BLYMYER
ENGINEERS, INC.

December 16, 1994
BEI Job No. 94015

Ms. Jean Kawahara
16550 Ashland Avenue
San Lorenzo, CA 94508

Subject: **Subsurface Investigation Letter Report**
Kawahara Nursery
16550 Ashland Avenue
San Lorenzo, CA

Dear Ms. Kawahara:

Blymyer Engineers, Inc. has prepared this letter report detailing the subsurface investigation completed to determine the potential source and on-site extent of petroleum hydrocarbon contamination detected in the soil and groundwater at the above referenced site. The investigation and results summarized in this letter were performed in accordance with Blymyer Engineers' *Revised Subsurface Investigation Letter Workplan*, dated August 8, 1994 (Appendix A).

Blymyer Engineers previously completed a *Preliminary Site Assessment, Phase I Subsurface Investigation* report, dated July 28, 1993 and a *Subsurface Investigation Status Report*, dated April 29, 1994. The completed investigations consisted of the installation of groundwater monitoring wells, soil sample collection from the soil bores prior to well installation, collection of groundwater samples from the monitoring wells and the on-site irrigation well, and thorough research of regulatory files relating to unauthorized releases of petroleum hydrocarbons in the vicinity of the site.

1.0 Introduction

1.1 Background

On December 1, 1992, one steel 5,000-gallon diesel underground storage tank (UST) was removed from the property owned by Kawahara Nursery, located at 16550 Ashland Avenue, San Lorenzo, California, by Tank Protect Engineering of Northern California. The UST was reported to be in good condition with no visible evidence of holes at the time of removal. The excavated soil was stockpiled at the site in two distinct piles and a composite soil sample was collected from each pile. Verification soil samples were collected and analyzed for Total Petroleum Hydrocarbons (TPH) as diesel. The soil sample collected from the southeastern wall of the excavation contained 5,000 milligrams per kilogram (mg/kg) TPH as diesel. The composite soil sample collected from the soil excavated from the southeastern portion of the excavation contained 210 mg/kg TPH as diesel.

The results of the UST closure were described in the *Underground Storage Tank Closure Report*,

completed by Tank Protect Engineering and forwarded to the Alameda County Health Care Services Agency (ACHCSA) by Mr. Tom Kawahara. In a letter dated January 27, 1993, the ACHCSA requested that a preliminary subsurface investigation be completed at the site to ascertain the extent of soil and groundwater petroleum hydrocarbon contamination.

On June 10, 1993, Blymyer Engineers supervised the installation of three groundwater monitoring wells MW-1, MW-2, and MW-3, at the site. Minor concentrations of petroleum hydrocarbons were detected in the soil samples collected during the installation of soil bores. The groundwater sample collected from monitoring well MW-3, installed adjacent to an on-site irrigation well, contained 120,000 micrograms per liter (µg/L) of TPH as gasoline, 170,000 µg/L of ethylbenzene, and 27,000 µg/L of total xylenes.

Blymyer Engineers also collected four discrete soil samples from the stockpiled soil that had been removed from the southeastern portion of the excavation and composited them into one sample. The results of the analysis of the composite soil sample did not indicate detectable concentrations of TPH as diesel.

In March 1994, Blymyer Engineers conducted a phased groundwater investigation at the site. The initial phases of the investigation included a review of records at the ACHCSA and the Regional Water Quality Control Board to determine if any toxic chemical or fuel leaks reported within ¼-mile radius may have impacted the site, a review of historical aerial photographs, and a review of all available information regarding the construction and pumping rates of the on-site irrigation well to determine the radius of influence of the well on the local groundwater flow.

In order to determine the influence of the pumping system on the shallow water-bearing zone, depth to groundwater measurements were collected from each of the monitoring wells on March 24, 1994, prior to disengagement of the irrigation well pump. On March 28, 1994, after the pump had been disengaged for at least 72 hours, depth to groundwater measurements were again collected from the wells. Following the disengagement of the irrigation well pump, the groundwater elevation decreased less than 0.2 inch in each of the monitoring wells. Blymyer Engineers reactivated the well and collected groundwater samples from each of the three monitoring wells and the irrigation well on March 28, 1994. The construction log of the on-site irrigation well indicated that the well is screened from approximately 45 to 60 feet below grade surface (bgs). Based on the depth of the irrigation well screened interval and the minimal change in depth to shallow groundwater during pump operation and after pump disengagement, it was determined that the irrigation well pump does not influence the shallow, impacted water bearing zone.

No detectable concentrations of petroleum hydrocarbons were detected in the groundwater samples collected from the irrigation well or monitoring wells MW-1 and MW-2. The analytical results of the groundwater sample collected from monitoring well MW-3 indicated 23,000 µg/L of TPH as diesel, 94,000 µg/L of TPH as gasoline, 4,800 µg/L of benzene, 6,500 µg/L of

toluene, 3,000 µg/L of ethylbenzene, and 15,000 µg/L of total xylenes.

A review of the local regulatory agency records indicated that an Army National Guard facility located approximately 300 feet downgradient of the site has reported an unauthorized release of gasoline into the groundwater. However, the lateral extent of the reported release has not yet been determined.

In response to Blymyer Engineers' *Preliminary Site Assessment, Phase I Subsurface Investigation* report and *Subsurface Investigation Status Report*, the ACHCSA, in a letter dated May 18, 1994, requested the full delineation of the extent of petroleum hydrocarbons in the groundwater at the site and in the soil adjacent to the UST excavation. In a letter, dated August 10, 1994, the ACHCSA approved the *Revised Subsurface Investigation Letter Workplan*, dated August 4, 1994, prepared by Blymyer Engineers, Inc.

1.2 Site Conditions

The site is located in a primarily residential area of San Lorenzo, California, approximately 50 yards south of California Highway 238, approximately one mile east of Interstate 880, and approximately 2.5 miles east of the San Francisco Bay (Figure 1). The site is currently operated by Kawahara Nursery, Inc. as a commercial landscaping nursery.

The site is relatively flat and occupies approximately 2 acres and consists of a small office, greenhouses, lathe houses, a barn, a shed, an incinerator, two residences, and an active irrigation well. The remainder of the property is covered with asphalt, concrete or landscaping (Figure 2). The property is surrounded by buildings and a chain-link and wood fence. There are no apparent drainage culverts visible at the site which would facilitate the off-site migration of rain water or spills.

A UST excavation extends approximately 3 feet beneath the south side of the single story wood frame office building. At the time of the investigation the office building was not shored to prevent structural damage resulting from possible slumping of the excavation walls. The western end of the excavation has been backfilled with a portion of the soil removed during the UST excavation.

1.3 Scope of Work

In accordance with Blymyer Engineers' *Revised Subsurface Investigation Letter Workplan*, a subsurface investigation was conducted to determine the extent and potential source of the petroleum hydrocarbon contaminated groundwater and the presence of petroleum hydrocarbons in the soil in the vicinity of the former UST basin at the site. The scope of work completed

during this investigation included the following actions:

- Preparation of a site-specific health and safety plan
- Completion of a soil gas survey consisting of 16 soil gas sample points collected from approximately 9 to 11 feet bgs
- Analysis of the soil gas samples in an on-site gas chromatograph for benzene, toluene, ethylbenzene, and total xylenes (BTEX) and Total Volatile Hydrocarbons (TVH)
- Drilling of two soil bores to approximately 20 feet bgs, one downgradient and one upgradient of the formerly detected petroleum hydrocarbon contaminated groundwater
- Drilling of one soil bore to approximately 18 feet bgs adjacent to the former UST basin
- Collection of two soil samples from each soil bore for laboratory analysis of TPH as gasoline and TPH as diesel, and BTEX
- Collection of one soil sample from the stockpiled soil for laboratory analysis of pH, flashpoint/ignitability, sulfide, cyanide, and lead
- Completion of the two 20-foot bgs soil bores to 2-inch-diameter PVC monitoring wells
- Development and purging of the two installed monitoring wells
- Collection of groundwater samples from the two installed wells (MW-4 and MW-5) and one previously installed monitoring well (MW-3) for analysis of TPH as gasoline, TPH as diesel, and BTEX
- Preparation of a letter report

2.0 Environmental Setting

2.1 Regional Geology and Site Geology

The site is located in the city of San Lorenzo, California, approximately 2.5 miles east of the San Francisco Bay, at an approximate elevation of 45 feet above the National Geodetic Vertical Datum.

The San Francisco Bay Area is a northwest-southeast trending region within the Coast Range Province of California. Rocks within the region range from Jurassic-aged sedimentary,

metamorphic, and plutonic basement rocks to Holocene alluvium. The geologic structure of the region is dominated by a major fault system which includes the San Andreas Fault on the west side of the San Francisco Bay and the Hayward Fault at the base of the Berkeley Hills on the east side of the Bay. These faults are the result of the forces that have uplifted the Coast Range and dropped the section now covered by the open water of the San Francisco Bay and Quaternary alluvium (Goldman, 1967).

The site is located on Quaternary alluvium derived from the Franciscan rocks of the Oakland Hills located to the east (Dibblee, 1980).

The Quaternary alluvium is underlain by unconsolidated sediments, which were deposited mainly as marine sedimentary and volcanic rocks in a geosyncline occupying this portion of California during the Jurrasic, Cretaceous, and Tertiary times. Toward the end of the Tertiary period a series of earth movements folded and faulted the deposits. These deposits are now found as a series or mix of mostly unconsolidated or highly compacted sandstone, shale, and chert, with some volcanic rocks, serpentines, and consolidated conglomerates. The water bearing properties of the bedrock in the area are not well known. Groundwater has been found in some of the sandstone and conglomerate units and in joints and fractures in the other rock types. The sandstone and conglomerate units have low yields and the joint or fracture zones are difficult to locate. Because most of the deposits are of marine origin, some may contain saline water (Hickenbottom and Muir, 1988).

3.0 Data Collection

3.1 Soil Gas Survey

A soil gas survey of the site was performed on October 3, 1994, by Tracer Research Corporation and Blymyer Engineers. The soil gas survey was designed to determine the extent and potential source of petroleum hydrocarbons detected in the groundwater at the site. The *Vapor Trace®* *Shallow Soil Gas Investigation* report, dated October 3, 1994, and completed by Tracer Research Corporation is included as Appendix B.

The soil gas survey was conducted by hydraulically advancing a 16-foot long, 3/4-inch-diameter hollow steel probe at 14 independent locations at the site, which are depicted on Figure 3. Soil gas samples were collected by a vacuum connected to the surface end of the probe from depths ranging from 9 to 11 feet bgs from each sampling location. The soil gas samples were analyzed at the site to discern the presence of BTEX and TVH by a mobile laboratory equipped with a gas chromatograph consisting of a flame ionization detector.

The analysis of the soil gas samples revealed slightly elevated concentrations of petroleum

hydrocarbons in the vicinity of the northeastern corner of the barn and the north-central portion of the property in the vicinity of the lath house and on-site irrigation well. The low levels of petroleum hydrocarbon compounds detected in the analyzed soil gas samples may be reflective of the clay soils encountered above the first water-bearing zone at the site. Therefore, the detected concentrations could have been indicative of potential on-site sources of petroleum hydrocarbons. The soil gas analytical results are summarized in Table I.

3.2 Soil Investigation

3.2.1 Soil Bore Installation and Sample Collection

Based on the results of the soil gas survey, soil bores MW-4 and MW-5 were drilled to investigate soil and groundwater based on the highest detected soil gas petroleum hydrocarbons and to determine the extent of the petroleum hydrocarbon contamination previously detected in the groundwater at the site. Soil bore SB-1 was drilled approximately 10 feet to the east of the UST excavation to determine the lateral extent of petroleum hydrocarbons detected in the confirmation soil samples collected during the excavation of the UST. Soil bores MW-4 and MW-5, were drilled to approximately 20 feet bgs and soil bore SB-1 was drilled to approximately 18 feet bgs at the locations indicated on Figure 2, on October 31, 1994. The soil bores were drilled by Gregg Drilling under the supervision of Blymyer Engineers, using a truck mounted hollow-stem auger drill rig.

Soil samples were collected for laboratory analysis from intervals of high photoionization detector (PID) readings and increased water content, in soil bores MW-4 and MW-5 at approximately 12 and 17 feet bgs and in soil bore SB-1 at approximately 7.5 and 17 feet bgs. Soil sample collection and decontamination procedures were conducted in accordance with Blymyer Engineers' *Standard Operating Procedure No. 1, Soil and Grab Groundwater Sampling Using a Hollow-Stem Auger Drill Rig*, presented as Appendix C. Following collection, the soil samples were placed on ice in a sealed ice chest for transportation to the analytical laboratory. Soil samples were field-screened for organic vapors using a PID. The Unified Soil Classification and PID results are shown on the bore logs included as Appendix D.

One discrete soil sample, SS-1, was collected from the stockpiled soil removed from the UST excavation, for disposal profiling.

All soil generated during drilling and sampling was stored at the site in Department of Transportation (DOT)-approved, 55-gallon drums for later disposal by Kawahara Nursery, Inc.

3.2.2 Soil Sample Analytical Methods

The soil samples were analyzed by National Environmental Testing, Inc., a California-certified laboratory, on a standard turnaround. The soil samples collected from the soil bores were analyzed for TPH as gasoline and TPH as diesel by modified EPA Method 8015 and BTEX by EPA Method 8020.

The soil sample collected from the stockpiled soil was analyzed by National Environmental Testing for pH by EPA Method 9040, flashpoint/ignitability by EPA Method 1010, sulfide by EPA Method 376.1, cyanide by EPA Method 335.2, and lead by EPA Method 7421.

The soil sample analytical results are summarized in Table II, and the full laboratory report is presented as Appendix E.

3.3 Groundwater Investigation

3.3.1 Monitoring Well Installation

Soil bores MW-4 and MW-5 were converted to 2-inch-diameter groundwater monitoring wells. Groundwater monitoring well completion and development procedures were conducted in accordance with Blymyer Engineers' *Standard Operating Procedure No. 2A, Completion of Borings as Groundwater Monitoring Wells*, presented as Appendix F and *Standard Operating Procedure No. 2B, Groundwater Monitoring Well Development*, presented as Appendix G. The Alameda County Flood Control and Water Conservation District Zone 7 Monitoring Well Permit is presented as Appendix H.

All decontamination and well development and purge water was stored on-site in labeled, DOT-approved, 55-gallon drums for later disposal by Kawahara Nursery, Inc.

3.3.2 Groundwater Sample Collection

how long?

Monitoring wells MW-4 and MW-5 were allowed to equilibrate after development. On November 8, 1994, the depth to groundwater was measured in monitoring wells MW-3, MW-4, and MW-5 and the top of casing (TOC) elevation of each well was surveyed to a common datum. Monitoring wells MW-3, MW-4, and MW-5 were purged and sampled using a clean Teflon® bailer, in accordance with Blymyer Engineers' *Standard Operating Procedure No. 3, Groundwater Monitoring and Well Sampling Using a Bailer or Hand Pump*, presented as Appendix I. A strong petroleum hydrocarbon odor and sheen were observed in the groundwater sample collected from monitoring well MW-3 during sampling. The Well Purging and Sampling Data Sheets for each well are included as Appendix I. On November 22, 1994, the depth to

water was measured in the two newly and the three previously installed groundwater monitoring wells at the site. The November 22, 1994, groundwater elevation measurements are presented in Table III.

All decontamination and purge water was stored on-site in DOT-approved, 55-gallon drums for later disposal by Kawahara Nursery, Inc.

3.3.3. Groundwater Sample Analytical Methods

The groundwater samples were submitted to National Environmental Testing, Inc. for analysis of TPH as gasoline and TPH as diesel by modified EPA Method 8015 and BTEX by EPA Method 8020.

The groundwater sample analytical results are summarized in Table IV, and the full laboratory report is included as Appendix K.

4.0 Data Interpretation

4.1 Site Stratigraphy

The stratigraphy of the site, as depicted on the soil bore logs in Appendix D, consists of layers of silty clay with thin, interbedded zones of poorly graded silty sand with gravel. A shallow perched water bearing zone was encountered at the site in a silty sand zone located approximately 12 feet bgs. The first encountered extensive water-bearing zone was encountered under confined conditions in a medium grained, poorly graded silty sand with gravel located approximately 17 to 18.5 feet bgs. The stabilized groundwater level in the wells, following equilibrium, ranged from 10.42 feet below TOC in monitoring well MW-5 to 12.34 feet below TOC in monitoring well MW-4.

4.2 Discussion of Soil Sample Analytical Results

The soil sample analytical results indicated a concentration of TPH as diesel of 130 mg/kg and TPH as gasoline of 4.1 mg/kg in the soil sample collected from soil bore SB-1, drilled adjacent to the UST excavation, at 17 feet bgs. The soil sample collected from soil bore MW-5 at 17 feet bgs contained 11 µg/kg of toluene and 27 µg/kg of total xylenes. None of the soil samples collected from soil bore MW-4 contained detectable concentrations of TPH as diesel, TPH as gasoline, or BTEX.

The soil sample collected from the stockpile soil, SS-1, had a pH of 7.5 and contained 0.35 mg/L of lead and 0.8 mg/kg of toluene.

4.3 Discussion of Groundwater Sample Analytical Results

The analytical results of the groundwater samples collected from monitoring well MW-3 indicated 35 mg/L of TPH as gasoline, 27 mg/L of TPH as diesel, 3,600 µg/L of benzene, 4,100 µg/L of toluene, 2,700 µg/L of ethylbenzene, and 18,000 µg/L of total xylenes. Concentrations of TPH as gasoline, TPH as diesel, and BTEX were not detected above the analytical method reporting limits in the groundwater samples analyzed from monitoring wells MW-4 and MW-5.

4.4 Groundwater Gradient

Figure 4 depicts the groundwater flow direction and gradient at the site as measured on November 22, 1994. The groundwater flow direction was to the northwest at an average gradient of 0.002 feet per foot. As described in the *Subsurface Investigation Status Report*, dated April 29, 1994, completed by Blymyer Engineers, the on-site irrigation well does not have a measurable impact on the groundwater flow direction and gradient at the site.

5.0 Conclusions

- Slightly elevated concentrations of petroleum hydrocarbons were detected in the soil gas samples collected from the northeastern corner of the barn and the north-central portion of the property in the vicinity of the lathe house and on-site irrigation well.

- The site stratigraphy consist of layers of silty clay with small, interbedded zones of poorly graded silty sand with gravel. A shallow perched water bearing zone is situated in a silty sand zone at approximately 12 feet bgs. A water-bearing zone was encountered under confined conditions in a silty sand with gravel located approximately 17 to 18.5 feet bgs. The stabilized groundwater level in the wells, following equilibrium, ranged from 10.42 to 12.34 feet below TOC.

- Concentrations of petroleum hydrocarbons are present in the soil corresponding to the depth of the confined water bearing zone in the vicinity of monitoring well MW-3 and also within 10 feet to the east of the UST excavation.

- The extent of petroleum hydrocarbon-contaminated groundwater at the site has been generally defined in the upgradient and downgradient directions of monitoring well MW-3.

- Based on the results of the soil and groundwater investigations completed to date the petroleum-hydrocarbon-contaminated groundwater does not appear to have migrated off-site.

- A potential on- or off-site source of the petroleum hydrocarbon contamination detected in the groundwater samples collected from monitoring well MW-3 has not been determined.

6.0 Recommendations

Blymyer Engineers recommends the following:

- Forward this report to:

  Ms. Juliet Shin
  Alameda County Health Care Services Agency
  1131 Harbor Bay Parkway, 2nd Floor
  Alameda CA 94502-6577

7.0 References

Dibblee, T.W. 1980, *Preliminary Geologic Map of the Hayward Quadrangle, Alameda and Contra Costa Counties, California*: United States Geological Survey, Open File Report 80-540, scale 1:24,000.

Goldman, Harold B., 1967, *Geology of San Francisco Bay*: San Francisco, California Division of Mines and Geology, prepared for the San Francisco Bay Conservation and Development Commission, 58 p.

Hickenbottom, Kelvin, and Muir, Kenneth, 1988, *Geohydrology and Groundwater Quality Overview of the East Bay Plain Area, Alameda County, California, 205(J) Report*: San Francisco, submitted to the San Francisco Bay Regional Water Quality Control Board, 83 p.

Please call Laurie Buckman at (510) 521-3773 with questions or comments regarding this project.

Sincerely,

Blymyer Engineers, Inc.

By: _____
Laurie A. Buckman
Project Geologist

And: _____
John Morrison, RG 5773
Registered Geologist

REGISTERED GEOLOGIST
JOHN C. MORRISON
No. 5773
Exp. 2/20/95
STATE OF CALIFORNIA

Tables

Table I:	Summary of Soil Gas Analytical Results
Table II:	Summary of Soil Sample Analytical Results
Table III:	Groundwater Elevation Measurements
Table IV:	Summary of Groundwater Sample Analytical Results

Figure

Figure 1:	Site Location Map
Figure 2:	Site Plan
Figure 3:	Soil Gas Survey Concentration Map
Figure 4:	Groundwater Gradient Map November 22, 1994

Appendices

Appendix A: *Revised Subsurface Investigation Letter Workplan*, dated August 4, 1994, completed by Blymyer Engineers, Inc.

Appendix B: *Vapor Trace® Shallow Soil Gas Investigation*, October 3, 1994, Tracer Research Corporation.

Appendix C: Blymyer Engineers, Inc.'s, *Standard Operating Procedure No. 1, Soil and Grab Groundwater Sampling Using a Hollow Stem Auger Drill Rig*

Appendix D: Boring and Well Construction Logs (MW-4, MW-5, and SB-1)

Appendix E: Soil sample laboratory analytical reports, dated November 15, 1994, National Environmental Testing, Inc.

Appendix F: Blymyer Engineers, Inc.'s, *Standard Operating Procedure No. 2A, Completion of Borings as Groundwater Monitoring Wells*

Appendix G: Blymyer Engineers, Inc.'s, *Standard Operating Procedure No. 2B, Groundwater Monitoring Well Development*

Appendix H: Alameda County Flood Control and Water Conservation District Zone 7 Monitoring Well Drilling Permit.

Appendix I: Blymyer Engineers, Inc.'s, *Standard Operating Procedure No. 3, Groundwater Monitoring and Well Sampling Using a Bailer or Hand Pump*

Appendix J: Well Purging and Sampling Data, November 11, 1994, MW-3, MW-4, and MW-5

Appendix K: Groundwater sample laboratory analytical reports, November 17, 1994, National Environmental Testing, Inc.

Table I, Summary of Soil Gas Analytical Results
BEI Job No. 94015, Kawahara Nursery, Inc.
16550 Ashland Avenue, San Lorenzo, CA

Sample ID	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	TVH (µg/L)
SG-01-10.0'	<0.01	<0.02	<0.04	<0.06	**1**
SG-02-11.0'	<0.01	<0.02	<0.04	<0.06	**1**
SG-03-11.0'	<0.01	<0.02	<0.04	<0.06	**0.2**
SG-04-9.0'	<0.01	<0.02	<0.04	<0.06	**0.3**
SG-05-10.0'	<0.03	<0.05	<0.08	<0.1	**0.3**
SG-06-10.0'	<0.03	<0.05	<0.08	<0.1	**2**
SG-07-9.0'	<0.01	<0.02	<0.04	<0.06	**0.6**
SG-08-9.0'	<0.01	<0.02	<0.04	<0.06	**2**
SG-09-9.0'	<0.01	<0.02	<0.04	<0.06	**0.8**
SG-10-10.0'	**0.08**	<0.02	<0.04	<0.06	**0.8**
SG-11-9.0'	<0.03	<0.05	<0.04	<0.1	**0.5**
SG-12-9.0'	<0.03	<0.05	<0.08	<0.1	**0.3**
SG-13-10.0'	<0.01	<0.02	<0.08	<0.06	**0.1**
SG-14-9.0'	**0.07**	<0.02	<0.04	<0.06	**0.5**
SG-15-10.0'	<0.01	<0.02	<0.04	<0.06	**1**
SG-16-10.0'	<0.01	<0.02	<0.04	<0.06	**0.3**

Notes:

TVH = Total Volatile Hydrocarbons
µg/L = micrograms per liter
<x = less then analytical detection limits (x)

Table II, Summary of Soil Sample Analytical Results
BEI Job No. 94015, Kawahara Nursery
16550 Ashland Avenue, San Lorenzo, California

Sample ID	Modifed EPA Method 8015 (mg/kg)		EPA Method 8020 (µg/kg)				EPA Method 9040	EPA Method 1010 (Degree F)	EPA Method 376.1 (mg/kg)	EPA Method 335.2 (mg/kg)	EPA Method 7421 (mg/L)
	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethylbenzene	Total Xylenes	pH*	Flashpoint/ Ignitability*	Sulfide*	Cyanide*	Lead*
MW-4 12'	<1	<1	<2.5	<2.5	<2.5	<2.5	NA	NA	NA	NA	NA
MW-4 17'	<1	<1	<2.5	<2.5	<2.5	<2.5	NA	NA	NA	NA	NA
MW-5 12.5'	<1	<1	<2.5	<2.5	<2.5	<2.5	NA	NA	NA	NA	NA
MW-5 17'	<1	<1	<2.5	**11**	<2.5	**27**	NA	NA	NA	NA	NA
SB-1 7.5'	<1	<1	<2.5	<2.5	<2.5	<2.5	NA	NA	NA	NA	NA
SB-1 17'	**130**	**4.1**	<2.5	<2.5	<2.5	<2.5	NA	NA	NA	NA	NA
SS-1	NA	NA	<0.5	**0.8**	<0.5	<2.5	7.5	>140	<10	<0.2	**0.35**

Notes:

<x	=	less than the analytical detection limit (x)
TPH	=	Total Petroleum Hydrocarbons
EPA	=	Environmental Protection Agency
mg/kg	=	milligram per kilogram
µg/kg	=	micrograms per kilogram
µg/L	=	micrograms per liter
*	=	landfill disposal characteristics

Table III, Groundwater Elevation Measurements
BEI Job No. 94015, Kawahara Nursery, Inc.
16550 Ashland Avenue, San Lorenzo, CA

Sample ID	Date	TOC Elevation (feet)	Depth to Water (feet)	Water Surface Elevation (feet)
MW-1	6/16/93	100	10.7	89.3
	3/24/94	100	11.11	88.89
	3/28/94	100	11.26	88.74
	11/22/94	100	12.04	87.96
MW-2	6/16/93	99.27	10.24	89.03
	3/24/94	99.27	10.65	88.62
	3/28/94	99.27	10.79	88.48
	11/22/94	99.27	11.58	87.69
MW-3	6/16/93	99.52	10.46	89.06
	3/24/94	99.52	10.81	88.71
	3/28/94	99.52	10.96	88.56
	11/22/94	99.52	11.68	87.84
MW-4	11/22/94	100.46	12.34	88.12
MW-5	11/22/94	98.14	10.42	87.72

Note:

TOC = Top of casing

Table IV, Summary of Groundwater Sample Analytical Results
BEI Job No. 94015, Kawahara Nursery
16550 Ashland Avenue, San Lorenzo, California

Sample ID	Modified EPA Method 8015 (mg/L)		EPA Method 8020 (µg/L)			
	TPH as Gasoline	TPH as Diesel	Benzene	Toluene	Ethylbenzene	Total Xylenes
MW-3	35	27	3,600	4,100	2,700	18,000
MW-4	<0.05	<0.05	<0.5	<0.5	<0.5	<0.5
MW-5	<0.05	<0.05	<0.5	<0.5	<0.5	<0.5

Notes:

<x	=	less than the analytical detection limit (x)
TPH	=	Total Petroleum Hydrocarbons
EPA	=	Environmental Protection Agency
MG/L	=	milligrams per liter
µg/L	=	microgram per Liter

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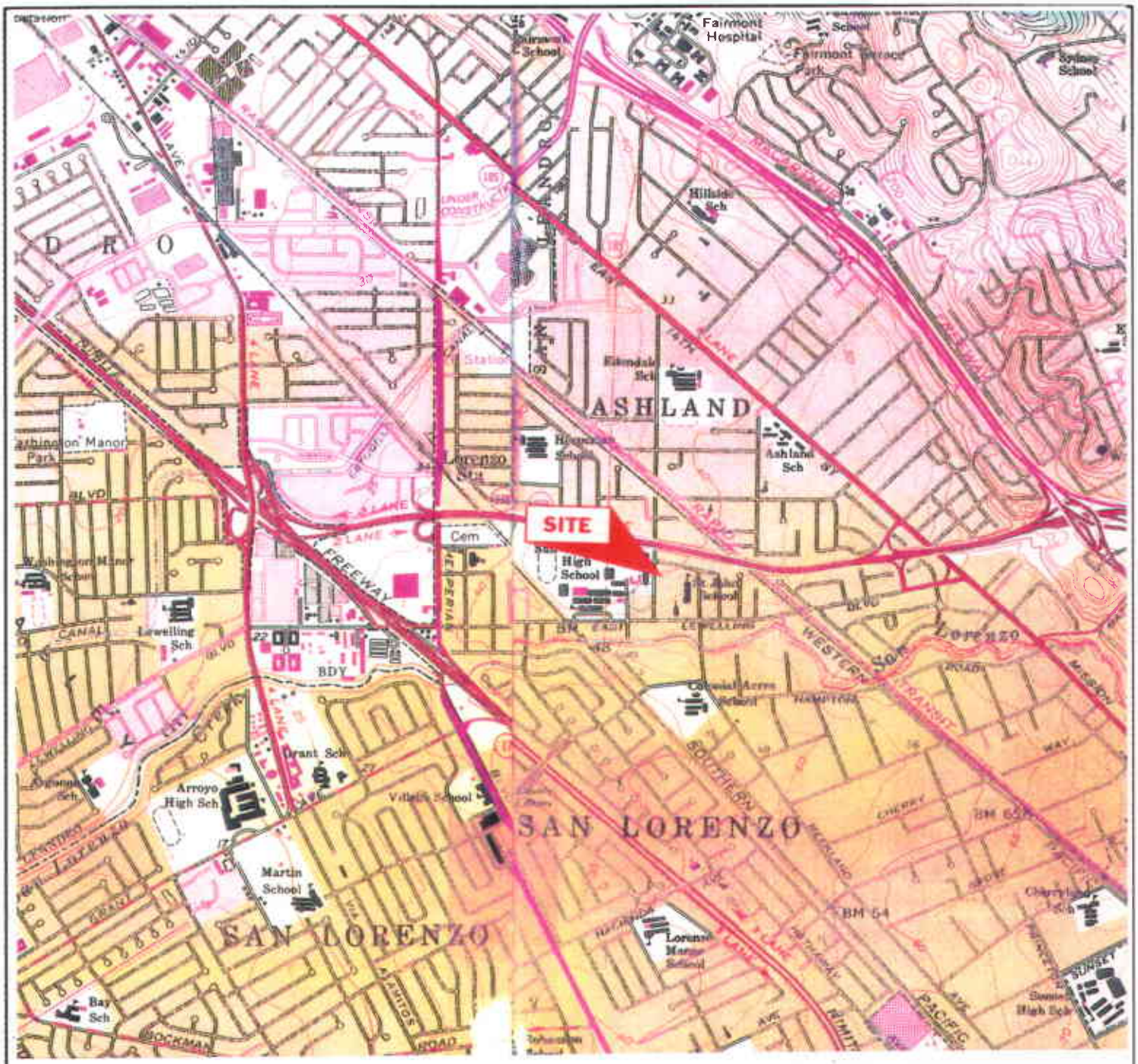


NITED STATES GEOLOGICAL SURVEY 7.5' QUADS. "SAN LEANDRO, CA" AND "OAKLAND EAST, CA" BOTH PHOTOREVISED 1980.

BLYMYER ENGINEERS, INC.

0 1000 2000

SCALE IN FEET

N

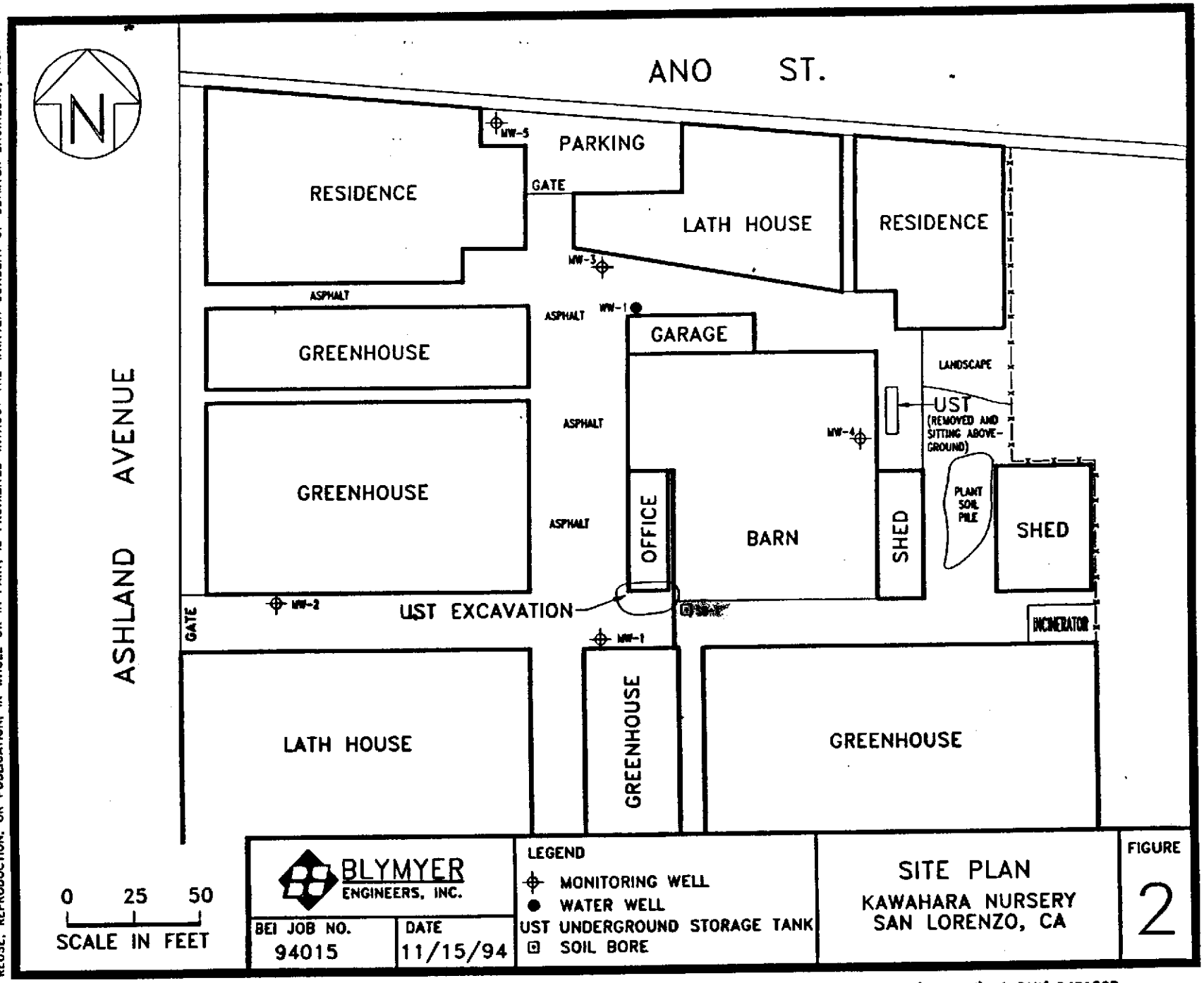
SITE LOCATION MAP

KAWAHARA NURSERY
16550 ASHLAND AVE.
SAN LORENZO, CA

FIGURE 1

BB JOB NO. 94015

DATE 12/13/94



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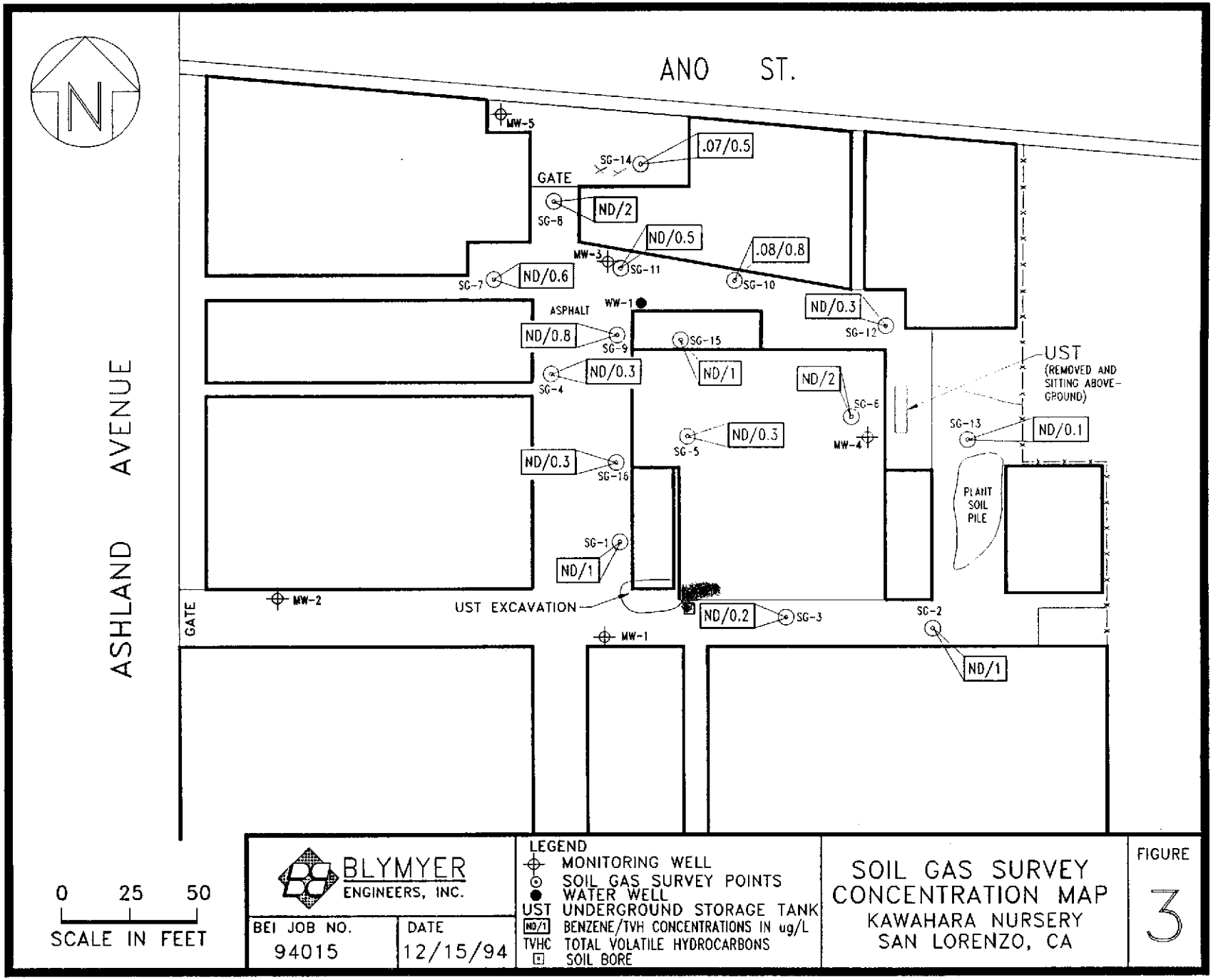

BLYMYER ENGINEERS, INC.

BEI JOB NO.	DATE
94015	12/15/94

LEGEND
- MONITORING WELL
- SOIL GAS SURVEY POINTS
- WATER WELL
- UST UNDERGROUND STORAGE TANK
- [ND/1] BENZENE/TVH CONCENTRATIONS IN ug/L
- TVHC TOTAL VOLATILE HYDROCARBONS
- SOIL BORE

SOIL GAS SURVEY CONCENTRATION MAP

KAWAHARA NURSERY
SAN LORENZO, CA

FIGURE 3

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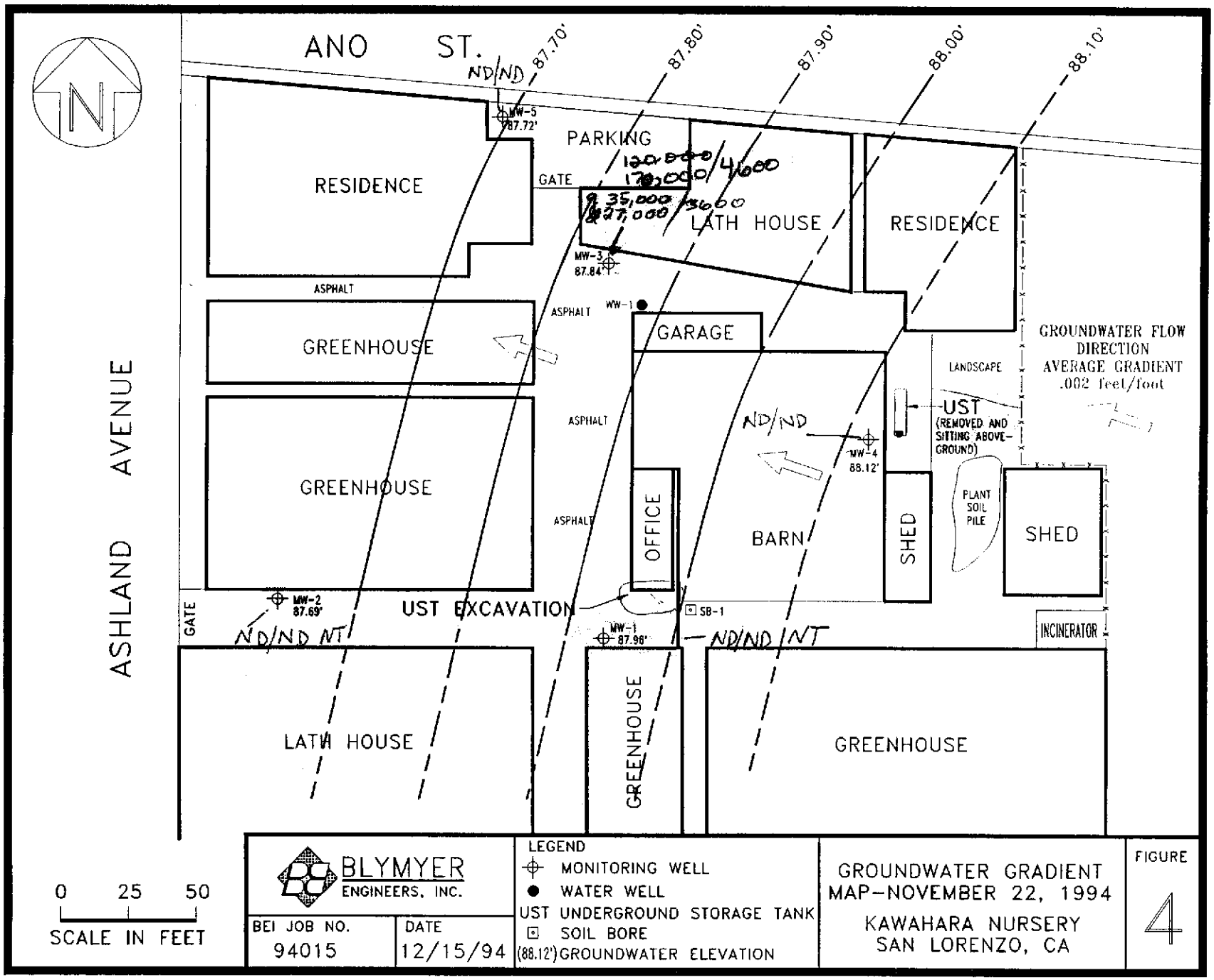

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BLYMYER
ENGINEERS, INC.

August 4, 1994
BEI Job No. 94015

Ms. Juliet Shin
Alameda County Health Care Services Agency
80 Swan Way, Room 200
Oakland, CA 94621

Subject: Revised Subsurface Investigation Letter Workplan
Kawahara Nursery
16550 Ashland Avenue
San Lorenzo, CA

Dear Ms. Shin:

Blymyer Engineers, Inc., on behalf of Kawahara Nursery, is pleased to present this letter workplan to determine the potential source and on-site extent of detected petroleum hydrocarbon contamination in soil and groundwater at the above referenced site. Blymyer Engineers completed a *Preliminary Site Assessment Phase I Subsurface Investigation* report, dated July 28, 1994 and a *Subsurface Investigation Status Report*, dated April 29, 1994. The completed investigations consisted of the installation of groundwater monitoring wells, soil sample collection from the soil bores prior to well installation, collection of groundwater samples from the monitoring wells and the on-site irrigation well, and a thorough research of regulatory files relating to unauthorized releases of petroleum hydrocarbons in the vicinity of the site.

Background

On December 1, 1992, one steel 5,000-gallon diesel underground storage tank (UST) was removed from the property owned by Kawahara Nursery, located at 16550 Ashland Avenue, San Lorenzo, California, by Tank Protect Engineering of Northern California. The UST was reported to be in good condition with no visible evidence of holes at the time of removal. The excavated soil was stockpiled at the site in two distinct piles and a composite soil sample was collected from each pile. Verification soil samples were collected and analyzed for Total Petroleum Hydrocarbons (TPH) as diesel. The soil sample collected from the southeastern wall of the excavation, contained 5,000 milligrams per kilogram (mg/kg) TPH as diesel. The composite soil sample collected from the soil excavated from the southeastern portion of the excavation contained 210 mg/kg TPH as diesel.

The results of the UST closure were described in the *Underground Storage Tank Closure Report*, completed by Tank Protect Engineering and forwarded to the Alameda County Health Care Services Agency (ACHCSA) by Mr. Tom Kawahara. In a letter dated January 27, 1993, the ACHCSA requested that a Preliminary Subsurface Investigation be completed at the site to ascertain the extent of soil and groundwater petroleum hydrocarbon contamination.

On June 10, 1993, Blymyer Engineers supervised the installation of three groundwater monitoring wells (MW-1, MW-2, and MW-3) at the site in the locations depicted on the enclosed Site Plan. Minor concentrations of petroleum hydrocarbons were detected in the soil samples collected during the installation of soil bores. The groundwater sample collected from monitoring well MW-3, installed adjacent to an on-site groundwater well contained 120,000 micrograms per liter (µg/L) of TPH as gasoline, 170,000 µg/L of ethylbenzene, and 27,000 µg/L of total xylenes.

Blymyer Engineers also collected four discrete soil samples from the stockpiled soil removed from the southeastern portion of the excavation and composited them into one sample. The results of the analysis of the composite soil sample did not indicate detectable concentrations of TPH as diesel.

In March 1994, Blymyer Engineers conducted a phased groundwater investigation at the site. The initial phases of the investigation included the review of records at the ACHCSA and the Regional Water Quality Control Board to determine if any toxic chemical or fuel leaks reported within ¼-mile radius may have impacted the site; the review of historical aerial photographs; and the review of all available information regarding the construction and pumping rates of the on-site irrigation well to determine the radius of influence of the well on the local groundwater flow.

Depth to groundwater measurements were collected from each of the monitoring wells prior to the disengagement of the irrigation well pump. After the pump had been disengaged for approximately 48 hours, depth to groundwater measurements were again collected from the wells to determine the influence of the pumping system on the shallow water bearing zone. Following the disengagement of the irrigation well pump, the groundwater elevation decreased less than 0.2 inch in each of the monitoring wells. Blymyer Engineers reactivated the well and collected groundwater samples from each of the three monitoring wells and the irrigation well on March 28, 1994. No detectable concentrations of petroleum hydrocarbons were detected in the groundwater samples collected from the irrigation well or monitoring wells M-1 and MW-2. The analytical results of the groundwater sample collected from monitoring well MW-3 indicated 23,000 µg/L of TPH as diesel, 94,000 µg/L of TPH as gasoline, 4,800 µg/L of benzene, 6,500 µg/L of toluene, 3,000 µg/L of ethylbenzene, and 15,000 µg/L of total xylenes.

On March 28, 1994, Blymyer Engineers collected one discrete soil sample from the stockpiled soil on the site. The soil sample contained 51 mg/kg of TPH as diesel.

A review of the local regulatory agency records indicated that a Army National Guard facility located approximately 300 feet downgradient of the site has reported an unauthorized release of gasoline into the groundwater. However, the lateral extent of the reported release has not yet been determined. The construction log of the on site irrigation well indicated that the well is screened from approximately 45 to 60 feet below grade surface. Based on the depth of the irrigation well screened interval and the unmeasurable change in depth to groundwater during pump operation and after pump disengagement, it was determined that the irrigation well pump does not influence the shallow, impacted water bearing zone.

Scope of Work

During the second phase of the proposed investigation at the site Blymyer Engineers will complete the following scope of work:

- **Prepare a site-specific health and safety plan**

  A health and safety plan outlining the potentially hazardous work conditions and contingencies for an emergency will be prepared for the site.

- **Conduct a soil gas survey**

  A soil gas survey will be conducted at the site, using up to 10 sampling points, to determine the extent of soil and groundwater petroleum hydrocarbon contamination. The proposed soil gas sampling points are depicted on the enclosed Soil Gas Sample Location Map. Soil gas samples will be collected from each sampling point at a depth of approximately 12 feet below grade surface (bgs). The collected soil gas samples will be analyzed by an on-site California-certified mobile laboratory for concentrations of Total Volatile Hydrocarbons and benzene, toluene, ethylbenzene, and total xylenes (BTEX). Each of the sample points will be backfilled with grout slurry and the surface concrete or asphalt will be replaced following sample collection.

- **Obtain permits**

  Permits will be obtained to install groundwater monitoring wells.

- **Drill three soil bores to a depth of approximately 18 feet**

  Three soil bores will be drilled using a hollow-stem auger drill rig at locations determined following the evaluation of the soil gas survey results. The soil bores will be drilled to approximately 18 feet bgs. Two of soil bores will be drilled downgradient and one soil bore will be drilled up gradient of the defined zone of petroleum hydrocarbon contamination.

- **Drill one soil bore to a depth of approximately 13 feet bgs**

  One soil bore will be drilled within 10 feet to the east of the underground storage tank (UST) excavation to delineate the extent of petroleum hydrocarbons detected in a soil sample collected from the east wall of the excavation.

- **Field screen soil samples**

  Soil samples will be collected from each soil bore, at encountered changes in soil

lithology or at a minimum of 5-foot intervals, for field screening using a photoionization detector (PID) and lithologic description.

- **Collect soil samples from the soil bores for laboratory analysis**

  Two soil samples will be collected from each soil bore for laboratory analysis. Samples will be analyzed from the zone directly above the soil/groundwater interface and from the interval displaying the highest field PID reading. The soil samples will be submitted to a California-certified laboratory for analysis of Total Petroleum Hydrocarbons (TPH) as gasoline and TPH as diesel by modified EPA Method 8015, and BTEX by EPA Method 8020.

- **Install groundwater monitoring wells**

  The three 18-foot soil bores will be converted to 2-inch diameter groundwater monitoring wells and the completed wells will be properly developed.

- **Collect groundwater samples for laboratory analysis**

  Following development, the wells will be purged of approximately three well volumes of water and the temperature, conductivity, and pH of the purged groundwater will be monitored to insure that these parameters are within 15 percent of the previous measurement prior to sampling. One groundwater sample will be collected from each well using a clean Teflon® bailer. The groundwater samples will be submitted to a California-certified laboratory for analysis of TPH as diesel and TPH as gasoline by modified EPA Method 8015, and BTEX by EPA Method 8020.

- **Dispose of stockpile soil**

  Approximately 20 cubic yards of soil presently stockpiled on the site and the soil cuttings generated during this investigation, will be transported and disposed of at the Vasco Road, Browning Ferris Landfill, a Class III landfill. Prior to transportation and disposal, one profile soil sample will be collected from the soil and analyzed for Toxicity Characteristic Leaching Procedures (TCLP) BTEX, Soluble Threshold Limit Concentrations (STLC) lead, and reactivity, ignitability, and corrosivity.

- **Prepare a final report**

  A final letter report will be prepared which will document all work performed, including summaries of the data, with conclusions and recommendations.

- **Drum decontamination, well development, and purge water**

  All decontamination water, and monitoring well development and purge water will be stored on-site in Department of Transportation-approved, 55-gallon drums for later disposal by the owner. Blymyer Engineers estimates that approximately three 55-gallon drums of water will be generated during this phase of the investigation.

All work will be completed in accordance with the enclosed Blymyer Engineers, Inc.'s *Standard Operating Procedures.*

Proposed Work Schedule

The proposed soil gas survey will be completed within 30 days of the ACHCSA's approval of this letter workplan. The proposed monitoring wells will be installed within 45 days of workplan approval and a final report detailing both phases of the investigation will be submitted to the ACHCSA within 90 days following workplan approval.

Please call Laurie Buckman at (510) 521-3773 with any questions or comments regarding this project.

Sincerely,

Blymyer Engineers, Inc.

By: _____
Laurie A. Buckman
Project Geologist

And: _____
John Morrison, RG 5773
Registered Geologist

Enclosures: Soil Gas Sample Location Map
Blymyer Engineers, Inc.'s, Standard Operating Procedure

No. 1, Soil and Grab Groundwater Sampling Using a Hollow Stem Auger Drill Rig

No. 2A, Completion of Borings as Groundwater Monitoring Wells

No. 2B, Groundwater Monitoring Well Development

cc: Mr. Sam Kawahara, Kawahara Nursery

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APPENDIX B

Vapor Trace® Shallow Soil Gas
Investigation

KAWAHARA NURSERY
San Lorenzo, California

October 3, 1994

Vapor Trace® Shallow Soil Gas Investigation

KAWAHARA NURSERY
San Lorenzo, California

October 3, 1994

Prepared for:

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Submitted by:

Karen L. McWhinla

164-0454-S

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APPENDIX A Condensed Data A-1

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1.0 KAWAHARA NURSERY SITE INVESTIGATION

Tracer Research Corporation (Tracer Research) performed a *Vapor Trace*® shallow soil gas investigation at Kawahara Nursery located at 16550 Ashland Avenue in San Lorenzo, California. The investigation was conducted on October 3, 1994 for Blymyer Engineers, Inc. of Alameda, California.

1.1 Objective

The purpose of the investigation was to determine the source and extent of possible soil and/or groundwater contamination by screening the shallow soil gas for the presence of volatile organic compounds (VOCs). The soil gas samples were collected and analyzed for the following analyte class and compounds:

Analyte Class: Hydrocarbon
benzene, toluene, ethylbenzene, xylenes (BTEX)
total volatile hydrocarbons (TVHC)

1.2 Overview of Results

For this investigation, sixteen samples were collected from sixteen sampling locations. Samples were collected at depths of 9 to 11 feet below ground surface (bgs). A summary of the results of the investigation is presented in Table 1.

Table 1. Soil Gas Sample Summary

Compound	# of samples in which compound was detected	Low conc. µg/L	High conc. µg/L	Sample(s) with high conc.
benzene	2	0.07	0.08	SG-10-10.0'
toluene	0	NA	NA	NA
ethylbenzene	0	NA	NA	NA
xylenes	0	NA	NA	NA
TVHC	16	0.1	2	SG-06-10.0' SG-08-9.0'

NA = Not Applicable

2.0 SITE DESCRIPTION

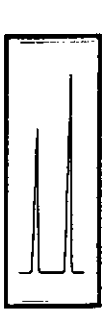
The soil gas samples were collected in and around the garage in dirt and thin asphalt cover. The subsurface of the site was reported to consist of sand, clay and bay mud. The depth of groundwater was reported to be approximately 13 feet bgs. The direction of flow was not reported.

3.0 SOIL GAS SAMPLING PARAMETERS

Soil gas sampling probes consisted of 14-foot lengths of 3/4-inch diameter hollow steel pipe. The probes were fitted with detachable drive tips and hydraulically pushed to depths of 9 to 11 feet bgs.

The aboveground end of each probe was fitted with an aluminum reducer (manifold) and a length of polyethylene tubing leading to a vacuum pump. Soil gas was pulled by the vacuum pump into the probe. Samples were collected in a glass syringe by inserting a needle through a silicone rubber segment in the evacuation line and down into the steel probe. The vacuum was monitored by a vacuum gauge to ensure an adequate gas flow from the vadose zone was maintained.

The volume of air within the probe was purged by evacuating 2 to 5 liters of gas. The evacuation time in minutes versus the vacuum in inches of mercury (Hg) was used to calculate the necessary evacuation time. The vacuum in inches Hg was recorded at each sampling location.



Sample probe vacuums ranged from 2 to 9 inches Hg. The vacuum capacity of the pump was approximately 20 inches Hg.

4.0 ANALYTICAL PARAMETERS

During this investigation, up to 10 milliliters (mL) of soil gas were collected for each sample and immediately analyzed in the Tracer Research analytical van. Subsamples (replicates) from these samples were injected into the gas chromatograph (GC) in volumes of 1 to 1,000 microliters (μL) depending on the VOC concentrations in the sample.

Analytical instruments were calibrated daily using fresh working standards made from National Institute of Sciences and Technology (NIST) traceable standards and reagent blanked solvents.

4.1 Chromatographic System

A Hewlett Packard 5890 Series II gas chromatograph, equipped with a flame ionization detector (FID) and a computing integrator, was used for the soil gas analyses. The hydrocarbon compounds, detected with the FID, were separated in the GC on a 4-foot by 1/8 inch outer diameter (OD) packed analytical column (10% TCEP stationary phase bonded to Chromosorb PAW support). The column was in a temperature controlled oven. Nitrogen was used as the carrier gas.

The instrument calibrations were checked periodically throughout the day to monitor the response factors and retention times. The following paragraphs explain the GC and FID processes.

GC Process

The soil gas is injected into the GC where it is swept through the analytical column by the carrier gas. The detector senses the presence of a component different from the carrier gas and converts that information to an electrical signal. The components of the sample pass through the column at different rates, according to their individual properties, and are detected by the detector. Compounds are identified by the time it takes them to pass through the column (retention time).

FID Process

The FID utilizes a flame produced by the combustion of hydrogen and air. When a component, which has been separated on the GC analytical column, is introduced into the flame, a large increase in ions occurs. A collector with a polarizing voltage is applied near the flame and the ions are attracted and produce a current, which is proportional to the amount of the sample compound in the flame. The electrical current causes the computing integrator to record a peak on a chromatogram. By measuring the area of the peak and comparing that area to the integrator response of a known aqueous standard, the concentration of the analyte in the sample is determined.

4.2 Analyses

The detection limits for target compounds depend on the sensitivity of the detector to the individual compound as well as the volume of the sample injection. The detection limits of the target compounds were calculated from the response factor, the sample injection size, and the calculated minimum peak size (area) observed under the conditions of the analyses. If any compound was not detected in an analysis, the detection limit is given as a "less than" value, e.g., <0.01 µg/L. The approximate detection limits for the target compounds are presented in Table 2.

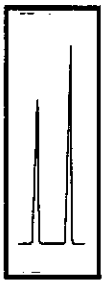


Table 2. Detection Limits for Target Compounds

Compound	Detection Limits (µg/L)
benzene	0.01
toluene	0.02
ethylbenzene	0.04
xylenes	0.06
TVHC	0.06

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

Tracer Research's Quality Assurance (QA) and Quality Control (QC) program was followed to maintain data that was reproducible through the investigation. An overview presenting the significant aspects of this program is presented below.

Soil Gas Sampling Quality Assurance

To ensure consistent collection of samples, the following procedures are performed:

- Sampling Manifolds

Tracer Research's custom designed sampling manifold connects the sample probe to the vacuum line and pump. The manifold is designed to eliminate sample exposure to the polymeric (plastic) materials that connect the probe to the vacuum pump.

The sampling manifold is attached to the end of the probe, forming an air tight union between the probe and the silicone tubing septum. The septum connects the manifold to the pump vacuum line and permits syringe sampling.

This sampling system allows the sample to be taken upstream of the sampling pump, manifold, and septum. Since cross contamination of sampling equipment can be a major problem, Tracer Research replaces the materials (probe and syringe), between sampling points, that contact the soil gas before or during sampling.

-Sampling Probes

Steel probes are used only once each day. To eliminate the possibility of cross contamination, they are washed with high pressure soap and hot water spray, or steam-cleaned. Enough sampling probes are carried on each van to avoid the need to re-use any during the day.

-Glass Syringes

Glass syringes are used for only one sample a day and are washed and baked out at night. If they must be used twice, they are purged with carrier gas (nitrogen) and baked out between probe samplings.

-Sampling Efficiency

Soil gas pumping is monitored by a vacuum gauge to ensure that an adequate flow of gas from the soil is maintained. A reliable gas sample can be obtained if the sample vacuum gauge reading is at least 2 inches Hg less than the maximum measured vacuum of the vacuum pump.

Analytical Quality Assurance Samples

Quality assurance samples are performed at the minimum frequencies listed in Table 3. The actual frequency depends on the number of samples analyzed each day and the length of time of the survey.

Table 3. Quality Assurance Samples

Sample type	Frequency
Ambient Air Samples	3 per day or 1 per site
Analytical Method Blanks	1 per day
Continuing Calibration Check	20% (1 every 5 samples)
Field System Blank	1 per day
Reagent Blank	1 per set of working standards
Replicate Samples	10% of all samples

The ambient air samples are obtained on site by sampling the air immediately outside the mobile analytical van and directly injecting it into the GC. Analytical method blanks are taken to demonstrate that the analytical instrumentation is not contaminated. These are performed by injecting carrier gas (nitrogen) into the GC with the sampling syringe. Subsampling syringes are also checked in this fashion.

Continuing calibration checks are analyzed to verify the detector response for the target VOCs. If the response changes by more than twenty-five percent, the gas chromatograph is recalibrated and new response factors are calculated.

Field system blanks are analyzed to check for contamination of the sampling apparatus, e.g., probe and sampling syringe. A sample is collected using standard soil gas sampling procedures, but without putting the probe into the ground. The results are compared to those obtained from a concurrently analyzed ambient air sample.

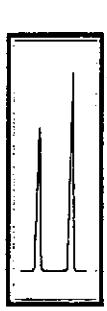
If the field system blanks detect compounds of interest at concentrations that indicate equipment contamination or concentrations that exceed normal background levels (ambient air analysis), corrective actions are performed. If the problem cannot be corrected, an out-of-control event is documented and reported. Field system blanks are performed after any probe decontamination process.

TRACER RESEARCH CORPORATION - ANALYTICAL RESULTS
Blymyer Engineers, Inc./Kawahara Nursery/San Lorenzo, California/164-0454-S
10/03/94

SAMPLE	BENZENE µg/L	TOLUENE µg/L	ETHYL BENZENE µg/L	XYLENES µg/L	TVHC µg/L
AIR	<0.01	<0.02	<0.04	<0.06	1
SG-01-10.0'	<0.01	<0.02	<0.04	<0.06	1
SG-02-11.0'	<0.01	<0.02	<0.04	<0.06	1
SG-03-11.0'	<0.01	<0.02	<0.04	<0.06	0.2
SG-04-9.0'	<0.01	<0.02	<0.04	<0.06	0.3
SG-05-10.0'	<0.03	<0.05	<0.08	<0.1	0.3
SG-06-10.0'	<0.03	<0.05	<0.08	<0.1	2
SG-07-9.0'	<0.01	<0.02	<0.04	<0.06	0.6
SG-08-9.0'	<0.01	<0.02	<0.04	<0.06	2
SG-09-9.0'	<0.01	<0.02	<0.04	<0.06	0.8
SG-10-10.0'	0.08	<0.02	<0.04	<0.06	0.8
SG-11-9.0'	<0.03	<0.05	<0.08	<0.1	0.5
SG-12-9.0'	<0.03	<0.05	<0.08	<0.1	0.3
SG-13-10.0'	<0.01	<0.02	<0.04	<0.06	0.1
SG-14-9.0'	0.07	<0.02	<0.04	<0.06	0.5
SG-15-10.0'	<0.01	<0.02	<0.04	<0.06	1
SG-16-10.0'	<0.01	<0.02	<0.04	<0.06	0.3
AIR	<0.01	<0.02	<0.04	<0.06	1

Analyzed by: K. Proctor
Proofed by: K. McWhirter

Tracer Research Corporation



Tracer Research Corporation appreciates the opportunity of being of service to your organization. Because we are constantly striving to improve our service to you, we welcome any comments or suggestions you may have about how we can be more responsive to the needs of your organization. If you have any questions about the field work, analytical results, or this report, please give Tom Wichman a call at (602) 888-9400.

APPENDIX C

BLYMYER
ENGINEERS, INC.

Standard Operating Procedure No. 1

Soil and Grab Groundwater Sampling Using a Hollow-Stem Auger Drill Rig

Revision No. 1

Approved By:

Michael Lewis
Quality Assurance/Quality Control Officer
Blymyer Engineers, Inc.

5/31/94
Date

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Attachments:

Boring Log
Drum Inventory Sheet

1.0 Introduction and Summary

This Standard Operating Procedure (SOP) describes methods for drilling with the use of hollow-stem augers, soil sampling with the use of split-spoon samplers, and grab groundwater sampling through an open borehole. Drilling activities covered by this SOP may be conducted to obtain soil and grab groundwater samples or to create a borehole within which a well may be constructed. Soil samples may be obtained to log subsurface materials, to collect samples for chemical characterization, or to collect samples for physical parameter characterization.

The soil sampling techniques described in this SOP are generally suitable for chemical characterization and physical classification tests; because a driven split-spoon sampler is employed, the resulting soil samples should generally be considered "disturbed" with respect to physical structure and may not be suitable for measuring sensitive physical parameters, such as strength and compressibility. The augering techniques described in this SOP generally produce a borehole with a diameter corresponding to the outside diameter of the auger flights, a relatively small annulus of remolded soil surrounding the outside diameter of the auger flights, and limited capability for cross-contamination between subsurface strata as the leading flights of the augers pass from contaminated strata to uncontaminated underlying strata. However, should conditions require strict measures to help prevent cross-contamination or maintain the integrity of an aquitard, consideration should be given to augmenting the procedures of this SOP, for example, by using pre-drilled and grouted isolation casing.

The procedures for hollow-stem auger drilling and split-spoon soil sampling generally consist of initial decontamination, advancement of the augers, driving and recovery of the split-spoon sampler, logging and packaging of the soil samples, decontamination of the split-spoon and continued augering and sampling until the total depth of the borehole is reached. Withdrawal of the augers upon reaching the total depth requires completion of the borehole by grouting, by constructing a well, or other measures; well construction is not covered in this SOP.

2.0 Equipment and Materials

- Drill rig, drill rods, hollow-stem augers, and drive-weight assembly (for driving the split-spoon sampler) should conform to ASTM D 1586-Standard Method for Penetration Test and Split-Barrel Sampling of Soils, except: (1) hollow-stem augers may exceed 6.5 inches inside diameter as may be necessary for installing 4-inch diameter well casing, (2) hollow-stem augers should have a center bit assembly (end plug), (3) alternative drive-weight assemblies or downhole hammers are acceptable as long as the type, weight, and equivalent free fall are noted on the boring log.

- Split-spoon sampler should conform to ASTM D 1586-Standard Method for Penetration Test and Split-Barrel Sampling of Soils, except: (1) split-spoon should be fitted with liners for collection of chemical characterization samples, and (2) allowable split-spoon diameters include nominal 1.5-inch inside diameter by nominal 2-inch outside diameter (Standard Penetration Test split-spoon), nominal 2-inch inside diameter by nominal 2.5-inch outside diameter (California Modified split-spoon), or nominal 2-1/2-inch inside diameter by nominal 3-inch outside diameter (Dames & Moore split-spoon). The split-spoon type and length of the split barrel portion of the sampler should be noted on the boring log, as should the use of a sample catcher if employed.

- Liners should be 3- to 6-inch length, fitted with plastic end caps, brass or stainless steel, with a nominal diameter corresponding to that of the inside diameter of the split-spoon sampler. The boring log should note whether brass or stainless steel liners were used.

- Teflon® sheets, approximate 6-mil thickness, precut to a diameter or width of the liner diameter plus approximately 1 inch.

- Plastic end caps.

- Adhesiveless silicone tape.

- Disposable polyethylene bailer.

- Type I/Type II Portland cement.

- Groundwater sample containers (laboratory provided only).

- Kimwipes®, certified clean silica sand, or deionized water (for blank sample preparation).

- Sample labels, boring log forms, chain-of-custody forms, drum labels, Drum Inventory Sheet, and field notebook.

- Ziploc® plastic bags of size to accommodate a liner.

- Stainless steel spatula and knife.

- Cooler with ice or dry ice (do not use blue ice) and packing material.

- Field organic vapor monitor. The make, model, and calibration information for the field

organic vapor monitor (including compound and concentration of calibration gas) should be noted on the boring log.

- Pressure washer or steam cleaner.
- Large trough (such as a water tank for cattle), plastic-lined pit, or equivalent for decontamination of hollow-stem augers, drill rod, and end plug.
- Buckets and bristle brushes for decontamination of liners, split-spoon sampler, and other small gear.
- Low-residue, organic-free soap such as Liquinox® or Alconox®.
- Distilled water.
- Heavy plastic sheeting such as Visqueen.
- Steel, 55-gallon, open-top drums conforming to the requirements of DOT 17H, if required.

As specified in the Site Safety Plan, additional safety and personnel decontamination equipment and materials may be needed.

3.0 Typical Procedures

The following typical procedures are intended to cover the majority of drilling and sampling conditions. However, normal field practice requires re-evaluation of these procedures and implementation of alternate procedures upon encountering unusual or unexpected subsurface conditions. Deviations from the following typical procedures may be expected and should be noted on the boring log.

1. Investigate location of the proposed boreholes for buried utilities and obstructions. At least 48 hours before drilling, contact known or suspected utility services individually or through collective services such as "Underground Service Alert."

2. Decontaminate drill rig, drill rods, hollow-stem augers, split-spoon sampler and other drilling equipment immediately prior to mobilization to the site.

3. Calibrate field organic vapor monitor equipment in accordance with the manufacturer's specifications. Note performance of the calibration in the geologist's field notebook.

4. Conduct "tail-gate" meeting and secure the work area in accordance with the Site Safety Plan.

5. Core concrete, if required.

6. Using hand-augering device, hand auger to a depth of 5 feet, if feasible, to clear underground utilities and structures not located by a utility service or on drawings. As appropriate, retain private buried utility location services or geophysical investigation services to search for buried utilities and obstructions. During initial advancement of each borehole, drill cautiously and have the driller pay particular attention to the "feel" of drilling conditions. The suspected presence of an obstruction, buried pipeline or cable, utility trench backfill, or similar may be cause for suspension of drilling, subject to further investigation.

7. Advance hollow-stem auger, fitted with end plug, to the desired sampling depth. Note depth interval, augering conditions, and driller's comments on boring log. Samples should be taken at intervals of 5 feet or less in homogeneous strata and at detectable changes of strata.

8. Remove drill rod and the end plug from the hollow-stem auger and note presence of water mark on drill rod, if any. If below the groundwater table in clean sand, allow water level in hollow-stem auger to equilibrate prior to removing end plug and remove plug slowly so as to minimize suction at the base of the plug. Also, monitor the top of the hollow-stem auger using field organic vapor monitor, as appropriate. In situations where heaving sand occurs, the use of a clean, inert knock-out plate may be employed, if necessary, to set wells. Also, clean water may be introduced into the hollow-stem auger to create a positive head pressure to exceed the hydrostatic pressure of the heaving sand formation.

9. Decontaminate split-spoon sampler, liners, spatulas and knives, and other equipment that may directly contact the chemical characterization sample. Fit the split-spoon sampler with liners and attach to drill rod.

10. Lower split-spoon sampler through hollow-stem of auger until sampler is resting on soil. Note in field notebook discrepancy between elevation of tip of sampler and leading edge of augers, if any. If more than 6 inches of slough exists inside the hollow-stem augers,

consider the conditions unsuitable and re-advance the hollow-stem augers and end plug to a new sampling depth.

11. Drive and recover split-spoon sampler according to the requirements of ASTM D 1586 - Standard Method for Penetration Test and Split-Barrel Sampling of Soils. Record depth interval, hammer blows for each 6 inches, and sample recovery on boring log (copy attached). Monitor the recovered split-spoon sampler with the field organic vapor monitor, as appropriate.

12. Remove either bottom-most or second-from-bottom liner (or both) from split-spoon sampler for purposes of chemical characterization and physical parameter testing. Observe soil at each end of liner(s) for purposes of completing sample description. Place Teflon® sheet at each end of liner, cover with plastic caps, and tape plastic caps with adhesiveless silicone tape (do not use electrical or duct tape) to further minimize potential loss of moisture or volatile compounds. Label liner(s) and place in Ziploc® bag on ice or dry ice inside cooler.

13. Extrude soil from remaining liner(s) and subsample representative 1-inch cube (approximate dimensions). Place subsample in Ziploc® bag and seal. Allow bag to equilibrate at ambient conditions for approximately 5 minutes and screen for organic vapors by inserting the probe of the field organic vapor monitor into the bag. Record depth interval, observed sample reading, and ambient (background) reading on the boring log. Discard bag and sample after use in the solid waste stockpile.

14. Classify soil sample in approximate accordance with ASTM D 2488-Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) and in accordance with the Unified Soil Classification System (USCS). Description should include moisture content, color, textural information, group symbol, group name, and odor. Optional descriptions, especially if classification is performed with protective gloves, include particle angularity and shape, clast composition, plasticity, dilatancy, dry strength, toughness, and reaction with HCl. Add notes on geologic structure of sample, as appropriate. Record depth interval, field organic vapor monitor reading, USCS classification, and other notes on the boring log.

15. Repeat steps 7 through 14 until total depth of borehole is reached.

16. If grab groundwater sample is to be collected, slowly lower bailer through the open borehole or partially retracted hollow-stem augers to minimize agitation and aeration of the sampled water. Transfer the grab groundwater sample into sample container(s).

Label sample container(s), place packing materials around containers, and place on ice or dry ice inside cooler.

17. After augers are removed, complete borehole according to the requirements specified elsewhere or by abandonment in accordance with section 8.0.

18. Decontaminate hollow-stem augers, drill rod, and end plug between boreholes and after finishing last borehole prior to drill rig leaving site.

19. Change decontamination solutions and clean decontamination trough, buckets, and brushes between boreholes.

20. Containerize decontamination liquids in 17H steel drums. Affix completed "Caution - Pending Analysis" labels to the drums.

21. Store bore cuttings on and cover with heavy plastic sheeting. If required by local regulations or due to site constraints, store bore cuttings in 17H steel drums. Affix completed "Caution - Analysis Pending" labels to drums.

22. Complete Drum Inventory Sheet (copy attached).

23. Complete pertinent portion of the chain-of-custody form and enter descriptions of field work performed in the field notebook.

4.0 Quality Assurance and Quality Control (QA/QC)

Optional quality control sampling consists of sequential replicates, collected at an approximate frequency of one sequential replicate for every 10 collected soil samples. Sequential replicates are collected by packaging two adjacent liners of soil from a selected split-spoon drive. Each sample is labeled according to normal requirements. The replicate samples obtained in such a manner are suitable for assessing the reproducibility of both chemical and physical parameters. Interpretations of data reproducibility should recognize the potential for significant changes in soil type, even over 6-inch intervals. Accordingly, sequential replicates do not supply the same information as normally encountered in duplicate or split samples. Duplicate or split samples are better represented by the laboratory performing replicate analyses on adjacent subsamples of soil from the same liner.

Optional quality control samples may be collected to check for cross-contamination using field blanks. Field blanks may be prepared by (1) wipe sampling decontaminated liners and split-spoon with Kimwipes®, (2) pouring clean silica sand into a decontaminated split-spoon sampler that has been fitted with liners, or (3) pouring deionized water over the decontaminated liners and split-spoon sampler and collecting the water that contacts the sampling implements for aqueous analysis. Field blanks may be prepared at the discretion of the field staff given reasonable doubt regarding the efficacy of the decontamination procedures.

The comparability of the field soil classification may be checked by conducting laboratory classification tests. Requests for laboratory testing verification of the field classification should be left to the discretion of the field staff.

Field decisions that may also affect the quality of collected data include the frequency of sampling and the thoroughness of documentation. Subject to reasonable limitations of budget and schedule, the completeness, comparability, and representativeness of data obtained using this SOP will be enhanced by decreasing the sampling interval (including collecting continuous samples with depth) and increasing the level of detail for sample classification and description of drilling conditions. More frequent sampling and more detailed documentation may be appropriate in zones of chemical concentration or in areas of critical geology (for example, zones of changing strata or cross-correlation of confining strata).

As required, rinse or wipe samples may be collected from the sampling equipment before the initial sampling is conducted to establish a baseline level of contamination present on the sampling equipment. Rinse or wipe samples may also be collected at intervals of decontamination wash and rinse events or after the final decontamination wash and rinse event.

5.0 Documentation

Observations, measurements, and other documentation of the drilling and soil sampling effort should be recorded on the following:

- Field notebook
- Boring log
- Sample label
- Chain-of-custody form

Documentation should include any deviations from this SOP, notations of unusual or unexpected conditions, and documentation of the containerization and disposal of investigation-derived waste. Information to be documented on the sample label and boring log is listed below.

5.1 Sample Label

- Project name and project number
- Borehole or well number
- Sample depth interval (feet below ground surface), record the depth interval using notation similar to "19.2-19.7;" generally do not record just one depth "19.2" because of uncertainty regarding the location such depth corresponds to (midpoint, top, etc.)
- Sample date and sample time
- Name of on-site geologist
- Optional designation of orientation of sample within the subsurface, for example, an arrow with "up" or "top" designated

5.2 Boring Log

- Project name, project number, and name of on-site geologist
- Borehole number
- Description of borehole location, including taped or paced measurements to noticeable topographic features (a location sketch should be considered)
- Date and time drilling started and completed
- Name of drilling company and name of drilling supervisor, optional names and responsibilities of driller's helpers
- Name of manufacturer and model number of drill rig

- Inside and outside diameter of the auger flights of the hollow-stem augers, type and size of sampler, optional description of type of bit on end plug and leading edge of auger, optional description of the size of drill rod
- USCS classification
- Number of blow counts, sampling interval, and total depth of borehole.
- Depth at which groundwater was first encountered with the notation "initial" and any other noted changes in groundwater movement or stabilized water level.
- Field organic vapor monitor readings
- Method of boring completion
- Other notations and recordings described previously in section 2.0, Equipment and Materials, and section 3.0, Typical Procedures

6.0 Decontamination

Prior to entering the site, the drill rig and appurtenant items (drill rod, hollow-stem augers, end plug, split-spoon sampler, shovels, troughs and buckets, driller's stand, etc.) should be decontaminated by steam cleaning or pressure washing. Between each borehole, appurtenant items that contacted downhole soil (essentially all appurtenant items including drill rod, hollow-stem augers, end plug, split-spoon sampler, shovels, troughs and buckets, etc.) should be decontaminated by steam cleaning or pressure washing. The drill rig should be steam cleaned or pressured washed as a final decontamination event. On-site decontamination should be conducted within the confines of a trough or lined pit to temporarily contain the wastewater. Between each borehole and prior to demobilization, the trough or lined pit should be decontaminated by steam cleaning or pressure washing. If a rack or other support is used to suspend appurtenant items over the trough or lined pit during decontamination, only the rack or other support needs to be decontaminated between boreholes.

Prior to collection of each sample, the split-spoon sampler, liners, sample catcher, spatulas and knives, and other equipment or materials that may directly contact the sample should be decontaminated. Decontamination for these items should consist of a soap wash (Alconox®, Liquinox®, or other organic-free, low-residue soap), followed by a clean water rinse. If testing for metals, a final rinse of deionized water should be conducted. Wastewater should be

temporarily contained.

Between each borehole, buckets and brushes should be decontaminated by steam cleaning or pressure washing. Before installation of each borehole is begun, fresh decontamination solutions should be prepared. Decontaminated equipment should be kept off of the ground surface. Cleaned equipment should be placed on top of plastic sheeting, which is replaced after completion of each borehole or on storage racks.

More rigorous decontamination procedures may be employed if necessary to meet sampling or QA/QC requirements.

7.0 Investigation-Derived Waste

Wastes resulting from the activities of this SOP may include soil cuttings, excess soil samples, decontamination liquids, and miscellaneous waste (paper, plastic, gloves, bags, etc.).

Solid waste from each borehole should be placed on and covered with heavy plastic sheeting unless required to be containerized in 17H steel drums. Solids from multiple boreholes may be combined within a single stockpile if field observations (presence or absence of chemical staining and field organic vapor monitoring) indicate the solids are similarly uncontaminated or similarly contaminated. Given sufficient space and reasonable doubt, separate stockpiles should be used for solid waste from each borehole.

Decontamination liquids for each borehole should be placed in individual 17H steel drums with completed "Caution - Analysis Pending" labels affixed. Liquids from multiple boreholes may be combined, subject to the same limitations as solids.

8.0 Borehole Abandonment

Each borehole that is not to be completed as a monitoring well should be completely filled with a neat cement (5.5 gallons of water in proportion to one 94-pound bag of Type I/Type II Portland cement, ASTM C-150) from the bottom of the bore to grade surface. Water used to hydrate cement should be free of contaminants and organic material. Bentonite may be added to reduce shrinkage and improve fluidity. Add 3 to 5 pounds of bentonite with 6.5 gallons of water and one 94-pound bag of Type I/Type II Portland cement. The water and bentonite should be mixed first before adding the cement. The borehole should be filled from the bottom first to grade surface. A tremie pipe should be used in small diameter boreholes or in formations prone to

bridging or collapse. The tremie pipe should be lifted as the cement grout is poured, but should never be lifted above the surface of the neat cement. In boreholes deeper than 50 feet, the neat cement may need to be applied with pressure.

9.0 References

Aller, L., Bennett T.W., Hackett G., Petty R.J., Lehr J.H., Sedoris H., and Nielson D.M., 1989. Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells. National Water Well Association, Dublin, OH, 1989.

American Society for Testing and Materials, 1992. ASTM Standards On Ground Water and Vadose Zone Investigations. ASTM, Philadelphia, PA, 1992.

Driscoll, F.G., 1986. Groundwater and Wells. Johnson Filtration Systems Inc., St. Paul, MN, 1986.

Neilson, D.M., 1991. Practical Handbook of Ground-Water Monitoring. Lewis Publishers, Chelsea, MI, 1991.

United States Environmental Protection Agency, 1986. RCRA Ground-Water Monitoring Technical Enforcement Guidance Document. U.S. EPA, 1986.

BLYMYER
ENGINEERS, INC.

BORING & WELL CONSTRUCTION LOG:

Job No.:
Client:
Site:

Date Drilled:
Sample Container:

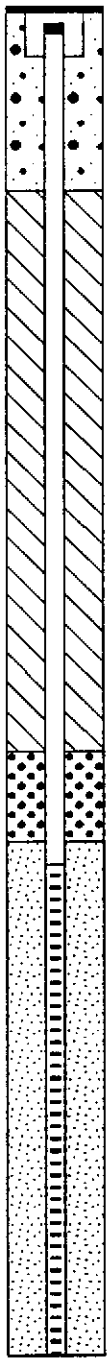
Driller:
Drilling Contractor:
Logged By:
Drilling Equipment:
Bore Diameter:
Total Depth: Ft.

Well Completion Depth: '
Component Size/Type — Depths in Feet From To

Surface Completion:
Blank Casing:
Slotted Casing:
Filter Pack:
Seal:
Annular Seal:
Surface Seal:
Bottom Seal:

Initial Water Level:
Stabilized water level:

Depth (ft)	Blows/6 In.	P.I.D. (ppm)	Samples	DESCRIPTION	Unified Soil Classification	Graphic Log	Water Depth
0							
5							
10							
15							
20							
25							
30							



(continued on next page)

BLYMYER ENGINEERS DRUM INVENTORY FORM

Number of Drums	Date Generated	Person on-site when generated	Soil or Groundwater	Contents (Cuttings, Purge Water, Development Water, Decon Water, PPE)	% Full	Bore or Monitoring Well ID	Do Lab Results Exist for Contents?

jmo\forms\drum.inv

Date Client Informed? _____ All drums labeled? _____

APPENDIX D

BLYMYER ENGINEERS, INC.

BORE LOG: SB-1

Job No.: 94015
Client: Kawahara Nursery
Site: 16550 Ashland Avenue
San Lorenzo, CA
Date Drilled: 10/31/94
Logged By: L. Buckman

Drilling Company: Gregg Drilling
Driller: Ted
Drilling Equipment: SIMCO/Hollow Stem Rotary
Sample Method: Brass Lined Split-spoon
Bore Diameter: 8 in.
Total Depth: 18 ft.

Initial Water Depth: ▼ 17.2 ft.
Stabilized Water Depth: ▼

Depth (ft.)	Blows/6 in.	P.I.D. (ppm)	Sample Intervals Cored / Cored/Analyzed	LITHOLOGIC DESCRIPTION	Unified Soil Classification	Graphic Log	Water Depth
0				CONCRETE-gravel FILL	C		
		0.3		Brown silty CLAY, with sand and <2% gravel; dry; odorless	CL		
		0					
		0					
5		0					
		0					
		0					
		0		Tan silty SAND; fine grained; poorly graded; moist; odorless	SM		
		0		Tan silty CLAY, with <1% gravel; moist; iron-stained; odorless	CL		
		0					
10		0.1					
		0					
		0					
		0		Tan silty SAND, with gravel; fine grained; poorly graded; wet; odorless	SM		
		0		Gray silty CLAY, moist; odorless	CL		
		0					
15		0					
		0		tan; <1% gravel; moist; odorless			▼ 17.2'
		0		Tan gray silty SAND, with <2% gravel; medium grained; poorly graded; wet; odorless	SM		
		0		Bore terminated at 18 ft.			
20							
25							

REGISTERED GEOLOGIST
JOHN C. MORRISSEY
No. 3773
Exp. 2/20/95
STATE OF CALIFORNIA

BORE & WELL CONSTRUCTION LOG: MW-4

BLYMYER ENGINEERS, INC.

Job No.: 94015
Client: Kawahara Nursery
Site: 18550 Ashland Avenue
San Lorenzo, CA
Date Drilled: 10/31/94
Logged By: L. Buckman

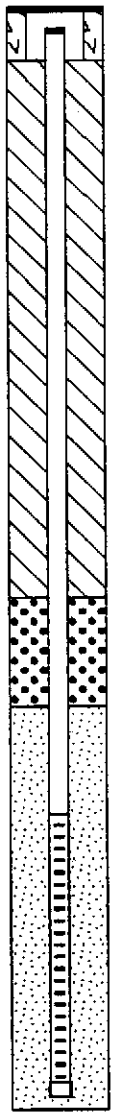
Drilling Company: Gregg Drilling
Driller: Ted
Drilling Equipment: SIMCO/Hollow Stem Rotary
Sample Method: Brass Lined Split-spoon
Bore Diameter: 8 in.
Total Depth: 20.5 ft.

Initial Water Depth: ▽ 18.5 ft.
Stabilized Water Depth: ▽ 12.34 ft.

Well Completion Depth: 20.25 ft.

Component Size/Type	Depths in feet From	To
Surface Completion: Flush Traffic Rated Vault with Locking Cap		
Surface Seal: Asphalt/Cement	.00	1.00
Annular Seal: Grout	1.00	11.00
Seal: Hydrated Bentonite	11.00	13.00
Sand Pack: #2-12 Sand	13.00	20.50
Bottom Seal: PVC Cap	20.00	20.25
Blank Casing: 2" Diam. PVC	.50	15.00
Screened Casing: 0.02" Slot-2" Diam. PVC	15.00	20.00

Depth (ft.)	Blows/6 in.	P.I.D. (ppm)	Sample Intervals Cored / Cored/Analyzed	LITHOLOGIC DESCRIPTION	Unified Soil Classification	Graphic Log	Water Depth
0				ASPHALT-gravel FILL	A		
		0		Black silty CLAY, with sand; dry; odorless			
		0					
		0.3			CL		
5		0					
		0		Brown sandy CLAY, with gravel; dry; odorless			
		0.2					
		0		Brown silty SAND, with <2% clay; moist; odorless	SM		
		0.2					
		0		Brown silty CLAY, with <2% gravel; moist; organic; odorless	CL		
10		0					
		0					
		0		Brown silty SAND, with gravel; medium grained; poorly graded; wet; odorless	SM		
		0			CL		▽ 12.34'
		0			SM		
		0.3		Brown silty CLAY, with <2% gravel; moist; organic; odorless			
		0		Brown silty SAND, <2% clay; fine grained; poorly graded; moist; iron-stained; odorless			
15		0					
		0		Brown silty CLAY; moist; iron-stained; odorless	CL		
		0		gray; very moist; odorless			
		0					
		0					▽ 18.5'
		0		Gray silty SAND, with <2% clay and <2% gravel; fine to medium grained; poorly graded; wet; odorless	ML		
20				Gray silty CLAY; very moist; iron-stained; odorless			
				Bore terminated at 20.5 ft.			
25							



REGISTERED GEOLOGIST
JOHN C. MORRISON
No. 5773
Exp. 2/29/95
STATE OF CALIFORNIA

BLYMYER
ENGINEERS, INC.

BORE & WELL CONSTRUCTION LOG: MW-5

Job No.: 94015
Client: Kawahara Nursery
Site: 18550 Ashland Avenue
San Lorenzo, CA
Date Drilled: 10/31/94
Logged By: L. Buckman

Drilling Company: Gregg Drilling
Driller: Ted
Drilling Equipment: SIMCO/Hollow Stem Rotary
Sample Method: Brass Lined Split-spoon
Bore Diameter: 8 In.
Total Depth: 20.5 ft.

Initial Water Depth: ▼ 20 ft.
Stabilized Water Depth: ▼ 10.42 ft.

Well Completion Depth: 20.25 ft.

Component	Size/Type	Depths in feet From	To
Surface Completion:	Flush Traffic Rated Vault with Locking Cap		
Surface Seal:	Asphalt/Cement	.00	1.00
Annular Seal:	Grout	1.00	11.00
Seal:	Hydrated Bentonite	11.00	13.00
Sand Pack:	#2-12 Sand	13.00	20.50
Bottom Seal:	PVC Cap	20.00	20.25
Blank Casing:	2" Diam. PVC	.50	15.00
Screened Casing:	0.02" Slot-2" Diam. PVC	15.00	20.00

Depth (ft.)	Blows/6 In.	P.I.D. (ppm)	Sample Intervals Cored / Cored/Analyzed	LITHOLOGIC DESCRIPTION	Unified Soil Classification
0				ASPHALT-gravel FILL	A
		0		Brown silty CLAY, with sand and <2% gravel; dry; odorless	
		0			
		0			
5		0			CL
		0			
		0			
		1.1		<2% gravel; slightly moist; iron-stained; odorless	
		0			
		0		Tan silty SAND; fine grained; poorly graded; dry; odorless	SM
10		0		Tan silty CLAY; slightly moist; iron-stained; odorless	CL
		0			
		1.1			
		0		Tan silty SAND, with gravel; fine grained; poorly graded; wet; odorless	SM
		0		Gray silty CLAY, moist; odorless	
		0		tan; moist; odorless; iron-stained	
15		0		gray; very moist; odorless	CL
		0		tan gray; with <1% sand; very moist; iron-stained; odorless	
		0		tan gray; with <2% gravel; wet; iron-stained; odorless	
		0			
		0		Tan gray silty SAND, with <2% gravel; medium grained; poorly graded; wet; odorless	SM
		0			
20		0			
				Bore terminated at 20.5 ft.	
25					

Water Depth: ▼ 10.42' at 10; ▼ 20' at 20

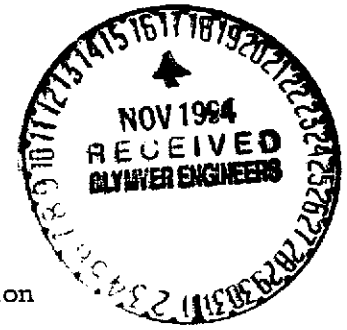
REGISTERED GEOLOGIST
JOHN C. MORRISON
No. 5773
Exp. 2/20/96
STATE OF CALIFORNIA

APPENDIX E

NATIONAL ENVIRONMENTAL TESTING, INC.

Santa Rosa Division
435 Tesconi Circle
Santa Rosa, CA 95401
Tel: (707) 526-7200
Fax: (707) 526-9623

Laura Buckman
Blymyer Engineers, Inc
1829 Clement Ave
Alameda, CA 94501



Date: 11/15/1994
NET Client Acct. No: 49500
NET Pacific Job No: 94.05254
Received: 11/02/1994

Client Reference Information

Kawahara Nursery, Job No. 94015

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Results apply only to the samples analyzed. Reproduction of this report is permitted only in its entirety. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Approved by:

Nora Pearmain
Project Coordinator

Jim Hoch
Operations Manager

Enclosure(s)

Ref: Kawahara Nursery, Job No. 94015

SAMPLE DESCRIPTION: SS-1A,B
Date Taken: 10/31/1994
Time Taken:
NET Sample No: 221503

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
Soil pH measured in water	7.5		N/A	pH units	9040		11/08/1994	177
Flashpoint/Ignitability	>140		N/A	Degree F	1010		11/11/1994	209
Sulfide	ND		10	mg/kg	376.1		11/07/1994	121
Cyanide (Total)	ND		0.2	mg/kg	335.2		11/09/1994	237
Lead (GFAA,WET)	0.35		0.01	mg/L	EPA 7421	11/10/1994	11/14/1994	223
METHOD 8020 (GC,Liquid)								
DILUTION FACTOR*	1						11/11/1994	2288
Benzene	ND		0.5	ug/L	8020		11/11/1994	2288
Toluene	0.8	C	0.5	ug/L	8020		11/11/1994	2288
Ethylbenzene	ND		0.5	ug/L	8020		11/11/1994	2288
Xylenes (Total)	ND		0.5	ug/L	8020		11/11/1994	2288
SURROGATE RESULTS	--						11/11/1994	2288
Bromofluorobenzene (SURR)	103			% Rec.	8020		11/11/1994	2288

C : Positive result confirmed by secondary column or GC/MS analysis.

Ref: Kawahara Nursery, Job No. 94015

SAMPLE DESCRIPTION: MW-4 17'
Date Taken: 10/31/1994
Time Taken:
NET Sample No: 221504

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
TPH (Gas/BTXE,Solid)								
METHOD 5030/M8015	--						11/09/1994	1522
DILUTION FACTOR*	1						11/09/1994	1522
as Gasoline	ND		1	mg/kg	5030		11/09/1994	1522
METHOD 8020 (GC,Solid)	--						11/09/1994	1522
Benzene	ND		2.5	ug/kg	8020		11/09/1994	1522
Toluene	ND		2.5	ug/kg	8020		11/09/1994	1522
Ethylbenzene	ND		2.5	ug/kg	8020		11/09/1994	1522
Xylenes (Total)	ND		2.5	ug/kg	8020		11/09/1994	1522
SURROGATE RESULTS	--						11/09/1994	1522
Bromofluorobenzene (SURR)	76			% Rec.	5030		11/09/1994	1522
METHOD M8015 (EXT., Solid)						11/07/1994		
DILUTION FACTOR*	1						11/08/1994	894
as Diesel	ND		1	mg/kg	3550		11/08/1994	894

Client Name: Blymyer Engineers, Inc
Client Acct: 49500
NET Job No: 94.05254

Date: 11/15/1994
ELAP Cert: 1386
Page: 4

Ref: Kawahara Nursery, Job No. 94015

SAMPLE DESCRIPTION: MW-4 12'
Date Taken: 10/31/1994
Time Taken:
NET Sample No: 221505

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
TPH (Gas/BTXE,Solid)								
METHOD 5030/M8015	--						11/09/1994	1523
DILUTION FACTOR*	1						11/09/1994	1523
as Gasoline	ND		1	mg/kg	5030		11/09/1994	1523
METHOD 8020 (GC,Solid)	--						11/09/1994	1523
Benzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Toluene	ND		2.5	ug/kg	8020		11/09/1994	1523
Ethylbenzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Xylenes (Total)	ND		2.5	ug/kg	8020		11/09/1994	1523
SURROGATE RESULTS	--						11/09/1994	1523
Bromofluorobenzene (SURR)	76			% Rec.	5030		11/09/1994	1523
METHOD M8015 (EXT., Solid)						11/07/1994		
DILUTION FACTOR*	1						11/08/1994	894
as Diesel	ND		1	mg/kg	3550		11/08/1994	894

Ref: Kawahara Nursery, Job No. 94015

SAMPLE DESCRIPTION: MW-5 12.5'
Date Taken: 10/31/1994
Time Taken:
NET Sample No: 221506

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
TPH (Gas/BTXE,Solid)								
METHOD 5030/M8015	--						11/09/1994	1523
DILUTION FACTOR*	1						11/09/1994	1523
as Gasoline	ND		1	mg/kg	5030		11/09/1994	1523
METHOD 8020 (GC,Solid)	--						11/09/1994	1523
Benzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Toluene	ND		2.5	ug/kg	8020		11/09/1994	1523
Ethylbenzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Xylenes (Total)	ND		2.5	ug/kg	8020		11/09/1994	1523
SURROGATE RESULTS	--						11/09/1994	1523
Bromofluorobenzene (SURR)	76			% Rec.	5030		11/09/1994	1523
METHOD M8015 (EXT., Solid)						11/07/1994		
DILUTION FACTOR*	1						11/08/1994	894
as Diesel	ND		1	mg/kg	3550		11/08/1994	894

Client Name: Blymyer Engineers, Inc
Client Acct: 49500
NET Job No: 94.05254

Date: 11/15/1994
ELAP Cert: 1386

Ref: Kawahara Nursery, Job No. 94015

SAMPLE DESCRIPTION: MW-5 17 #
Date Taken: 10/31/1994
Time Taken:
NET Sample No: 221507

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
TPH (Gas/BTXE,Solid)								
METHOD 5030/M8015	--						11/09/1994	1523
DILUTION FACTOR*	1						11/09/1994	1523
as Gasoline	ND		1	mg/kg	5030		11/09/1994	1523
METHOD 8020 (GC,Solid)	--						11/09/1994	1523
Benzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Toluene	11	C	2.5	ug/kg	8020		11/09/1994	1523
Ethylbenzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Xylenes (Total)	27	C	2.5	ug/kg	8020		11/09/1994	1523
SURROGATE RESULTS	--						11/09/1994	1523
Bromofluorobenzene (SURR)	78			% Rec.	5030		11/09/1994	1523
METHOD M8015 (EXT., Solid)						11/07/1994		
DILUTION FACTOR*	1						11/08/1994	894
as Diesel	ND		1	mg/kg	3550		11/08/1994	894

C : Positive result confirmed by secondary column or GC/MS analysis.

Ref: Kawahara Nursery, Job No. 94015

SAMPLE DESCRIPTION: SB-1 7.5'
Date Taken: 10/31/1994
Time Taken:
NET Sample No: 221508

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
TPH (Gas/BTXE,Solid)								
METHOD 5030/M8015	--						11/09/1994	1523
DILUTION FACTOR*	1						11/09/1994	1523
as Gasoline	ND		1	mg/kg	5030		11/09/1994	1523
METHOD 8020 (GC,Solid)	--						11/09/1994	1523
Benzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Toluene	ND		2.5	ug/kg	8020		11/09/1994	1523
Ethylbenzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Xylenes (Total)	ND		2.5	ug/kg	8020		11/09/1994	1523
SURROGATE RESULTS	--						11/09/1994	1523
Bromofluorobenzene (SURR)	72			% Rec.	5030		11/09/1994	1523
METHOD M8015 (EXT., Solid)						11/07/1994		
DILUTION FACTOR*	1						11/08/1994	894
as Diesel	ND		1	mg/kg	3550		11/08/1994	894

Ref: Kawahara Nursery, Job No. 94015

SAMPLE DESCRIPTION: SB-1 17'
Date Taken: 10/31/1994
Time Taken:
NET Sample No: 221509

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
TPH (Gas/BTXE,Solid)								
METHOD 5030/M8015	--						11/09/1994	1523
DILUTION FACTOR*	1						11/09/1994	1523
as Gasoline	4.1	GH	1	mg/kg	5030		11/09/1994	1523
METHOD 8020 (GC,Solid)	--						11/09/1994	1523
Benzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Toluene	ND		2.5	ug/kg	8020		11/09/1994	1523
Ethylbenzene	ND		2.5	ug/kg	8020		11/09/1994	1523
Xylenes (Total)	ND		2.5	ug/kg	8020		11/09/1994	1523
SURROGATE RESULTS	--						11/09/1994	1523
Bromofluorobenzene (SURR)	72			% Rec.	5030		11/09/1994	1523
METHOD M8015 (EXT., Solid)						11/07/1994		
DILUTION FACTOR*	10						11/08/1994	894
as Diesel	130		10	mg/kg	3550		11/08/1994	894

GH : The positive result appears to be a heavier hydrocarbon than Gasoline.

Ref: Kawahara Nursery, Job No. 94015

CONTINUING CALIBRATION VERIFICATION STANDARD REPORT

Parameter	CCV Standard % Recovery	CCV Standard Amount Found	CCV Standard Amount Expected	Units	Date Analyzed	Analyst Initials
Soil pH measured in water	100.3	7.02	7.00	pH units	11/08/1994	mee
Cyanide (Total)	100.5	0.195	0.194	mg/kg	11/09/1994	mee
Lead (GFAA,WET)	110.2	0.02754	0.0250	mg/L	11/14/1994	djm
METHOD 8020 (GC,Liquid)						
Benzene	111.2	5.56	5.00	ug/L	11/11/1994	lss
Toluene	107.8	5.39	5.00	ug/L	11/11/1994	lss
Ethylbenzene	98.0	4.90	5.00	ug/L	11/11/1994	lss
Xylenes (Total)	103.3	15.5	15.0	ug/L	11/11/1994	lss
Bromofluorobenzene (SURR)	103.0	103	100	% Rec.	11/11/1994	lss
TPH (Gas/BTXE,Solid)						
as Gasoline	102.6	5.13	5.00	mg/kg	11/09/1994	pbg
Benzene	100.8	25.2	25.0	ug/kg	11/09/1994	pbg
Toluene	99.2	24.8	25.0	ug/kg	11/09/1994	pbg
Ethylbenzene	104.0	26.0	25.0	ug/kg	11/09/1994	pbg
Xylenes (Total)	98.7	74.0	75.0	ug/kg	11/09/1994	pbg
Bromofluorobenzene (SURR)	92.9	92.9	100	% Rec.	11/09/1994	pbg
TPH (Gas/BTXE,Solid)						
as Gasoline	102.6	5.13	5.00	mg/kg	11/09/1994	pbg
Benzene	100.8	25.2	25.0	ug/kg	11/09/1994	pbg
Toluene	99.2	24.8	25.0	ug/kg	11/09/1994	pbg
Ethylbenzene	104.0	26.0	25.0	ug/kg	11/09/1994	pbg
Xylenes (Total)	98.7	74.0	75.0	ug/kg	11/09/1994	pbg
Bromofluorobenzene (SURR)	92.9	92.9	100	% Rec.	11/09/1994	pbg
METHOD M8015 (EXT., Solid)						
as Diesel	99.4	994	1000	mg/kg	11/08/1994	tts

Ref: Kawahara Nursery, Job No. 94015

METHOD BLANK REPORT

Parameter	Method Blank Amount Found	Reporting Limit	Units	Date Analyzed	Analyst Initials
Sulfide	ND	10	mg/kg	11/07/1994	vid
Cyanide (Total)	ND	0.2	mg/kg	11/09/1994	mee
Lead (GFAA,WET)	ND	0.01	mg/L	11/14/1994	djm
METHOD 8020 (GC,Liquid)					
Benzene	ND	0.5	ug/L	11/11/1994	lss
Toluene	ND	0.5	ug/L	11/11/1994	lss
Ethylbenzene	ND	0.5	ug/L	11/11/1994	lss
Xylenes (Total)	ND	0.5	ug/L	11/11/1994	lss
Bromofluorobenzene (SURR)	106		% Rec.	11/11/1994	lss
TPH (Gas/BTXE,Solid)					
as Gasoline	ND	1	mg/kg	11/09/1994	pbg
Benzene	ND	2.5	ug/kg	11/09/1994	pbg
Toluene	ND	2.5	ug/kg	11/09/1994	pbg
Ethylbenzene	ND	2.5	ug/kg	11/09/1994	pbg
Xylenes (Total)	ND	2.5	ug/kg	11/09/1994	pbg
Bromofluorobenzene (SURR)	80		% Rec.	11/09/1994	pbg
TPH (Gas/BTXE,Solid)					
as Gasoline	ND	1	mg/kg	11/09/1994	pbg
Benzene	ND	2.5	ug/kg	11/09/1994	pbg
Toluene	ND	2.5	ug/kg	11/09/1994	pbg
Ethylbenzene	ND	2.5	ug/kg	11/09/1994	pbg
Xylenes (Total)	ND	2.5	ug/kg	11/09/1994	pbg
Bromofluorobenzene (SURR)	80		% Rec.	11/09/1994	pbg
METHOD M8015 (EXT., Solid)					
as Diesel	ND	1	mg/kg	11/08/1994	tts

Ref: Kawahara Nursery, Job No. 94015

MATRIX SPIKE / MATRIX SPIKE DUPLICATE

Parameter	Matrix Spike % Rec.	Matrix Spike Dup % Rec.	RPD	Spike Amount	Sample Conc.	Matrix Spike Conc.	Matrix Spike Dup. Conc.	Units	Date Analyzed	Analyst Initials
Cyanide (Total)	92.0	98.4	6.7	1.88	ND	1.73	1.81	mg/kg	11/09/1994	mee
Lead (GFAA,WET)	89.3	93.7	4.8	0.125	0.01	0.1216	0.1271	mg/L	11/14/1994	djm
METHOD 8020 (GC,Liquid)										
Benzene	98.0	101.0	2.9	19.9	ND	19.5	20.1	ug/L	11/11/1994	lss
Toluene	97.1	101.8	4.6	82.9	ND	80.5	84.4	ug/L	11/11/1994	lss
TPH (Gas/BTXE,Solid)										
as Gasoline	108.2	106.6	1.5	5.00	ND	5.41	5.33	mg/kg	11/09/1994	pbg
Benzene	102.7	105.5	2.7	110	ND	113	116	ug/kg	11/09/1994	pbg
Toluene	102.6	104.8	2.1	378	ND	388	396	ug/kg	11/09/1994	pbg
TPH (Gas/BTXE,Solid)										
as Gasoline	90.0	96.2	6.7	5.00	ND	4.5	4.81	mg/kg	11/09/1994	pbg
Benzene	89.1	97.3	8.8	110	ND	98	107	ug/kg	11/09/1994	pbg
Toluene	92.9	98.9	6.3	378	ND	351	374	ug/kg	11/09/1994	pbg
METHOD M8015 (EXT., Solid)										
as Diesel	92.2	100.0	8.0	16.7	ND	15.4	16.7	mg/kg	11/08/1994	tts

Client Name: Blymyer Engineers, Inc
Client Acct: 49500
NET Job No: 94.05254

Date: 11/15/1994
ELAP Cert: 1386
Page: 12

Ref: Kawahara Nursery, Job No. 94015

LABORATORY CONTROL SAMPLE REPORT

Parameter	LCS % Recovery	RPD	LCS Amount Found	LCS Amount Expected	Units	Date Analyzed	Analyst Initials
Flashpoint/Ignitability	100.0		81	81	Degree F	11/11/1994	shr
Sulfide	96.1		346	360	mg/kg	11/07/1994	vid
Lead (GFAA,WET)	94.8		0.1185	0.125	mg/L	11/14/1994	djm
METHOD M8015 (EXT., Solid) as Diesel	104.2		17.4	16.7	mg/kg	11/08/1994	tts

NET®

KEY TO ABBREVIATIONS and METHOD REFERENCES

<	:	Less than; When appearing in results column indicates analyte not detected at the value following. This datum supercedes the listed Reporting Limit.
*	:	Reporting Limits are a function of the dilution factor for any given sample. Actual reporting limits and results have been multiplied by the listed dilution factor. **Do not** multiply the reporting limits or reported values by the dilution factor.
dw	:	Result expressed as dry weight.
mean	:	Average; sum of measurements divided by number of measurements.
mg/Kg (ppm)	:	Concentration in units of milligrams of analyte per kilogram of sample, wet-weight basis (parts per million).
mg/L	:	Concentration in units of milligrams of analyte per liter of sample.
mL/L/hr	:	Milliliters per liter per hour.
MPN/100 mL	:	Most probable number of bacteria per one hundred milliliters of sample.
N/A	:	Not applicable.
NA	:	Not analyzed.
ND	:	Not detected; the analyte concentration is less than the applicable listed reporting limit.
NTU	:	Nephelometric turbidity units.
RPD	:	Relative percent difference, 100 [Value 1 - Value 2]/mean value.
SNA	:	Standard not available.
ug/Kg (ppb)	:	Concentration in units of micrograms of analyte per kilogram of sample, wet-weight basis (parts per billion).
ug/L	:	Concentration in units of micrograms of analyte per liter of sample.
umhos/cm	:	Micromhos per centimeter.

Method References

Methods 100 through 493: see "Methods for Chemical Analysis of Water & Wastes", U.S. EPA, 600/4-79-020, Rev. 1983.

Methods 601 through 625: see "Guidelines Establishing Test Procedures for the Analysis of Pollutants" U.S. EPA, 40 CFR, Part 136, Rev. 1988.

Methods 1000 through 9999: see "Test Methods for Evaluating Solid Waste", U.S. EPA SW-846, 3rd edition, 1986., Rev. 1, December 1987.

SM: see "Standard Methods for the Examination of Water & Wastewater, 17th Edition, APHA, 1989.

Revised September, 1993
abb.93

BLYMYER ENGINEERS, INC.

1829 Clement Avenue
Alameda, CA 94501 (510) 521-3773 FAX (510) 865-2594

#3532

CHAIN OF CUSTODY RECORD

PAGE ____ OF ____

JOB # 94015 | PROJECT NAME/LOCATION: Kawahara Nursery

SAMPLERS (SIGNATURE): L. Beckman

TURNAROUND TIME: 10 DAY(S)

REMARKS:

DATE	TIME	COMP	GRAB	SAMPLE NAME/LOCATION	# OF CONTAINERS	TPH AS GASOLINE + BTXE (MOD EPA 8015/8020)	TPH AS DIESEL (MOD EPA 8015)	VOC (EPA 624/8240)	SEMI-VOC (EPA 625/8270)	TRPH (EPA 418.1)	BTXE (EPA 8020/602)	TOLP BTEX	STLC lead	PCB			HOLD	REMARKS
10/31/94		~~X~~	X	SS-1A,B	2							X	X	X				Composit in lab
"			X	MW-4 17'	1	X	X											use SS-A&B as comp
"			X	MW-4 12'	1	X	X											
"			X	MW-5 12' use 12.5	2	X	X											hold MW 5 7.5
"			X	MW-5 17'	1	X	X											hold MW 4 5.5
"			X	SB-1 10' use 7.5	1	X	X											per Laurie Fax
"			X	SB-1 17'	1	X	X											Blymyer to NF 11/4

REQUESTED BY: L Beckman

RESULTS AND INVOICE TO: Blymyer Engineers L Beckman

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE / TIME	REMARKS:	

WHITE: Accompany Sample YELLOW: BEI, After Lab Signs PINK: Original Sampler

BLYMYER
ENGINEERS, INC.

Standard Operating Procedure No. 2A

Completion of Borings as Groundwater Monitoring Wells

Revision No. 1

Approved By:

Michael S. Lewis

Michael Lewis
Quality Assurance/Quality Control Officer
Blymyer Engineers, Inc.

6/22/94

Date

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Attachments:

Boring and Well Construction Log
Drum Inventory Sheet
Monitoring Well Construction Specifications for Unconfined Water-Bearing Zone
Monitoring Well Construction Specifications for Confined Water-Bearing Zone

1.0 Introduction and Summary

This Standard Operating Procedure (SOP) describes methods for installation of a groundwater monitoring well within an existing borehole. The well construction techniques discussed in this SOP are generally suitable for construction of wells that are screened in one groundwater zone and that will be used for water quality sampling and/or observations of groundwater elevation (piezometers). Typically, 2- or 4-inch-diameter wells with total depths less than 80 feet will be installed using this SOP. Large-diameter or deeper wells may require modification of the methods described herein. Discussion of specific well casing and screen material is beyond the scope of this SOP, and well casing and screen material should be selected on a site-specific basis. The permitting activities of this SOP apply in California. Different permits are required in other locations.

The procedures for construction of wells generally consist of well permitting, well design, decontamination of well casing and screen, simultaneous assembly and lowering of casing and screen into the borehole, placement of the filter pack around the screen, installation of a bentonite seal above the filter pack, sealing of the remaining annular space with grout, and surface completion.

2.0 Equipment and Materials

- Pressure washer or steam cleaner.
- Equipment for mixing grout.
- Clean water.
- Hand tools (pipe wrenches, chain wrenches, pipe vise, shovels, rubber mallet, etc.).
- Tape measure long enough to reach the bottom of the boring.
- Well casing, screen, bottom plug, and well cap using threaded, flush-joints. Use Schedule 40 PVC unless noted otherwise. Well screen shall be factory slotted.
- Stainless steel machine screws.
- Centralizers (generally not required).

- Buckets and bristle brushes for decontamination.
- Low-residue, organic-free soap such as Liquinox® or Alconox®.
- Tremie pipe (1.5-inch diameter).
- Filter pack material (typically clean sand of specified gradation).
- Bentonite pellets for seal above filter pack, unaltered sodium bentonite.
- Type I or Type II Portland cement for grout.
- Bentonite powder (for grout only).
- Locking well cap with lock.
- Emco Wheaton A721 Monitoring Well manhole traffic cover (or equivalent).
- Steel, 55-gallon drums that meet the specification of DOT 17H.
- Drum labels, Boring and Well Construction Log, Drum Inventory Sheet, DWR 188 (Water Well Drillers Report), and field notebook.
- Calculator.

Site-specific conditions may require other specialized equipment.

3.0 Typical Procedures

The following procedures apply to most well installations. However, normal field practice requires re-evaluation and modification of these procedures upon encountering unexpected situations during well construction. Deviations from the following procedures may occur and should be documented.

1. Determine local jurisdiction charged with regulation of wells and apply for required local permits or prepare required workplan. Local jurisdictions may include county, water district, or city. Determine special design considerations (such as minimum length of grout seal) and inspection requirements (such as witnessing the placement of the grout

seal).

2. Well design begins with the conception of the purpose for the well, and should include consideration of the analytes of interest, anticipated subsurface conditions at the intended well location, and the actual subsurface soil conditions encountered during drilling and recorded on the Boring and Well Construction Log (copy attached).

3. Prior to installation in the borehole, well casing and screen should be decontaminated and inspected. If not certified clean by the manufacturer and delivered to the site in a protective casing, decontaminate well casing and screen and all fittings prior to insertion into the borehole.

4. Change decontamination solutions and clean decontamination trough, buckets, and brushes between boreholes.

5. Assembly of the well screen and blank casing is accomplished simultaneously with insertion into the borehole. Initially, a bottom plug is screwed onto the bottom of the screen (or, if the bottom of the screen is cut, the plug is attached with stainless steel machine screws) and the screen is lowered into the borehole. The next length of casing (screen or blank depending on the specific well design) is attached and the process is repeated until the well extends from the bottom of the borehole to the ground surface. Various types of mechanical clamps are used to prevent dropping of the well screen into the well during assembly. It is useful to leave surplus blank casing extending above grade at this point to facilitate subsequent construction activities. Attached are Blymyer Engineers, Inc.'s Monitoring Well Construction Specifications for Unconfined Water-Bearing Zone and Monitoring Well Construction Specifications for Confined Water-Bearing Zone to be used as references once the hydraulic characteristics of the aquifer have been determined. The well casing and screen should be installed as straight vertically as possible. Centralizers should be used if necessary to center the casing in the borehole.

   Measure the length of well screen and blank casing inserted into the borehole and record the quantities on the Boring and Well Construction Log, a copy of which is attached. The total length of well screen and casing should be confirmed by taping. Cap the well casing temporarily so that no foreign materials may enter the well during installation.

6. Install the filter pack by pouring filter pack material into the annulus between the casing and borehole. Unless impractical due to site conditions or otherwise delineated in a Workplan, Quality Assurance Project Plan, or Sampling Plan, in an unconfined water-

bearing zone, install filter pack from an elevation approximately 6 inches beneath the elevation of the bottom plug of the well casing to approximately 2 feet above the top of the screened interval. In a confined water-bearing zone, install the filter pack from an elevation approximately 6 inches beneath the elevation of the bottom plug of the well casing to the approximate bottom of the confining layer which should correspond to the top of the screen interval.

If augers or drill casing remain in the ground during well construction, the annulus between the augers and the casing may be used as a tremie pipe. If the well is constructed in an open borehole that exceeds 20 feet of depth or is below the groundwater table, then the filter pack should be placed using a tremie pipe. The filter pack should be poured slowly into the borehole and the depth to the top of the filter pack should be tagged periodically with a tape. Adequate time should be allowed for the filter pack material to settle through standing water prior to tagging or the tape may be lost by burial. Tagging may be time consuming but provides reasonable precaution against filter pack bridging during installation.

If augers are being used as a tremie pipe, they should be withdrawn as the filter pack is placed. During placement, the elevation of the tip of the augers or temporary casing should be kept slightly above the top of the filter pack (but no more than 5 feet above the top of the filter pack). Minimizing the separation between the top of the filter pack and tip of the augers or temporary casing during filter pack placement will help prevent inclusions of formation material or slough into the filter pack. However, if the tip of the augers or temporary casing is not kept above the top of the filter pack and the filter pack is allowed to settle within the augers or temporary casing, a filter pack bridge may occur and the well casing may become "locked" inside the augers/temporary casing. The bridged material should be broken mechanically before installing more filter pack material.

The theoretical quantity of filter pack material required to fill the annulus should be calculated. The quantity of filter pack material actually installed in the well should be measured and compared to the calculated quantity. Both quantities should be recorded on the Boring and Well Construction Log.

7. The bentonite seal is installed by pouring bentonite pellets onto the top of the filter pack. The bentonite seal should be tamped down to ensure that no bridging has occurred. For wells deeper than 20 feet, a tremie pipe should be used to place the bentonite seal. Unless impractical due to site-specific conditions or otherwise delineated in a Workplan, Quality Assurance Project Plan, or Sampling Plan, the bentonite seal should extend

approximately 2 feet above the top of the filter pack. The manufacturer's name, quantity used, and type of bentonite used should be recorded on the Boring and Well Construction Log. The top of the bentonite seal should be measured by taping. A tremie pipe may also be used in small-diameter boreholes or in formations prone to bridging or collapse. The tremie pipe is lifted as the bentonite pellets are poured onto the top of the filter pack. If placed in the unsaturated zone, clean water (approximately 5 gallons) should be poured on top of the pellets after their installation and the pellets should be allowed to hydrate for approximately 10 minutes before proceeding with installation of the overlying grout seal.

8. Where the top of the screened interval is deeper than 5 feet, the grout seal should be tremied into the well to prevent inclusions of formation material or slough into the grout seal. Unless otherwise delineated in the Workplan, Quality Assurance Project Plan, or Sampling Plan, the grout seal should consist of neat cement grout (5.5 gallons of water in proportion to one 94-pound bag of Type I or Type II Portland cement (ASTM C-150)). Water used to hydrate the cement is to be free of contaminants and organic material. Bentonite powder may added to reduce shrinkage, retain flexibility to accommodate freeze/thaw conditions, and improve fluidity. If bentonite powder is to be used, add 3 to 5 pounds of bentonite powder with 6.5 gallons of water and one 94-pound bag of Type I or Type II Portland cement. The water and bentonite should be mixed first before adding the cement. Local requirements may require inspection of grout seal placement by the regulating authority.

   If augers or temporary casing remain in the borehole during grouting, the level of the grout should be kept above the tip of the augers or casing to help prevent inclusions of formation material in the grout seal.

   The volume of the grout actually used should be recorded on the Boring and Well Construction Log and compared to the theoretical annular volume of the sealed interval. Any discrepancies should be noted on the Boring and Well Construction Log.

9. Complete the surface of the well by installing an Emco Wheaton A721 Monitoring Well Manhole traffic cover (or equivalent) in accordance with the attached construction specification. Attach the locking cap and lock.

10. The completed well should be protected from disturbance while the bentonite seal hydrates and the grout cures. Further well activities, such as development or sampling, should be withheld for a period of 72 hours to allow these materials to obtain an initial set. Local requirements may require longer than 72 hours.

11. Complete and file form DWR 188 (Water Well Drillers Report) and submit to local agency.

12. Containerize decontamination liquids in 17H steel drums. Affix completed "Caution - Pending Analysis" labels to the drums.

13. Complete the Drum Inventory Sheet (copy attached) and the Boring and Well Construction Log.

14. Enter descriptions of field work performed in the field notebook.

4.0 Quality Assurance and Quality Control (QA/QC)

Quality assurance checks for well completion include comparison of theoretical versus actual volumes of filter pack, bentonite seal, and grout seal. Discrepancies that indicate actual "take" was less than theoretical may indicate inclusions of formation material or slough within the annulus. Specific attention to such discrepancies is necessary if the bentonite seal and grout seal are needed to separate contaminated from uncontaminated zones that may be penetrated by the well.

Other quality assurance checks include accurate measurement and documentation of the lengths and types of materials used to complete the well.

5.0 Documentation

Observations, measurements, and other documentation of the well completion effort should be recorded on the following:

- Field notebook
- Boring and Well Construction Log
- DWR 188 (Water Well Drillers Report)
- Drum Inventory Sheet

Documentation should include any deviations from this SOP, as well as documentation of the containerization and disposal of investigation-derived waste.

6.0 Decontamination

Materials used for filter pack, bentonite seal, and grout seal should be new at the beginning of each project. Damaged or partially-used containers of material that are brought on site by drillers or other material suppliers should not be used for well completion. If there is sufficient question regarding contamination of materials, obtain representative samples for later laboratory testing.

If not certified clean by the manufacturer and delivered to the site in a protective casing, decontaminate well casing and screen and all fittings prior to insertion into the borehole.

Between each borehole, appurtenant items that contacted downhole soil and groundwater should be decontaminated. The drill rig should be steam cleaned or pressured washed as a final decontamination event. On-site decontamination should be conducted within the confines of a trough or lined pit to temporarily contain the wastewater. Between each borehole and prior to demobilization, the trough or lined pit should be decontaminated by steam cleaning or pressure washing. If a rack or other support is used to suspend appurtenant items over the trough or lined pit during decontamination, only the rack or other support needs to be decontaminated between boreholes.

Prior to insertion in each borehole, the measuring tape, and other materials and supplies that may directly contact the soil or groundwater, should be decontaminated. Decontamination of these items should consist of a soap wash (Alconox®, Liquinox®, or other low-residue, organic-free soap) followed by a clean water rinse. Decontamination liquids should be stored in labeled 17H drums.

Between each borehole, buckets and brushes should be decontaminated by steam cleaning or pressure washing. Before installation of each well is begun, fresh decontamination solutions should be prepared. Decontaminated equipment should be kept off of the ground surface. Cleaned equipment should be placed on top of plastic sheeting, which is replaced after completion of each borehole, or on storage racks.

More rigorous decontamination procedures may be employed if necessary to meet sampling or QA/QC requirements.

7.0 Investigation-Derived Waste

Wastes resulting from the activities of this SOP may include decontamination liquids and miscellaneous waste (paper, plastic, gloves, bags, etc.). These wastes should be containerized in 17H steel drums for each borehole. Wastes from multiple boreholes may be combined within a single drum if field observations (presence or absence of chemical staining and field organic vapor monitoring) indicate the boreholes are similarly uncontaminated or similarly contaminated. Given reasonable doubt, separate drums should be used for waste from each borehole.

Completed "Caution - Analysis Pending" labels should be affixed to each drum.

8.0 References

Aller, L., Bennett T.W., Hackett G., Petty R.J., Lehr J.H., Sedoris H., and Nielson D.M., 1989. Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells. National Water Well Association, Dublin, OH, 1989.

American Society for Testing and Materials, 1992. ASTM Standards On Ground Water and Vadose Zone Investigations. ASTM, Philadelphia, PA, 1992.

Driscoll, F.G., 1986. Groundwater and Wells. Johnson Filtration Systems Inc., St. Paul, MN, 1986.

Neilson, D.B., 1991. Practical Handbook of Ground-Water Monitoring. Lewis Publishers, Chelsea, MI, 1991.

United States Environmental Protection Agency, 1992. RCRA Ground-Water Monitoring: Draft Technical Guidance. U.S. EPA, 1992.

BLYMYER
ENGINEERS, INC.

BORING & WELL CONSTRUCTION LOG:

Job No.:
Client:
Site:

Date Drilled:
Sample Container:

Driller:
Drilling Contractor:
Logged By:
Drilling Equipment:
Bore Diameter:
Total Depth: Ft.

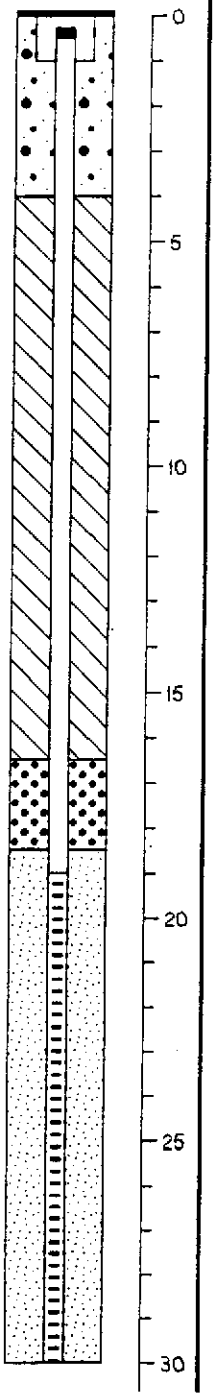
Well Completion Depth: '
Component Size/Type

Depths in Feet
From To

Surface Completion:
Blank Casing:
Slotted Casing:
Filter Pack:
Seal:
Annular Seal:
Surface Seal:
Bottom Seal:

Initial Water Level:
Stabilized water level:

Depth (ft)	Blows/6 In.	P.I.D. (ppm)	Samples	DESCRIPTION	Unified Soil Classification	Graphic Log	Water Depth
0							
5							
10							
15							
20							
25							
30							



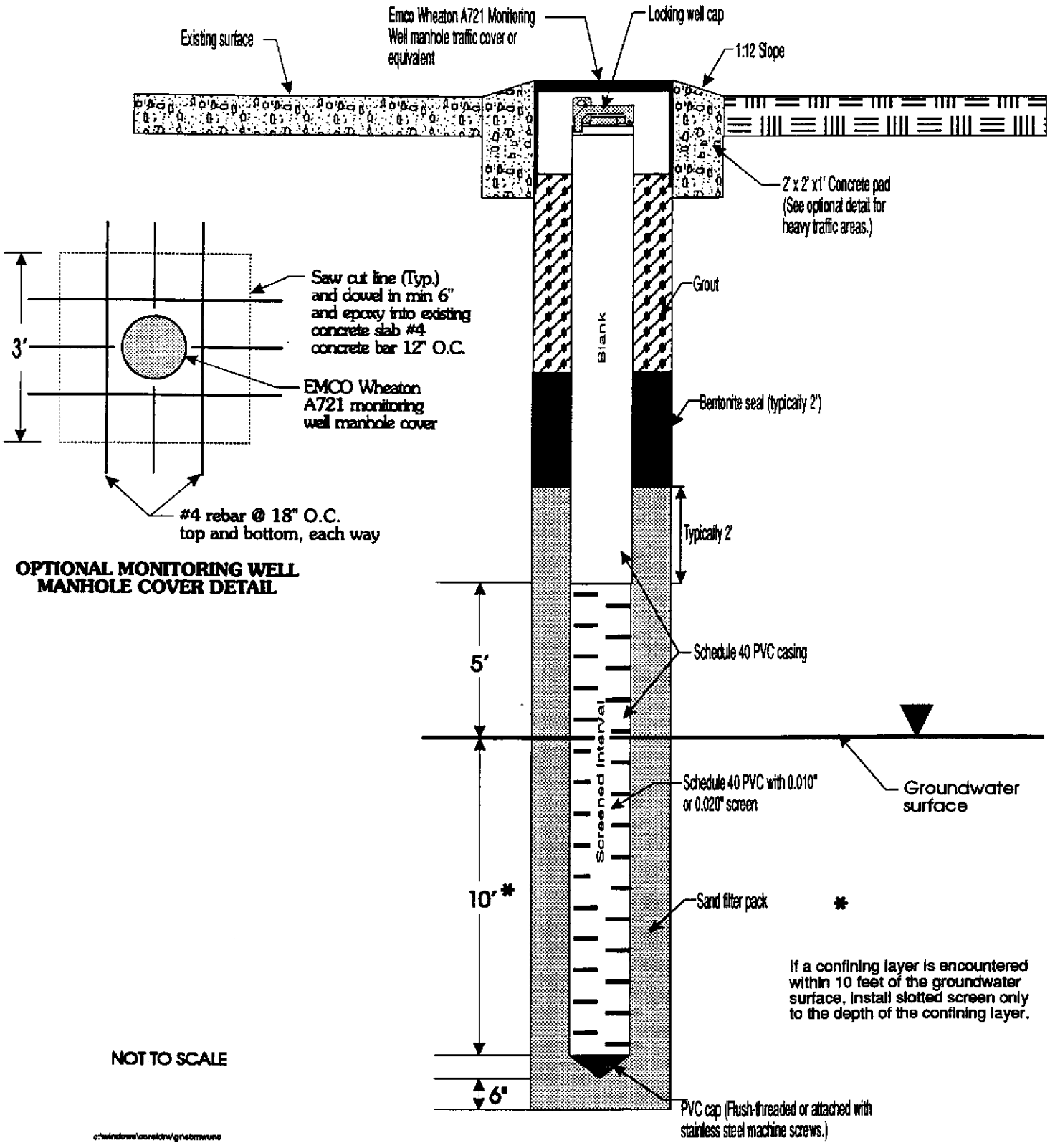
(continued on next page)

BLYMYER ENGINEERS DRUM INVENTORY FORM

Number of Drums	Date Generated	Person on-site when generated	Soil or Groundwater	Contents (Cuttings, Purge Water, Development Water, Decon Water, PPE)	% Full	Bore or Monitoring Well ID	Do Lab Results Exist for Contents?

Date Client Informed? _____ All drums labeled? _____

MONITORING WELL CONSTRUCTION SPECIFICATIONS FOR UNCONFINED WATER-BEARING ZONE

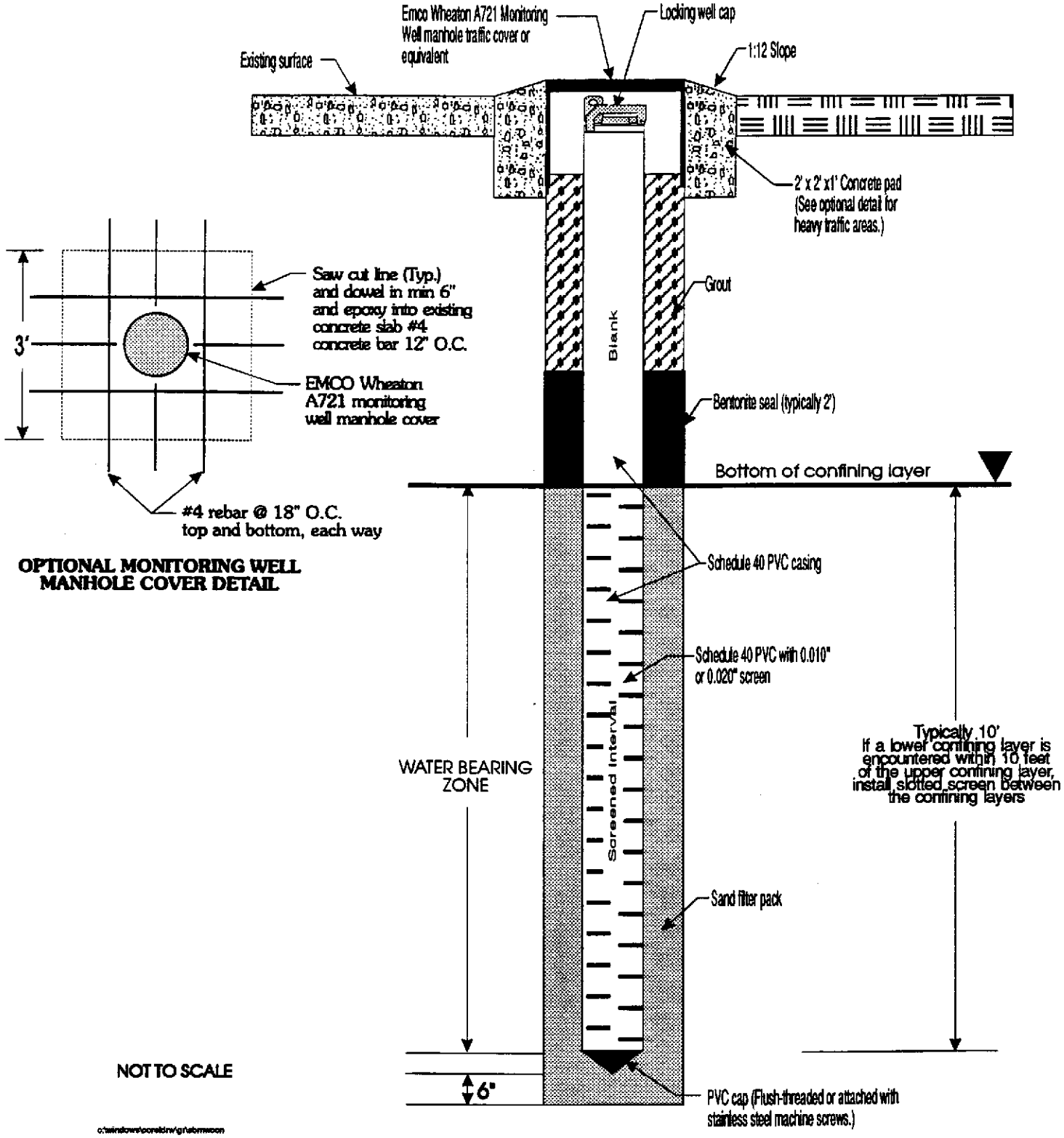


OPTIONAL MONITORING WELL MANHOLE COVER DETAIL

NOT TO SCALE

c:\windows\coreldrw\gr\ebmwuno

MONITORING WELL CONSTRUCTION SPECIFICATIONS FOR CONFINED WATER-BEARING ZONE



OPTIONAL MONITORING WELL MANHOLE COVER DETAIL

NOT TO SCALE

c:\windows\coreldrw\gr\ebmwcon

APPENDIX G

BLYMYER
ENGINEERS, INC.

Standard Operating Procedure No. 2B

Groundwater Monitoring Well Development

Revision No. 1

Approved By:

Michael S. L

Michael Lewis
Quality Assurance/Quality Control Officer
Blymyer Engineers, Inc.

6/24/94

Date

Table of Contents

1.0 Introduction and Summary 1

2.0 Equipment and Materials 1

3.0 Typical Procedures 2

4.0 Quality Assurance and Quality Control 4

5.0 Documentation 5

6.0 Decontamination 5

7.0 Investigation-Derived Waste 6

8.0 References 6

Attachments:

Drum Inventory Sheet
Well Development Log

1.0 Introduction and Summary

This Standard Operating Procedure (SOP) describes procedures to develop wells that have been properly installed. Typically, fine soil particles are entrained within the filter pack and adjacent formation during well installation. The well development procedures described herein are intended to help remove the fine soil particles, resulting in enhanced hydraulic response of the well and increased representativeness of groundwater samples collected from the well for chemical analysis.

Typically, this SOP will be used to develop 2- or 4-inch-diameter groundwater monitoring wells and occasionally larger diameter monitoring or pumping wells, all screened within a single groundwater zone. The procedures described herein may also need modification if floating product or an immiscible dense layer (sinker) is observed in the well.

Well development activities generally include decontaminating the downhole equipment, repetitive combinations of surging/swabing and overpumping/bailing, measurement and observation of well yield, turbidity, and field parameters, and containerizing the development wastewater. Development is typically conducted until no further improvement in well response and turbidity is observed or a reasonable time has been devoted to development.

2.0 Equipment and Materials

- Pressure washer or steam cleaner.
- Buckets and bristle brushes for decontamination.
- Low-residue, organic-free soap such as Liquinox® or Alconox®.
- Clean water.
- Steel, 55-gallon, open-top drums that meet the specification of DOT 17H.
- Field organic vapor monitor.
- Glass beaker, ±250 milliliter for measurement of field parameters. A similar flow-through cell may also be used.
- Water level meter.

- Drum labels, Well Development Log, Drum Inventory Sheet, and field notebook.

- pH, temperature, and specific conductivity instruments, including pH and specific conductivity standards approximating or spanning the natural groundwater parameters.

- Vented surge block or swab of appropriate diameter for the screened interval of the well casing. (Do not use a swab on PVC well casing).

- Bailing and/or overpumping equipment consisting of one or a combination of the following:

  Bailer: Stainless steel or PVC. Dedicated or new bailer rope. Generally as large a diameter as will fit down well.

  Surface Centrifugal Pump: Limited to water lift of approximately 20 feet. Dedicated or new flexible plastic suction hose. Foot valve and flow control valve optional.

  Air-Lift Pump: Dual-casing assembly with eductor casing (outer casing) to extend at least 2 feet beyond inner casing. Foot valve should be provided at the bottom of the eductor casing to prevent release of aerated water into the well when the air lift pump is turned off. Air from compressor should be dual-filtered to remove oil. Clean section of flexible polyethylene pipe and associated connectors to replace existing air compressor hose. (Do not use the air compressor hose.)

  Submersible Pump: Two-inch Grundfos electric submersible pump or equivalent.

As specified in the Site Safety Plan, additional safety and personnel decontamination equipment and materials may be needed.

3.0 Typical Procedures

The following procedures are intended to cover the majority of well development conditions. However, normal field practice requires re-evaluation of these procedures upon encountering unusual or unexpected conditions such as observation of floating product or an immiscible dense layer, measuring elevated pH in the development water, or observation of dramatic increases in turbidity as development progresses. Deviations from the following procedures may be expected and should be documented.

1. Development should generally be initiated after the well sealing materials (grout) have obtained an initial cure. Typically, development may begin 3 to 7 days after well completion.

2. Remove top cap and perform field organic vapor monitoring of well casing.

3. Measure static water level and total depth of well. Compare total depth to well completion diagram. Calculate volume of standing water in casing.

4. Decontaminate downhole equipment in accordance with section 6.0. Verify effectiveness of oil-air separator on air-lift pump prior to use and record in field notebook. Place a clean white cloth over the air discharge, opening the discharge valve fully, and then check the cloth for oil staining.

5. Complete calibration of field equipment and record in field notebook.

6. Begin bailing or overpumping using as high an evacuation rate as possible. Record the following on the Well Development Log (copy attached) at the beginning of development and during each bail/overpump cycle:

   - Volume removed and time
   - pH, temperature, and specific conductance
   - Turbidity (clarity and color)
   - Approximate drawdown and well yield
   - Whether well was bailed/pumped dry
   - Other observations (such as presence of product) as appropriate

   Bail/overpump until at least one casing volume of standing water has been removed. Continue bailing/overpumping if the removed water remains very turbid, indicating removal of fines from the screened interval. Terminate bailing/overpumping upon improvement of clarity.

7. Surge/swab the well to loosen fines from the screened interval. Position vented surge block several feet above the screened interval and surge/swab with upward motion. The

initial surging motion should be relatively gentle. As the surge block is lowered, the force of the surging should be increased. Lower the surge/swab several feet and repeat, keep surging/swabbing progressively lower intervals until the bottom of the screened interval is reached. For each interval, surge/swab for several minutes or as indicated by field experimentation.

8. Repeat items 6 and 7 until evacuated water at the end of the bailing/overpumping cycle is low or non-turbid, field parameters are representative of natural groundwater conditions, and well yield has stabilized at a value representative of the intercepted groundwater zone. Terminate development after a reasonable period of time even if these conditions are not observed. Unless otherwise specified in a Workplan, Quality Assurance Project Plan, or Sampling Plan, 4 hours may typically be taken as a reasonable time effort.

9. Terminate development by bailing or overpumping for an extended period of time to remove fines that have been loosened by the last cycle surging/swabing. Record final observations.

10. Containerize development water and decontamination wastewater in steel drum(s). Affix drum(s) with completed "Caution - Analysis Pending" labels.

4.0 Quality Assuarance and Quality Control (QA/QC)

Meters for measurement of field parameters should be calibrated at least once per day. Calibration standards should generally approximate or span natural groundwater characteristics. Recalibration may be appropriate if unusual measurements are noticed. Calibration activities should be documented in the field notebook.

Quantitative turbidity measurements may be taken with a turbidity meter (both field and laboratory versions are available). If qualitative descriptions of turbidity are used, these terms (high-, moderate-, low-turbidity) may be further defined on the well development log. Representative samples may also be collected and returned to the laboratory for measurement with a turbidity meter.

Because well development is typically the first activity of a newly completed well and because the activity is fairly vigorous, the following precautions may be appropriate:

- If product is observed but not anticipated within the groundwater zone intercepted by a well, and the well penetrated a contaminated overlying groundwater zone, well

development may be interrupted subject to further consideration or study. Faulty well sealing may result in migration of product from overlying to underlying groundwater zones, which is exacerbated during development.

- If elevated pH is observed but not anticipated, and the well is being developed soon after completion, well development may be interrupted subject to further consideration or study. Elevated pH may originate from grout that has not yet cured, or from grout infiltration into the filter pack.

- If turbidity increases dramatically after surging/swabbing and does not return to previously observed levels, the cause may be a broken well casing, broken screen, or dislodged end cap, which allows soil to enter the casing unretarded by the filter pack. Probing the well may disclose a break or faulty joint. Consider interrupting well development if this condition is suspected.

5.0 Documentation

The well completion schematic should be taken into the field to serve as reference information. Observations, measurements, and other documentation of the development effort should be recorded on the following:

- Field notebook
- Well Development Log
- Drum Inventory Sheet

Documentation should include any deviations from this SOP, as well as the documentation of the containerization and disposal of investigation-derived waste.

6.0 Decontamination

Prior to entering the site, well development equipment should be decontaminated by steam cleaning, pressure washing, or equivalent.

Prior to development of each well, downhole equipment should be decontaminated by steam cleaning or pressure washing, washing with soap, and rinsing with tap water, or equivalent.

Equipment should be steam cleaned, pressure washed, or equivalent, after well development is

complete.

7.0 Investigation-Derived Waste

Development water and decontamination wastewater should be containerized in steel drums. Drums should be labeled with completed "Caution - Analysis Pending" labels, including: generator's name, accumulation date, a description of contents, and well number of waste origination. Waste from different wells may be combined in single drums, but suspected chemically-affected and clean wastes should not be mixed.

8.0 References

Aller, L., Bennett T.W., Hackett G., Petty R.J., Lehr J.H., Sedoris H., and Nielson D.M., 1989. Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells. National Water Well Association, Dublin, OH, 1989.

American Society for Testing and Materials, 1992. ASTM Standards On Ground Water and Vadose Zone Investigations. ASTM, Philadelphia, PA, 1992.

Driscoll, F.G., 1986. Groundwater and Wells. Johnson Filtration Systems Inc., St. Paul, MN, 1986.

Nielson, D.M., 1991. Practical Handbook of Ground-Water Monitoring. Lewis Publishers, Chelsea, MI, 1991.

United States Environmental Protection Agency, 1992. RCRA Ground-Water Monitoring: Draft Technical Guidance. U.S. EPA, 1992.

BLYMYER ENGINEERS DRUM INVENTORY FORM

Number of Drums	Date Generated	Person on-site when generated	Soil or Groundwater	Contents (Cuttings, Purge Water, Development Water, Decon Water, PPE)	% Full	Bore or Monitoring Well ID	Do Lab Results Exist for Contents?

[illegible]

Date Client Informed? _____ All drums labeled? _____

BLYMYER ENGINEERS, INC.

WELL DEVELOPMENT LOG

Page _____ of _____

All measurements taken from: ☐ Top of Casing ☐ Protective Casing ☐ Ground Level

Well Number: _____
Date: _____
Time Start: _____ End: _____
Client: _____
Project: _____
Job Number: _____
Installation Date: _____
Well Diameter: _____
Condition of Manhole Locking Cap: _____

Borehole Diameter: _____
Screen Length: _____
Measured Depth (pre-development): _____
Static Water Level (ft.): _____
Standing Water Column (ft.): _____
One Well Volume (gal.): _____
One Annulus Volume (gal.): _____
Equipment Calibrated: _____

Qty. of Drilling fluid Lost: _____
Minimum Gal. to be Purged: _____
Development Method: _____
Purging Equipment: _____
Water Level Equipment: _____
T/pH/EC Meter: _____
Turbidity Meter: _____
Other: _____

Time	Amount Purged (gal)	Field Parameters Measured						Comments	Field Tech.
		EC	pH	Temperature	Turbidity	PID			

H:\LWBECK\WELLDEV.SHT

APPENDIX H

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588 VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 16550
Ashland Ave, San Lorenzo, CA

CLIENT
Name Kawahara Nursery
Address 16550 Ashland Phone
City San Lorenzo Zip

APPLICANT
Name Blymyer Engineers, Inc
(L Burkman)
Address 1829 Clement Phone 521-3773
City Alameda Zip 94501

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection		General	
Water Supply		Contamination	
Monitoring	X	Well Destruction	

PROPOSED WATER SUPPLY WELL USE
Domestic Industrial Other Monitoring
Municipal Irrigation

DRILLING METHOD:
Mud Rotary Air Rotary Auger X
Cable Other

DRILLER'S LICENSE NO. 485165

WELL PROJECTS
Well Casing Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 20 ft.
Surface Seal Depth 2 ft. Number 3

GEOTECHNICAL PROJECTS
Number of Borings Maximum
Hole Diameter 8 in. Depth 18 ft.

ESTIMATED STARTING DATE 10/24/94
ESTIMATED COMPLETION DATE Dec 94

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

APPLICANT'S SIGNATURE Louis R. Blymyer Date 10/17/94

FOR OFFICE USE

PERMIT NUMBER 94660
LOCATION NUMBER

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A.) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

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

(C.) GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

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

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 17 Oct 94
Wyman Hong

31992

BLYMYER
ENGINEERS, INC.

Standard Operating Procedure No. 3

Groundwater Monitoring and Well Sampling Using a Bailer or Hand Pump

Revision No. 1

Approved By:

Michael Lewis
Quality Assurance/Quality Control Officer
Blymyer Engineers, Inc.

9/14/94
Date

Table of Contents

1.0 Introduction and Summary 1

2.0 Equipment and Materials 1

3.0 Typical Procedures 3

4.0 Quality Assurance and Quality Control 6

5.0 Documentation 6

6.0 Decontamination 7

7.0 Investigation-Derived Waste 7

8.0 References 8

Attachments:

Well Purging and Sampling Data form
Drum Inventory Sheet

Table I: Groundwater Sample Containers, Preservation, and Holding Time

1.0 Introduction and Summary

This Standard Operating Procedure (SOP) describes standard procedures to monitor, purge, and sample groundwater monitoring wells. This SOP will typically be used for 2- or 4-inch-diameter groundwater monitoring wells which have been properly installed and developed. The monitoring and sampling described herein is appropriate for a variety of groundwater analyses, including total and dissolved metals, volatile and semivolatile organic compounds, and general minerals. For newly installed and developed wells, the purging and sampling described in this SOP is typically performed at least 72 hours after well development to allow ambient groundwater conditions to re-establish in the vicinity of the well.

The procedures described in this SOP should be modified for domestic wells or wells with dedicated sampling equipment. The procedures should also be modified if product is observed in the well. These procedures may have to be modified if a sample of floating product (floater) or a sample of an immiscible dense layer (sinker) is to be collected.

Typical groundwater well monitoring, purging, and sampling activities include decontaminating equipment, measuring the potentiometric surface elevation and floating product thickness, purging the stagnant water from the well casing and filter pack, measuring field parameters, purging, terminating the purging process when field parameters stabilize, collecting groundwater samples, and labeling and preserving the collected samples.

2.0 Equipment and Materials

- Buckets and bristle brushes for decontamination.
- Low-residue, organic-free soap such as Liquinox® or Alconox®.
- If sampling is to be performed for metals, dilute (10%) reagent-grade nitric acid (for decontamination).
- Clean water (for decontamination).
- Distilled water (for decontamination and quality control blank samples).
- Cooler with ice (do not use blue ice or dry ice).
- Steel, 55-gallon, open-top drums, DOT 17H.

- Drums labels, Well Purging and Sampling Data form, Drum Inventory Sheet, chain-of-custody form, and field notebook.

- Field organic vapor monitor. The make, model, and calibration information of the field organic vapor monitor (including compound and concentration of calibration gas) should be documented.

- Laboratory-cleaned containers of proper type and size for the analytical parameters (refer to Table I).

- Reagent-grade chemicals for sample preservation, as required for the analytical parameters (refer to Table I).

- If field filtration will be performed for dissolved metals analyses, at least three 45-micron cellulose acetate filters for each well and one filtering device. Alternate filter type and size (cellulose nitrate, Teflon®, or glass-fiber pre-filters) may be required. Do not use polycarbonate-screen filters. The make, type, and size of filter, including disposable filters, should be documented.

- PVC hand pump.

- Glass beaker, ±250-milliliter, for measurement of field parameters. A similar flow-through cell may also be used.

- Electronic water level meter or oil-water interface probe with a minimum accuracy of 0.01 feet.

- pH, temperature, and specific conductivity instruments, including pH and specific conductivity standards approximating or spanning the natural groundwater parameters. Oxidation-reduction potential (ORP) or dissolved oxygen meters may also be required.

- Bailers: polyethylene or Teflon®. Dedicated or new bailer rope. If samples are collected for volatile organic compound analysis, bailer should also be fitted with bottom-emptying device.

- Disposable polyethylene bailer (if groundwater is suspected or known to be contaminated). If groundwater is not suspected to be contaminated or due to preference, a Teflon® bailer may be used.

As specified in the Site Safety Plan, additional safety and personnel decontamination equipment and materials may be needed.

3.0 Typical Procedures

The following procedures are intended to cover the majority of monitoring, purging, and sampling conditions. However, normal field practice requires re-evaluation of these procedures and implementation of alternate procedures upon encountering unusual or unexpected conditions. Deviations from the following procedures are to be expected and should be documented.

1. Remove well cap and perform field organic vapor monitoring of well casing.

2. Decontaminate monitoring, purging, and sampling equipment. Section 6.0 of this SOP contains decontamination procedures.

3. Using the electronic water level meter, measure static water level and total well depth from the top-most portion of the well casing (either marked or notched) and compare to historic measurements. If floating product or an immiscible dense layer is suspected or is found to be present, use the oil-water interface probe instead of the electronic water level meter. Collect at least two of all measurements to verify accuracy and consistency. Two consecutive measurements should agree within 0.04 foot. Remeasure if discrepancies are noted with historic data. If the water level has not stabilized, collect at least three measurements at equal time intervals as the water level approaches stabilization. Repeat this process using successive sets of three measurements until the water level stabilizes. Document observation of product layer(s), if appropriate. Calculate volume of standing water in casing. Record the following observations during monitoring:

    - Well identification and elevation of the top of the well casing.
    - Description of measuring device.
    - Date and time of reading.
    - Name of person monitoring the well.
    - Depth to floating or immiscible dense product layer and initial water level and bottom depth of well readings.

- Stabilized water level with the procedures, data, and computations noted in the field notebook and Well Purging and Sampling Data form to document determination of the stabilized water level.

4. Purge well by repeatedly lowering the bailer into the well, allowing the bailer to fill, removing the bailer, and emptying the collected groundwater into a 55-gallon drum or other suitable container. If using a hand pump, pump the discharge water directly into a drum. Record the following observations at the beginning of purging, periodically during purging, and during sampling:

   - Purge volume and time.
   - pH, temperature, and specific conductivity (measure initially and after removal of each casing volume).
   - Turbidity (clarity and color).
   - Approximate drawdown and well yield during purge.
   - Whether well was purged dry.
   - Other observations (such as presence of product) as appropriate.

5. Terminate purging when one of the following conditions is observed:

   Quick Recharge Wells:
   Well shows stabilized field parameters (three consecutive readings of each parameter within 15% of one another) and at least 3 casing volumes of standing water have been removed. If field parameters have not stabilized after removal of 10 casing volumes of standing water, terminate purging anyway. Wells should be allowed to recover to at least 80% of the original standing water depth prior to sampling.

   Slow Recharge Wells:
   Wells that are initially purged dry, and do not recover to 80% of the original standing water depth within 2 hours, should be sampled when sufficient recovery has occurred to submerge the sampling bailer. Generally, 3 feet of recovery may be considered sufficient recovery for normal bailer submergence. However, never bail a well dry if the recharge rate causes the formation of water to vigorously cascade down the sides of the screen and

cause an accelerated loss of volatiles. If this condition is anticipated, purge three well casing volumes from the well at a rate that does not cause recharge water to be excessively agitated.

6. If recharge has submerged the entire screened interval, sample from mid-depth of screened interval. Otherwise, sample from mid-depth of water column at time of sampling.

7. If field filtration will be performed for dissolved metals analyses, filter sample. If the sample is moderately turbid or very turbid, collect companion filtered and unfiltered samples.

8. Slowly lower bailer through the well casing to minimize agitation and aeration of the sampled water. Transfer the groundwater sample into sample container(s) as designated in Table I, such that the sample containers designated for the most volatile analytes are filled first in descending order of volatility. Containers should generally be filled to capacity. Forty-milliliter glass vials should be filled from the bottom using a sample discharge tube (bottom-emptying device for bailer). Forty-milliliter vials should not have any headspace (air pocket). Replace well cap after sampling.

9. Label sample container(s), place packing materials around containers, and place on ice inside cooler.

10. Change decontamination solutions and clean decontamination buckets and brushes between wells.

11. Containerize purge and decontamination liquids in 17H steel drums. Affix completed "Caution - Analysis Pending" labels to the drums.

12. Complete Drum Inventory Sheet (copy attached).

13. Complete pertinent portion of the chain-of-custody form and enter field descriptions of work performed in the field notebook.

4.0 Quality Assurance and Quality Control (QA/QC)

Depending on the level of data validation required on a given project, quality control sampling may consist of none, one, or any combination of the following samples, to be collected at a pre-established frequency (i.e., one quality control sample for every 10 natural samples):

- Duplicate samples, using 40-milliliter vials only.
- Equipment blank - prepared by collecting a sample of deionized water which has been passed over and through decontaminated sampling equipment.
- Trip blanks - typically if analyses require collection of samples in 40-milliliter vials (typical frequency of 1 per day of sampling). A trip blank consists of a laboratory-supplied sample container filled with analyte-free water that is sent to the field in a sealed container and transported back to the laboratory. It is not opened in the field.
- Other quality control samples, including standard reference materials and natural matrix spikes.

Meters for measurements of field parameters should be calibrated at least once per day. Calibration standards should generally approximate or span natural groundwater characteristics. Recalibration may be appropriate if unusual measurements are noticed. Calibration activities should be documented in the field notebook.

5.0 Documentation

The following information should be compiled prior to sampling and taken into the field for reference:

- Well completion schematic
- Summary of historic water level, total depth, and field parameter measurements

Observations, measurements, and other documentation of the purging and sampling effort should be recorded on the following:

- Field notebook
- Well Purging and Sampling form
- Drum Inventory Sheet

Documentation should include any deviations from this SOP, as well as documentation of the containerization and disposal of sampling-derived waste.

6.0 Decontamination

Prior to purging and sampling each well, down-well equipment and equipment that will contact the sample (except sample containers) should be decontaminated according to the following procedure:

- Steam clean or pressure wash (optional unless oily contamination covers equipment)
- Wash with low-residue, organic-free soap
- Rinse with clean water
- Rinse with distilled water

If metals are included in the analytical parameters, the decontamination procedures should include:

(1) a dilute nitric acid rinse, and
(2) a second clean water rinse, prior to rinsing with distilled water

Prior to leaving the site, monitoring, purging, and sampling equipment should be decontaminated.

7.0 Investigation-Derived Waste

Purge water, excess sample, and decontamination liquids should be containerized in steel 17H drums. Drums should be labeled with "Caution - Analysis Pending" labels, including: Generator's name, well designation, and accumulation date. Generally, liquids from different wells may be combined, but liquids that are anticipated to be contaminated should not be mixed with liquids that are not thought to be contaminated.

8.0 References

American Society for Testing and Materials, 1992. ASTM Standards On Ground Water and Vadose Zone Investigations. ASTM, Philadelphia, PA, 1992.

Driscoll, F.G., 1986. Groundwater and Wells. Johnson Filtration Systems Inc., St. Paul, MN, 1986.

Korte, N. and Kearl, P., 1985. Procedures for the Collection and Preservation of Groundwater and Surface Water Samples and for the Installation of Monitoring Wells: Second Edition, GJ/TMC-08, U.S. Department of Energy, Technical Measurements Center, Grand Junction Projects Office, 1985.

Neilson, D.M., 1991. Practical Handbook of Ground-Water Monitoring. Lewis Publishers, Chelsea, MI, 1991.

United States Environmental Protection Agency, 1992. RCRA Ground-Water Monitoring: Draft Technical Guidance. U.S. EPA, 1992.

Table 1 Standard Operating Procedure No. 3 Groundwater Sample Containers, Preservation, and Holding Time		
Analytical Parameter	Method	References
Halogenated VOCs by GC	EPA 8010	1,2
Aromatic VOCs by GC	EPA 8020	1,2
Organochlorine Pesticides and PCBs	EPA 8080	1,2
Polynuclear Aromatic Compounds	EPA 8100, EPA 8310	1
Chlorinated Herbicides	EPA 8150	1,2
VOCs by GC/MS	EPA 8240	1,2
Semi-VOCs by GC/MS	EPA 8270	1,2
Total Recoverable Petroleum Hydrocarbons	EPA 418.1	1
TPH as Diesel	EPA 3550/8015M	3
TPH as Gasoline with BTEX Distinction	EPA 5030/8015M/8020	3
Metals	EPA 6010	1,2

References

(1) United States Environmental Protection Agency, 1986. Test Methods for Evaluating Solid Waste. U.S. EPA, 1986.
(2) Wagner, R.E., 1992. Guide to Environmental Analytical Methods. Genium Publishing Corp., Schenectady, NY, 1992.
(3) State of California LUFT Task Force, 1988. LUFT Manual: Guidelines for Site Assessment, Cleanup and Underground Storage Tank Closure. State of California, 1988.

Table 1 (Continued)
Standard Operating Procedure No. 3
Groundwater Sample Containers, Preservation, and Holding Time

Analytical Parameter	Containers	Preservation	Max. Holding Time
Halogenated VOCs by GC	Two 40-ml glass vials	Cool to 4°C*	14 days
Aromatic VOCs by GC	Two 40-ml glass vials	Cool to 4°C, HCl or H_2SO_4 to pH <2*	14 days
Organochlorine Pesticides and PCBs	Two 1-liter glass bottles	Cool to 4°C*	Extract within 7 days, analyze extract within 40 days
Polynuclear Aromatic Hydrocarbons	Two 1-liter glass bottles	Cool to 4°C, store in dark*	Extract within 7 days, analyze extract within 40 days
Chlorinated Herbicides	Two 1-liter glass bottles	Cool to 4°C*	Extract within 7 days, analyze extract within 40 days
VOCs by GC/MS	Two 40-ml glass vials	Cool to 4°C, HCl or H_2SO_4 to pH <2*	14 days
Semi-VOCs by GC/MS	Two 1-liter glass bottles	Cool to 4°C*	Extract within 7 days, analyze extract within 40 days
Total Recoverable Petroleum Hydrocarbons	Two 1-liter glass bottles	Cool to 4°C, H_2SO_4 to pH <2	28 days
TPH as Diesel	Two 1-liter glass bottles	Cool to 4°C	Extract within 14 days, analyze extract within 40 days
TPH as Gasoline with BTEX Distinction	Two 40-ml glass vials	Cool to 4°C, HCl to pH <2*	14 days
Metals	Two 500-ml polyethylene bottles	HNO_3 to pH <2 (after field filtration)	6 months

* Add 0.008% sodium thiosulfate ($Na_2S_2O_3$) if residual chlorine is present, such as in drinking water and treated sewage

Note: Use Teflon®-lined caps for all sample containers for organic compound analysis.

Well Purging and Sampling Data

Date	Project Number	Project Name
Well Number	Boring Diameter	Casing Diameter

Column of Liquid in Well	Volume to be Removed	
Depth to product	Gallons per foot of casing	=
Depth to water	Column of water	x
Total depth of well	Volume of casing	=
Column of water	No. of volumes to remove	x
	Total volume to remove	=

Method of measuring liquid
Method of purging well
Method of decontamination

Physical appearance of water (clarity, color, particulates, odor)
Initial
During
Final

Field Analysis	Initial	During		Final
Time				
Temperature (F)				
Conductivity (us/cm)				
pH				
Method of measurement				
Total volume purged				
Comments				

Sample Number	Amount of Sample

Signed/Sampler	Date
Signed/Reviewer	Date

Well Purging and Sampling Data

Date	11/8/94	Project Number	94015	Project Name	Kawahara
Well Number	MW-3	Boring Diameter	N/A	Casing Diameter	2"

Column of Liquid in Well		Volume to be Removed	
Depth to product	N/A	Gallons per foot of casing	= 0.17 gal/ft.
Depth to water	11.98 ft.	Column of water	x 7.27 ft.
Total depth of well	19.25 ft.	Volume of casing	= 1.2 gal.
Column of water	7.27 ft.	No. of volumes to remove	x 3
		Total volume to remove	= 3.6 gal.

Method of measuring liquid	Oil/water interface probe
Method of purging well	Disposable polyethylene bailer
Method of decontamination	Liqui-nox and distilled water

Physical appearance of water (clarity, color, particulates, odor)	
Initial	Clear, strong gasoline odor, sheen in purge bucket
During	Silty, dark color, strong gasoline odor, sheen in purge bucket
Final	Silty, dark color, strong gasoline odor, sheen in purge bucket

Field Analysis	Initial	During		Final
Time	12:54	12:59	13:05	13:11
Temperature (F)	66.5	66.7	66.0	65.8
Conductivity (us/cm)	1360	1300	1230	1230
pH	7.20	6.83	6.82	7.02
Method of measurement	Hydac meter			
Total volume purged	3.75 gal.			
Comments	Sampled with disposable polyethylene bailer			

Sample Number	Amount of Sample
MW-3	3-40ml VOA w/ HCl
	2-1l amber bottles

Signed/Sampler	Stephen W. Hall	Date	11/8/94
Signed/Reviewer	Janice A. Hall	Date	12/1/94

Well Purging and Sampling Data

Date	11/8/94	Project Number	94015	Project Name	Kawahara
Well Number	MW-4	Boring Diameter	N/a	Casing Diameter	2"

Column of Liquid in Well		Volume to be Removed	
Depth to product	N/A	Gallons per foot of casing	= 0.17 gal/ft.
Depth to water	12.75 ft.	Column of water	x 7.00 ft.
Total depth of well	19.75 ft.	Volume of casing	= 1.2 gal.
Column of water	7.00 ft.	No. of volumes to remove	x 3
		Total volume to remove	= 3.6 gal.

Method of measuring liquid	Oil/water interface probe
Method of purging well	Disposable polyethylene bailer
Method of decontamination	Liqui-nox and distilled water

Physical appearance of water (clarity, color, particulates, odor)	
Initial	Clear, no odor
During	Silty, brown color, no odor
Final	Silty, brown color, no odor

Field Analysis	Initial	During		Final
Time	11:53	11:58	12:05	12:11
Temperature (F)	62.2	62.0	61.1	61.5
Conductivity (us/cm)	1080	1060	1070	1080
pH	7.70	7.61	7.69	7.77
Method of measurement	Hydac meter			
Total volume purged	3.75 gal.			
Comments	Sampled with disposable polyethylene bailer			

Sample Number	Amount of Sample
MW-4	3-40ml VOA w/ HCl
	2-1l amber bottles

Signed/Sampler	Stephen G. Mathews	Date	11/8/94
Signed/Reviewer	[signature]	Date	12/15/94

Well Purging and Sampling Data

Date	11/8/94	Project Number	94015	Project Name	Kawahara
Well Number	MW-5	Boring Diameter	N/A	Casing Diameter	2"

Column of Liquid in Well		Volume to be Removed	
Depth to product	N/A	Gallons per foot of casing	= 0.17 gal/ft.
Depth to water	10.66 ft.	Column of water	x 9.34 ft.
Total depth of well	20.00 ft.	Volume of casing	= 1.6 gal.
Column of water	9.34 ft.	No. of volumes to remove	x 3
		Total volume to remove	= 3.8 gal.

Method of measuring liquid	Oil/water interface probe
Method of purging well	Disposable polyethylene bailer
Method of decontamination	Liqui-nox and distilled water

Physical appearance of water (clarity, color, particulates, odor)	
Initial	Clear, no odor
During	Slightly silty, tan color, no odor
Final	Silty, tan color, no odor

Field Analysis	Initial	During		Final
Time	10:30	10:36	10:42	10:48
Temperature (F)	69.4	66.1	65.5	65.6
Conductivity (us/cm)	1230	1230	1180	1180
pH	7.70	7.33	7.21	7.12
Method of measurement	Hydac meter			
Total volume purged	4.0 gal.			
Comments	Sampled with disposable polyethylene bailer			

Sample Number	Amount of Sample
MW-5	3-40ml VOA w/ HCl
	2-1l amber bottles

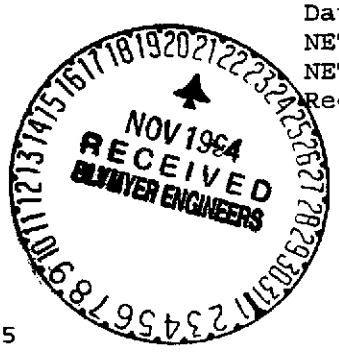
Signed/Sampler	Stephen G. Mihan	Date	11/8/94
Signed/Reviewer	James G. Baker	Date	12/15/94

APPENDIX K

NATIONAL ENVIRONMENTAL TESTING, INC.

Santa Rosa Division
435 Tesconi Circle
Santa Rosa, CA 95401
Tel: (707) 526-7200
Fax: (707) 526-9623

Laurie Buckman
Blymyer Engineers, Inc
1829 Clement Ave
Alameda, CA 94501



Date: 11/17/1994
NET Client Acct. No: 49500
NET Pacific Job No: 94.05405
Received: 11/09/1994

Client Reference Information

Kawahara/San Lorenzo CA 94015

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Results apply only to the samples analyzed. Reproduction of this report is permitted only in its entirety. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Approved by:

Jennifer L. Roseberry
Client Services Manager

Jim Hoch
Operations Manager

Enclosure(s)

Client Name: Blymyer Engineers, Inc
Client Acct: 49500
NET Job No: 94.05405

Date: 11/17/1994
ELAP Cert: 1386
Page: 2

Ref: Kawahara/San Lorenzo CA 94015

SAMPLE DESCRIPTION: MW-5
Date Taken: 11/08/1994
Time Taken: 11:15
NET Sample No: 222093

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
TPH (Gas/BTXE,Liquid)								
METHOD 5030/M8015	--						11/14/1994	2294
DILUTION FACTOR*	1						11/14/1994	2294
as Gasoline	ND		0.05	mg/L	5030		11/14/1994	2294
METHOD 8020 (GC,Liquid)	--						11/14/1994	2294
Benzene	ND		0.5	ug/L	8020		11/14/1994	2294
Toluene	ND		0.5	ug/L	8020		11/14/1994	2294
Ethylbenzene	ND		0.5	ug/L	8020		11/14/1994	2294
Xylenes (Total)	ND		0.5	ug/L	8020		11/14/1994	2294
SURROGATE RESULTS	--						11/14/1994	2294
Bromofluorobenzene (SURR)	97			% Rec.	5030		11/14/1994	2294
METHOD M8015 (EXT., Liquid)						11/14/1994		
DILUTION FACTOR*	1						11/15/1994	846
as Diesel	ND		0.05	mg/L	3510		11/15/1994	846

Client Name: Blymyer Engineers, Inc
Client Acct: 49500
NET Job No: 94.05405

Date: 11/17/1994
ELAP Cert: 1386

Ref: Kawahara/San Lorenzo CA 94015

SAMPLE DESCRIPTION: MW-4 #
Date Taken: 11/08/1994
Time Taken: 12:30
NET Sample No: 222094

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
TPH (Gas/BTXE,Liquid)								
METHOD 5030/M8015	--						11/14/1994	2294
DILUTION FACTOR*	1						11/14/1994	2294
as Gasoline	ND		0.05	mg/L	5030		11/14/1994	2294
METHOD 8020 (GC,Liquid)	--						11/14/1994	2294
Benzene	ND		0.5	ug/L	8020		11/14/1994	2294
Toluene	ND		0.5	ug/L	8020		11/14/1994	2294
Ethylbenzene	ND		0.5	ug/L	8020		11/14/1994	2294
Xylenes (Total)	ND		0.5	ug/L	8020		11/14/1994	2294
SURROGATE RESULTS	--						11/14/1994	2294
Bromofluorobenzene (SURR)	94			% Rec.	5030		11/14/1994	2294
METHOD M8015 (EXT., Liquid)						11/14/1994		
DILUTION FACTOR*	1						11/15/1994	846
as Diesel	ND		0.05	mg/L	3510		11/15/1994	846

Ref: Kawahara/San Lorenzo CA 94015

SAMPLE DESCRIPTION: MW-3
Date Taken: 11/08/1994
Time Taken: 13:30
NET Sample No: 222095

Parameter	Results	Flags	Reporting Limit	Units	Method	Date Extracted	Date Analyzed	Run Batch No.
TPH (Gas/BTXE,Liquid)								
METHOD 5030/M8015	--						11/15/1994	2302
DILUTION FACTOR*	500						11/15/1994	2302
as Gasoline	35,000		20	mg/L	5030		11/15/1994	2302
METHOD 8020 (GC,Liquid)	--						11/15/1994	2302
Benzene	3,600		200	ug/L	8020		11/15/1994	2302
Toluene	4,100		200	ug/L	8020		11/15/1994	2302
Ethylbenzene	2,700		200	ug/L	8020		11/15/1994	2302
Xylenes (Total)	18,000		200	ug/L	8020		11/15/1994	2302
SURROGATE RESULTS	--						11/15/1994	2302
Bromofluorobenzene (SURR)	112			% Rec.	5030		11/15/1994	2302
METHOD M8015 (EXT., Liquid)						11/14/1994		
DILUTION FACTOR*	10						11/15/1994	846
as Diesel	27	DL	0.5	mg/L	3510		11/15/1994	846

DL : The positive result appears to be a lighter hydrocarbon than Diesel.

Ref: Kawahara/San Lorenzo CA 94015

CONTINUING CALIBRATION VERIFICATION STANDARD REPORT

Parameter	CCV Standard % Recovery	CCV Standard Amount Found	CCV Standard Amount Expected	Units	Date Analyzed	Analyst Initials
TPH (Gas/BTXE,Liquid)						
as Gasoline	110.0	1.10	1.00	mg/L	11/14/1994	lss
Benzene	96.8	4.84	5.00	ug/L	11/14/1994	lss
Toluene	96.4	4.82	5.00	ug/L	11/14/1994	lss
Ethylbenzene	101.4	5.07	5.00	ug/L	11/14/1994	lss
Xylenes (Total)	100.0	15.0	15.0	ug/L	11/14/1994	lss
Bromofluorobenzene (SURR)	105.0	105	100	% Rec.	11/14/1994	lss
TPH (Gas/BTXE,Liquid)						
as Gasoline	98.0	0.98	1.00	mg/L	11/15/1994	aal
Benzene	95.2	4.76	5.00	ug/L	11/15/1994	aal
Toluene	90.2	4.51	5.00	ug/L	11/15/1994	aal
Ethylbenzene	101.2	5.06	5.00	ug/L	11/15/1994	aal
Xylenes (Total)	99.3	14.9	15.0	ug/L	11/15/1994	aal
Bromofluorobenzene (SURR)	109.0	109	100	% Rec.	11/15/1994	aal
METHOD M8015 (EXT., Liquid)						
as Diesel	106.0	1060	1000	mg/L	11/15/1994	tts

Ref: Kawahara/San Lorenzo CA 94015

METHOD BLANK REPORT

Parameter	Method Blank Amount Found	Reporting Limit	Units	Date Analyzed	Analyst Initials
TPH (Gas/BTXE,Liquid)					
as Gasoline	ND	0.05	mg/L	11/14/1994	lss
Benzene	ND	0.5	ug/L	11/14/1994	lss
Toluene	ND	0.5	ug/L	11/14/1994	lss
Ethylbenzene	ND	0.5	ug/L	11/14/1994	lss
Xylenes (Total)	ND	0.5	ug/L	11/14/1994	lss
Bromofluorobenzene (SURR)	116		% Rec.	11/14/1994	lss
TPH (Gas/BTXE,Liquid)					
as Gasoline	ND	0.05	mg/L	11/15/1994	aal
Benzene	ND	0.5	ug/L	11/15/1994	aal
Toluene	ND	0.5	ug/L	11/15/1994	aal
Ethylbenzene	ND	0.5	ug/L	11/15/1994	aal
Xylenes (Total)	ND	0.5	ug/L	11/15/1994	aal
Bromofluorobenzene (SURR)	101		% Rec.	11/15/1994	aal
METHOD M8015 (EXT., Liquid)					
as Diesel	ND	0.05	mg/L	11/15/1994	tts

Ref: Kawahara/San Lorenzo CA 94015

MATRIX SPIKE / MATRIX SPIKE DUPLICATE

Parameter	Matrix Spike % Rec.	Matrix Spike Dup % Rec.	RPD	Spike Amount	Sample Conc.	Matrix Spike Conc.	Matrix Spike Dup. Conc.	Units	Date Analyzed	Analyst Initials
TPH (Gas/BTXE,Liquid)										
as Gasoline	102.0	102.0	0.0	1.00	ND	1.02	1.02	mg/L	11/14/1994	lss
Benzene	92.6	91.6	1.1	21.5	ND	19.9	19.7	ug/L	11/14/1994	lss
Toluene	95.1	95.1	0.0	89.8	ND	85.4	85.4	ug/L	11/14/1994	lss
TPH (Gas/BTXE,Liquid)										
as Gasoline	105.0	111.0	5.6	1.00	ND	1.05	1.11	mg/L	11/16/1994	dfw
Benzene	108.8	110.4	1.5	19.3	ND	21.0	21.3	ug/L	11/16/1994	dfw
Toluene	107.7	110.5	2.6	81.6	ND	87.9	90.2	ug/L	11/16/1994	dfw
METHOD M8015 (EXT., Liquid)										
as Diesel	94.5	97.5	14.3	2.00	ND	1.69	1.95	mg/L	11/15/1994	tts

Ref: Kawahara/San Lorenzo CA 94015

LABORATORY CONTROL SAMPLE REPORT

Parameter	LCS % Recovery	RPD	LCS Amount Found	LCS Amount Expected	Units	Date Analyzed	Analyst Initials
METHOD M8015 (EXT., Liquid) as Diesel	68.0		0.680	1.00	mg/L	11/15/1994	tts

KEY TO ABBREVIATIONS and METHOD REFERENCES

<	:	Less than; When appearing in results column indicates analyte not detected at the value following. This datum supercedes the listed Reporting Limit.
*	:	Reporting Limits are a function of the dilution factor for any given sample. Actual reporting limits and results have been multiplied by the listed dilution factor. **Do not** multiply the reporting limits or reported values by the dilution factor.
dw	:	Result expressed as dry weight.
mean	:	Average; sum of measurements divided by number of measurements.
mg/Kg (ppm)	:	Concentration in units of milligrams of analyte per kilogram of sample, wet-weight basis (parts per million).
mg/L	:	Concentration in units of milligrams of analyte per liter of sample.
mL/L/hr	:	Milliliters per liter per hour.
MPN/100 mL	:	Most probable number of bacteria per one hundred milliliters of sample.
N/A	:	Not applicable.
NA	:	Not analyzed.
ND	:	Not detected; the analyte concentration is less than the applicable listed reporting limit.
NTU	:	Nephelometric turbidity units.
RPD	:	Relative percent difference, 100 [Value 1 - Value 2]/mean value.
SNA	:	Standard not available.
ug/Kg (ppb)	:	Concentration in units of micrograms of analyte per kilogram of sample, wet-weight basis (parts per billion).
ug/L	:	Concentration in units of micrograms of analyte per liter of sample.
umhos/cm	:	Micromhos per centimeter.

Method References

Methods 100 through 493: see "Methods for Chemical Analysis of Water & Wastes", U.S. EPA, 600/4-79-020, Rev. 1983.

Methods 601 through 625: see "Guidelines Establishing Test Procedures for the Analysis of Pollutants" U.S. EPA, 40 CFR, Part 136, Rev. 1988.

Methods 1000 through 9999: see "Test Methods for Evaluating Solid Waste", U.S. EPA SW-846, 3rd edition, 1986., Rev. 1, December 1987.

SM: see "Standard Methods for the Examination of Water & Wastewater, 17th Edition, APHA, 1989.

Revised September, 1993
abb.93

BLYMYER
ENGINEERS, INC.
1629 Clement Avenue
Alameda, CA 94501 (510) 521-3773 FAX (510) 865-2594

CHAIN OF CUSTODY RECORD

PAGE ____ OF ____

JOB # 94015

PROJECT NAME/LOCATION: Kawahara Nursery

SAMPLERS (SIGNATURE): J. Buckman

TURNAROUND TIME: 10 DAY(S)

REMARKS:

DATE	TIME	COMP	GRAB	SAMPLE NAME/LOCATION	# OF CONTAINERS	TPH AS GASOLINE + BTXE (MOD EPA 8015/8020)	TPH AS DIESEL (MOD EPA 8015)	VOC (EPA 624/8240)	SEMI-VOC (EPA 625/8270)	TRPH (EPA 418.1)	BTXE (EPA 8020/602)	RUF BTEX	STLC lead	PCB		HOLD	
10/31/94		~~X~~	X	SS-1	2							X	X	X			Composit in lab
"			X	MW-4 17'	1	X	X										
"			X	MW-4 12'	1	X	X										
"			X	MW-5 12'	1	X	X										
"			X	MW-5 17'	1	X	X										
"			X	SB-1 10'	1	X	X										
"			X	SB-1 17'	1	X	X										

REQUESTED BY: L Buckman

RESULTS AND INVOICE TO: Blymyer Engineers L Buckman

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE / TIME	REMARKS:	

WHITE: Accompany Sample YELLOW: BEI, After Lab Signs PINK: Original Sampler

#3752

BLYMYER
ENGINEERS, INC.
1829 Clement Avenue
Alameda, CA 94501 (510) 521-3773 FAX (510) 865-2594

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

JOB # 94015

PROJECT NAME/LOCATION: Kawahara / San Lorenzo CA

SAMPLERS (SIGNATURE): Steph W Mlow

TURNAROUND TIME: Standard DAY(S)

REMARKS:

DATE	TIME	COMP	GRAB	SAMPLE NAME/LOCATION	# OF CONTAINERS	TPH AS GASOLINE + BTXE (MOD EPA 8015/8020)	TPH AS DIESEL (MOD EPA 8015)	VOC (EPA 624/8240)	SEMI-VOC (EPA 625/8270)	TRPH (EPA 418.1)	BTXE (EPA 8020/602)					HOLD
11/8/94	1115		X	MW-5	5	X	X									
11/8/94	1230		X	MW-4	5	X	X									
11/8/94	1330		X	MW-3	5	X	X									

CHILLED
11-9-94
Seal Intact.
QBD

REQUESTED BY: Laurie Buckman

RESULTS AND INVOICE TO: Blymyer Engineers, Inc

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)
Steph W Mlow	11/9/94 1315			11/9/94 18:00	11/10/94 0827
RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE / TIME	REMARKS:	
				NET VIA: NCS, TEMP.:	

WHITE: Accompany Sample YELLOW: BEI, After Lab Signs PINK: Original Sampler

PRIORITY ENVIRONMENTAL LABS

Precision Environmental Analytical Laboratory

December 29, 1993

PEL # 9312078

ALL ENVIRONMENTAL, INC.

Attn: Steve DeHope
Re: One composited soil sample for Reactivity analysis.

Project name: Davis
Project number: 1039

Date sampled: Dec 10, 1993
Date extracted: Dec 27, 1993

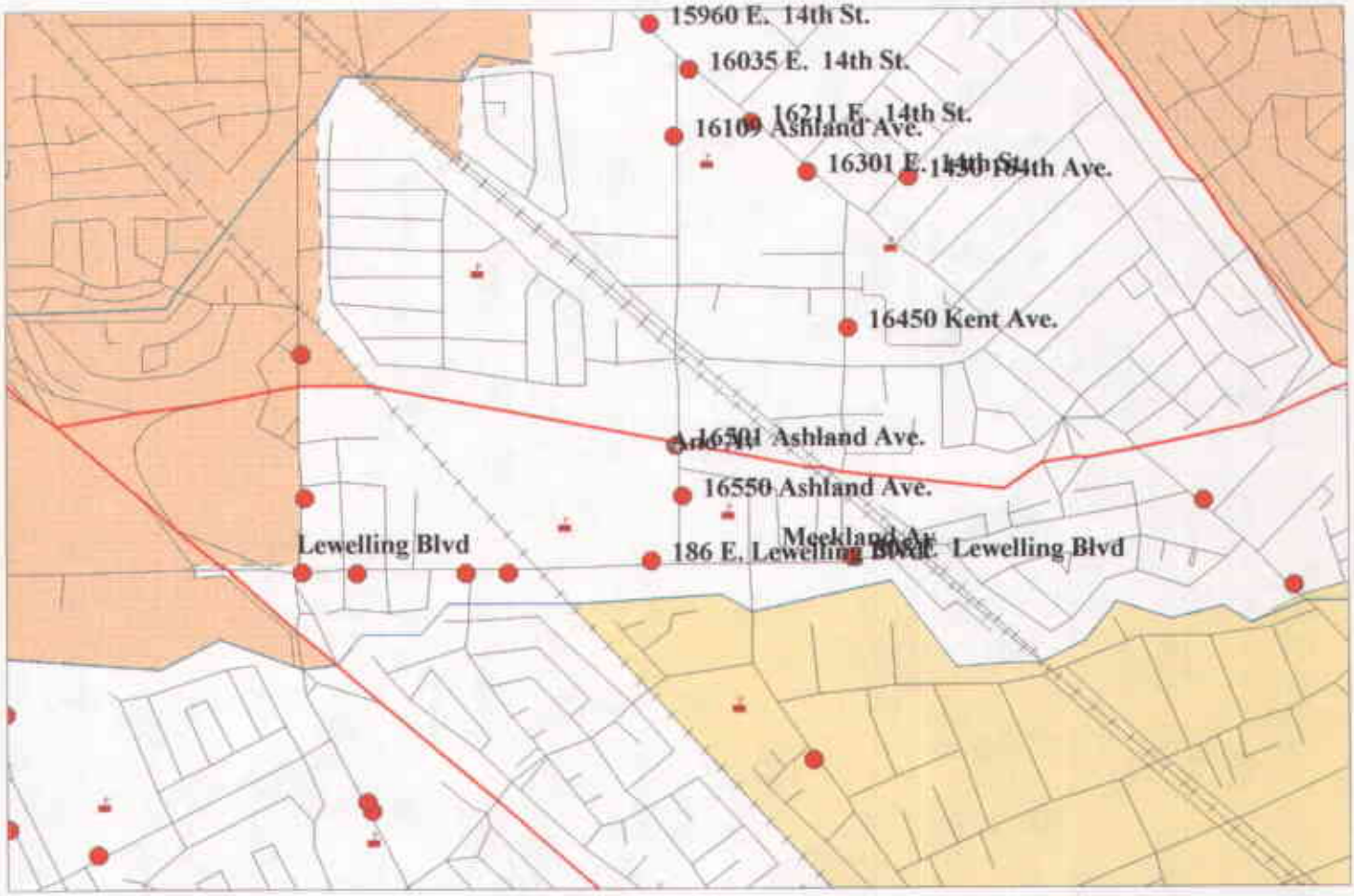
Date submitted: Dec 10, 1993
Date analyzed: Dec 28, 1993

RESULTS:

SAMPLE I.D.	REACTIVITY
STKP 1-4	NO
Blank	NO
Method of Analysis	Title 22, CCR 66261.23

David Duong
Laboratory Director

1764 Houret Court Milpitas, CA. 95035 Tel: 408-946-9636 Fax: 408-946-9663


15960 E. 14th St.
16035 E. 14th St.
16211 E. 14th St.
16109 Ashland Ave.
16301 E. 14th St.
16450 Kent Ave.
16501 Ashland Ave.
16550 Ashland Ave.
Lewelling Blvd
186 E. Lewelling Blvd
Lewelling Blvd