDUAL CHLORINE	1	1.45	2.00	1.27- 2.25	1.40- 2.12	ACCEPTABLE
MG/L)	2	0.115	0.110	D.L.-0.246	.0099-0.210	ACCEPTABLE

BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
STANDS FOR DETECTION LIMIT

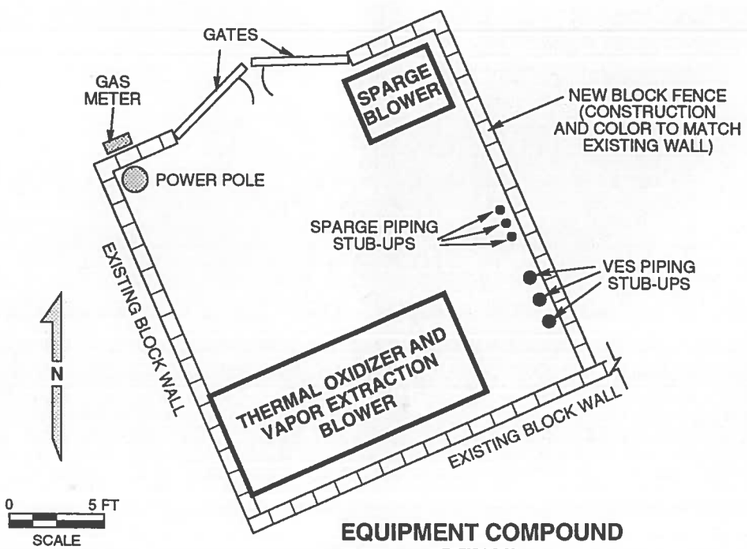
APPENDIX H

PRELIMINARY ENGINEERING PLANS

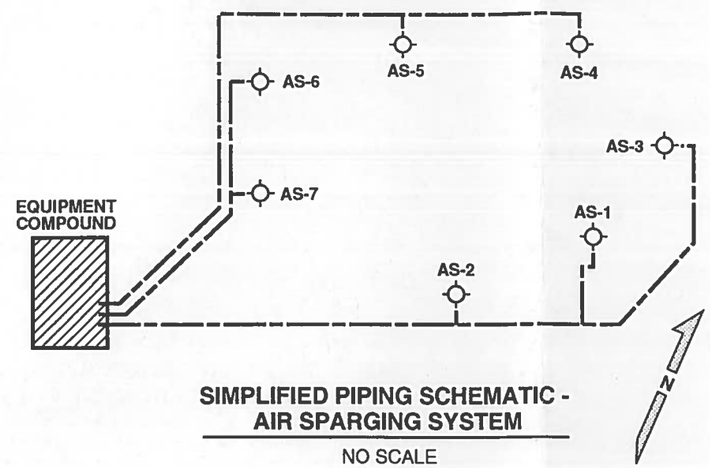
PRELIMINARY



SITE PLAN

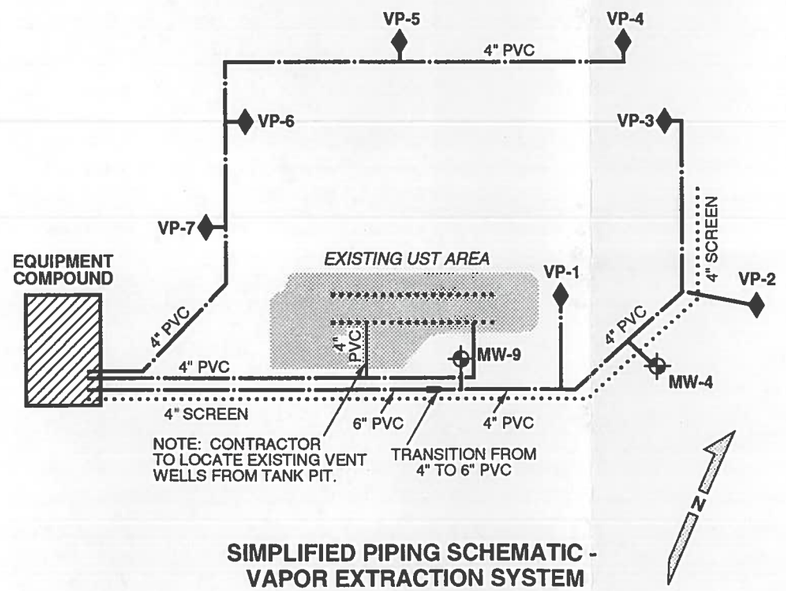


EQUIPMENT COMPOUND DETAIL



SIMPLIFIED PIPING SCHEMATIC - AIR SPARGING SYSTEM

NO SCALE



SIMPLIFIED PIPING SCHEMATIC - VAPOR EXTRACTION SYSTEM

NO SCALE

NO.	DATE	BY	REVISION

LEGEND

- MW-9 — MONITOR WELL
- VP-1 — VAPOR EXTRACTION WELL
- AS-1 — AIR SPARGING WELL
- PR-3 — VADOSE ZONE MONITOR WELL
- E — OVERHEAD ELECTRIC LINE
- ELECTRIC POLE
- TELEPHONE RISER
- MANHOLE
- TRENCH LINE
- VES LINE (BLANK)
- VES LINE (SCREENED)
- AIR SPARGE LINE

NOTE:
WELLS MW-9, VP-1, AS-1, PR-2, AND PR-3 NOT SURVEYED LOCATIONS

ATTENTION

SIGNATURE	DATE
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PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

NEW MEXICO ENVIRONMENT DEPT.
UNDERGROUND STORAGE TANK BUREAU
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, N.M. 87106 (505) 242-3113

SITE PLAN

DESIGNED BY:	DETAILED BY:	CHECKED BY:
TT/JMW	CARTO-GRAPHICS	TB 12.3.92
DATE: 11/28/92	FILE: NMED-Y1	
PROJECT NO.: 023352875	CONTRACT:	
DRAWING: Y1	REVISION: –	

SOIL VAPOR EXTRACTION AND AIR SPARGE REMEDIATION SYSTEM

800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

PRELIMINARY

Prepared for:

NEW MEXICO ENVIRONMENT DEPARTMENT
UNDERGROUND STORAGE TANK BUREAU

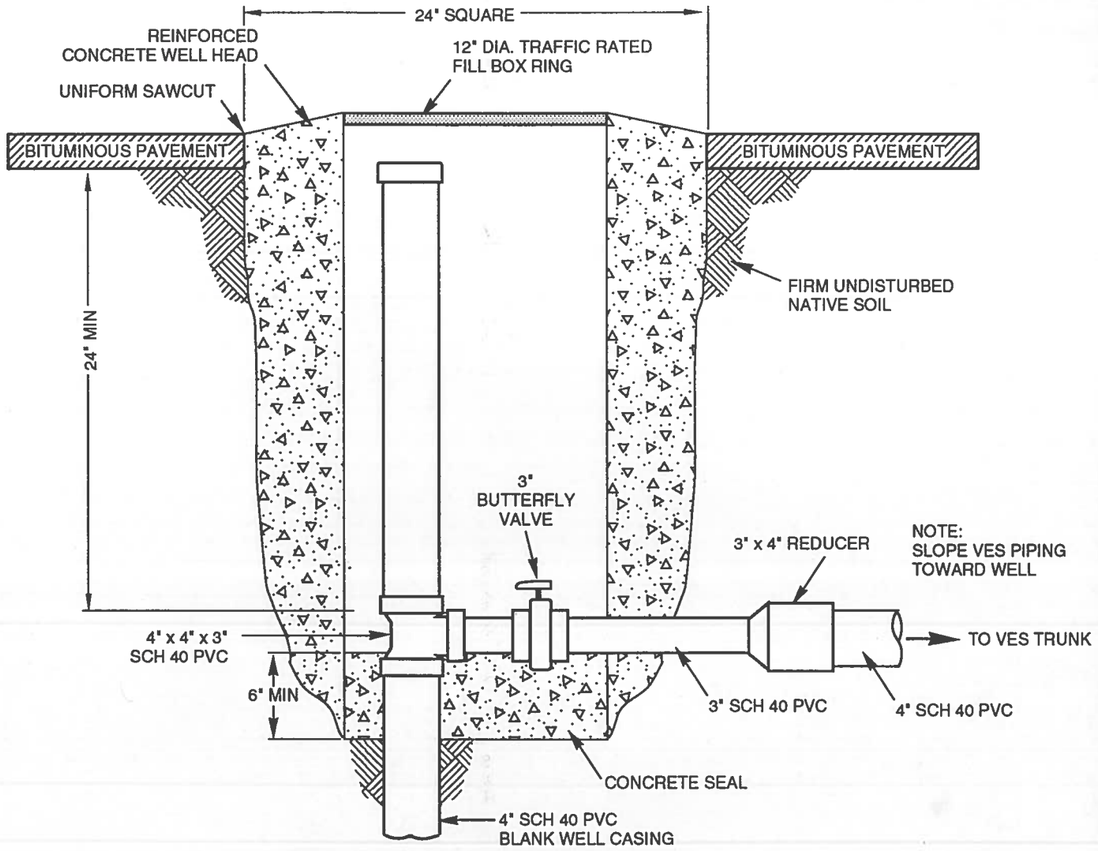
PROJECT NO. 023352875
MOVEMBER 1992

SHEET INDEX

DWG. NO.	TITLE
Y1	SITE PLAN
Y2	WELLHEAD AND PIPING MANIFOLD DETAILS
Y3	TRENCH DETAIL

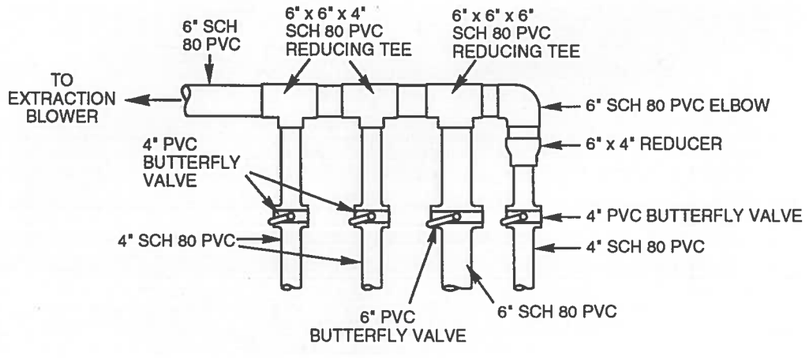
GROUNDWATER TECHNOLOGY

2501 E. YALE BLVD. SE SUITE 204
ALBUQUERQUE, NEW MEXICO 87106



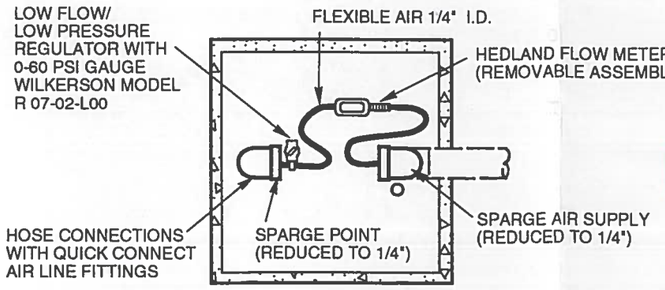
VAPOR EXTRACTION WELLHEAD (TYPICAL)

NO SCALE



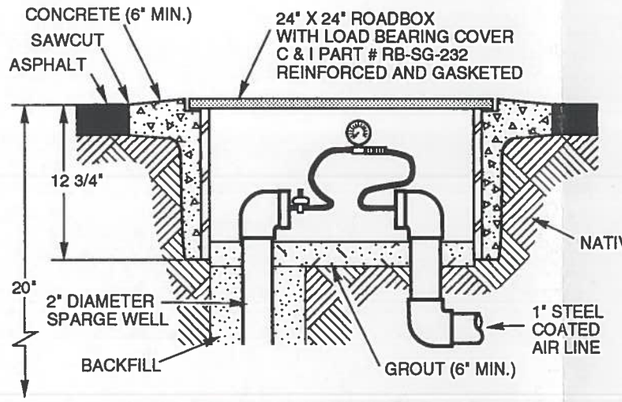
VES PIPING MANIFOLD (TYPICAL)

NO SCALE



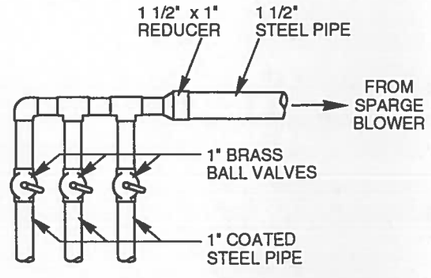
SPARGE WELLHEAD DETAIL (TYPICAL)
PLAN VIEW

NO SCALE



SPARGE WELLHEAD DETAIL (TYPICAL)

NO SCALE



SPARGE PIPING MANIFOLD (TYPICAL)

NO SCALE

NO.	DATE	BY	REVISION

PRELIMINARY

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PROJECT MGR:	
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NEW MEXICO ENVIRONMENT DEPT.
UNDERGROUND STORAGE TANK BUREAU
800 BRIDGE BLVD. S.W.
ALBUQUERQUE, NEW MEXICO

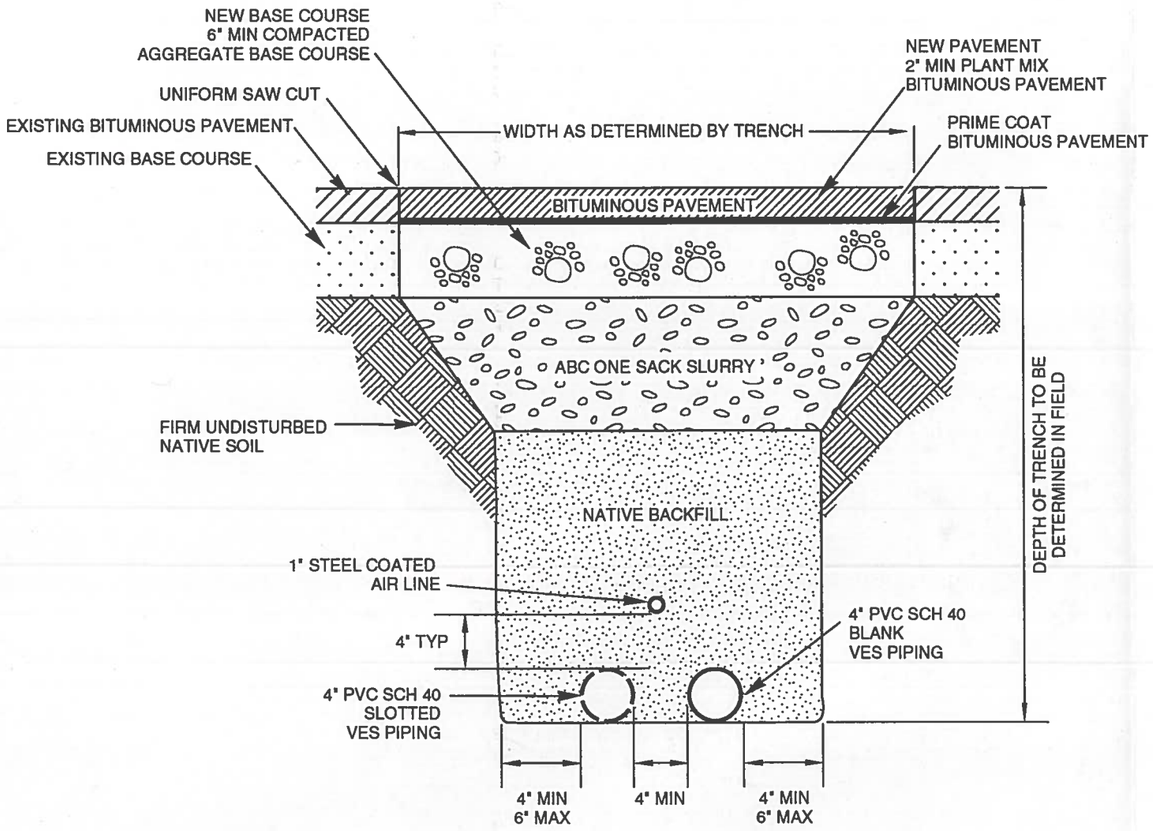
GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, N.M. 87106 (505) 242-3113

WELLHEAD AND PIPING MANIFOLD DETAILS

DESIGNED BY:	DETAILED BY:	CHECKED BY:
TT/JMW	CARTO-GRAPHICS	TB 12.3.92

DATE:	FILE:
11/28/92	NMED-Y2
PROJECT NO.: 023352875	CONTRACT:
DRAWING: Y2	REVISION: –

NOTE:
SLOPE VES PIIPING FROM
EQUIPMENT COMPOUND TOWARD
WELLS - MINIMUM 1% SLOPE



TRENCH DETAIL (TYPICAL)

NO SCALE

TRENCH CONSTRUCTION NOTES:

1) TRENCH BACKFILL SHALL BE NATIVE SOIL IF ACCEPTABLE, COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.

2) TRENCH BACKFILL BELOW NON-PAVED AREAS MAY CONSIT OF NATIVE SOIL AND SHALL BE COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY.

3) BACKFILL MAY BE SUBJECT TO TESTING AND IF THE REQUIRED STATE OF COMPACTION IS NOT OBTAINED, THE OWNER MAY REQUIRE THAT THE BACKFILL BE REMOVED AND RECOMPACTED AT THE CONTRACTOR'S EXPENSE.

4) CUT SLOPE SHALL BE AS DETERMINED BY CONTRACTOR. ALL EXCAVATION WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL CONDITIONS SET FORTH BY OSHA'S REVISED STANDARDS FOR EXCAVATIONS, 29 CFR 1926 SUBPART P.

5) NATIVE SOIL BACKFILL SHALL BE FREE FROM ORGANIC MATTER, FROZEN SOIL, ROCKS IN EXCESS OF 4" DIAMETER, ROOTS, OR DELETERIOUS COMPONENTS.

6) CONTAMINATED SOIL SHALL NOT BE USED AS BACKFILL WITHOUT WRITTEN AUTHORIZATION.

7) TRENCH BOTTOM SHALL BE FIRM COMPACTED NON-FROZEN SOIL. CONTRACTOR SHALL VERIFY TRENCH BOTTOM SUITABILITY (IN ORDER TO AVOID EXCESSIVE SETTLEMENT) FOR PROJECT. PLACEMENT OF PIPE AND PIPE BEDDING MATERIAL SHALL NOT BE PERFORMED UNTIL APPROVAL OF TRENCH BOTTOM HAS BEEN RECEIVED.

8) FILTER CLOTH TO ENCAPSULATE THE NARROW TRENCH LIMITS SHALL BE PLACED TO ENCLOSE THE SELECT GRANULAR BACKFILL AROUND THAT PIPE FOR HIGH GROUNDWATER CONDITIONS, OR POOR TRENCH WALL CONDITIONS, AS REQUIRED.

9) PIPE BEDDING MATERIALS SHALL BE PLACED BY HAND AND COMPACTED AS OUTLINED IN 6" (MAX) LIFTS, BANK TO BANK, TO 12" ABOVE THE PIPE SURFACE. COMPACTION OF THE PIPE BEDDING MATERIAL FOR SINGLE PIPE SYSTEMS SHALL BE 92% STANDARD PROCTOR DENSITY AND COMPACTION FOR MULTIPLE PIPE SYSTEMS SHALL BE 95% STANDARD PROCTOR DENSITY.

BITUMINOUS REPLACEMENT NOTES:

1) NEW PAVEMENT AND AGGREGATE BASE SHALL BE OF THE SAME TYPE AND THICKNESS AS THAT WHICH IS REMOVED, BUT IN NO CASE SHALL BE LESS THAN INDICATED.

2) BITUMINOUS CONCRETE SHALL BE AMERICAN PUBLIC WORKS ASSOC. APWA 2205 PLANT MIX. WEARING /SURFACE COURSE TYPE 3, BINDER/BASE COURSE TYPE 1.

3) TACK COAT ALL SAW CUT EDGES WITH RC-70, MC-30, OR MC-70 LIQUID ASPHALTS.

4) REMOVE AND DISPOSE OF ALL EXCESS MATERIALS IN CONFORMANCE WITH APPLICABLE REGULATIONS.

5) COMPACT 6" (MIN) BASE COURSE FOR BITUMINOUS CONCRETE TO 95% STANDARD PROCTOR DENSITY.

6) COMPACT UPPER 36" OF TRENCH BACKFILL TO 95% STANDARD PROCTOR DENSITY IN MAX 12" LIFTS UNLESS OTHERWISE NOTED.

NO.	DATE	BY	REVISION

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2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, N.M. 87106 (505) 242-3113

TRENCH DETAIL

DESIGNED BY:	DETAILED BY:	CHECKED BY:
TT/JMW	CARTO-GRAPHICS	TB 12.3.92

DATE:	FILE:
11/28/92	NMED-Y3
PROJECT NO.: 023352875	CONTRACT:
DRAWING: Y3	REVISION: –