A Report Prepared for

Carnation Company
800 North Brand Boulevard
Glendale, California 91203

WORK PLAN
CARNATION FACILITY
OAKLAND, CALIFORNIA

5-16-91

HLA Job No. 20294,003.02

by

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May 16, 1991

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1.0 INTRODUCTION

From 1929 to 1991, Carnation operated a dairy production facility at 1310 14th Street, Oakland, California. In January 1989, Carnation excavated an underground waste oil tank, two underground gasoline tanks, and two underground diesel storage tanks. During removal of the tanks, gasoline and diesel were observed to be present as a separate phase floating in the excavations. Carnation investigated the extent of the contamination and implemented several interim remedial measures to address the gasoline and diesel problems. The chemicals detected, which include free-phase gasoline, diesel, waste oil, and their dissolved chemical components, are believed to have been released from the leaking underground waste oil tank and from piping connected to the four underground fuel storage tanks. In addition to the petroleum hydrocarbons, polychlorinated biphenyls (PCBs) have been detected in oil floating on the groundwater table at one location. Animal fats have also been found floating on the groundwater table over much of the facility.

In December 1990, Carnation retained Harding Lawson Associates (HLA) to review the existing site characterization and remediation data. This Work Plan presents the proposed tasks required to complete site characterization and to select appropriate remediation technologies for soil and groundwater contamination.

Harding Lawson Associates

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May 17, 1991

20294,003.02

Alameda County Health Care Services
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

Attention: Ms. Katherine Chesick
Senior Hazardous Materials Specialist

Ladies and Gentlemen:

Work Plan
Carnation Facility
Oakland, California

Enclosed is Harding Lawson Associates' (HLA) *Work Plan*, that describes site characterization activities proposed for the Carnation Facility in Oakland, California. This work plan has been revised to incorporate your verbal comments received during our May 6, 1991 meeting concerning monitoring floating product thickness at the facility while site characterization activities are proceeding and, your May 8, 1991 letter specifying dates for submittal of a remediation plan for floating product recovery (July 15, 1991) and implementation of the plan (September 1, 1991). During our May 6, 1991 meeting it was agreed that the Work Plan would be revised to address monitoring of free product thickness and that Carnation would initiate an interim remedial action to recover floating product if it is found off the Carnation facility. This differs from your letter of May 8, 1991 indicating that Carnation agreed to development of a remediation plan for the free product at the site.

Carnation has been and will continue to be an extremely pro-active party in remediating the facility. They have expended a significant amount of time and effort trying to solve the existing problem with only partial success because the site was not adequately characterized before moving ahead with remedial actions. The Work Plan presented by HLA is designed to fill in the data gaps and allow selection of a workable remedial action within four months. The remedial action(s) selected will address contaminated soil, groundwater, and floating product. The principal remedial options that are likely to be employed at the facility include excavation, pump and treat, or a combination of pumping and biological treatment. If excavation is the selected remedial action, removal of floating product prior to excavation will be a duplication of effort. If either pump and treat options are employed, removal of floating product will be conducted. Carnation does not wish to duplicate their efforts, but has indicated that they will move ahead with product recovery if floating product migrates off of their facility.

The tasks presented in the Work Plan are scheduled to be completed no later than the end of September 1991, and possibly several weeks earlier. Since remediation of the identified floating product will be addressed in the engineering and cost evaluation report, scheduled to be completed in September, and Carnation is committed to a timely implementation of the remediation alternative(s) selected, we respectfully suggest that your requested remediation plan and implementation for floating product recovery be coordinated with the overall site remediation.

It is also our understanding that you will review the enclosed work plan and provide comments within two weeks. The activities outlined in the work plan will be initiated after Carnation has received notification from the Alameda County Department of Environmental Health that HLA's *Work Plan* is acceptable.

If you have any questions concerning this report please feel free to contact me at (415) 899-7319.

Yours very truly,

HARDING LAWSON ASSOCIATES

R. Bruce Scheibach

R. Bruce Scheibach
Principal Hydrogeologist

2.0 BACKGROUND

2.1 Physical Setting

Carnation's dairy facility covers two square blocks bounded by 14th, 16th, Poplar, and Cypress streets (Plate 1) in Oakland, California. The topography at and around the site generally slopes very gently to the west, toward San Francisco Bay. Land use in the vicinity of the facility is predominantly light industrial, with a few residential and commercial tracts east of the facility.

The entire site is paved with concrete or asphalt. A warehouse with several vehicle service bays occupies the northern side of the site (Plate 2). The four underground fuel tanks and one waste oil tank were adjacent to the warehouse (Plate 2).

2.2 Site History

The facility was originally constructed by American Creamery in 1915. Carnation purchased the facility in 1929 and made additions and improvements to the buildings between 1946 and 1973. Carnation ceased operations at the facility in March 1991.

2.3 Previous Investigations

During excavation and removal of the four underground fuel storage tanks in January 1989, gasoline and diesel were observed to be present as a separate phase floating layer in the excavations. Carnation characterized the site and implemented several interim remedial measures to address the gasoline and diesel problems. These measures included installation of 33 groundwater monitoring wells (Plate 2 and Table 1), installation of approximately 100 product recovery wells and the recovery of approximately 5,000 gallons of gasoline and diesel floating on the groundwater table, aeration and bioremediation of excavated soils, and pumpage and treatment of approximately 1.5 million gallons of groundwater. An aquifer test was conducted and numerous soil vapor recovery wells were installed and operated.

In addition to the petroleum hydrocarbons, PCBs were detected in one area and animal fats have been found floating on the groundwater table over much of the facility.

2.4 Environmental Site Assessment

Because there is a possibility that other hazardous material source areas existing on adjacent properties may have contributed to groundwater contamination in the area, HLA has reviewed and evaluated published regulatory agency lists of sites within a 0.25-mile radius surrounding the property (Plate 3) to identify adjacent or nearby properties having hazardous materials/waste problems.

The following regulatory agency lists were reviewed:

- **U.S. Environmental Protection Agency (U.S. EPA) National Priorities List (NPL) for Uncontrolled Hazardous Waste Sites, February 1991**

  The NPL is a list of federal Superfund sites. There are no properties in the study area on the NPL.

- **U.S. EPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), March 14, 1991**

  CERCLIS provides information about businesses or properties identified as potential federal Superfund sites. There are no properties in the study area on the CERCLIS list.

- **Expenditure Plan for the Hazardous Substance Cleanup Bond Act of 1984 (State Bond Expenditure Plan), January 1990**

  The State Bond Expenditure Plan list compiled by the California Department of Health Services (DHS) identifies hazardous waste sites in the state that have been targeted for cleanup by responsible parties, the DHS, or the U.S. EPA for the next five fiscal years. There are no properties in the study area on the State Bond Expenditure Plan List.

- **DHS Abandoned Sites Lists, February 4, 1991**

  The DHS Abandoned Sites List provides information concerning past and present potential hazardous waste sites that could be considered potential State Bond Expenditure Plan sites. There are no properties in the study area considered active by the DHS and no properties in the study area on the DHS Abandoned Sites Lists.

- **California Regional Water Quality Control Board (RWQCB) Toxics Cases, March 5, 1991**

  The RWQCB Toxics List provides a list of cases included in the RWQCB Site Management System for Alameda County. There are no properties in the study area listed as a RWQCB Toxics Case.

- **Hazardous Waste and Substances Site List (Cortese List), November 1990**

  The Cortese List, compiled by the California State Office of Planning and Research, provides information concerning identified hazardous waste/substance sites within the state. Three properties in the study area are on the Cortese List.

  The following properties are listed on the Cortese List and discussed in the RWQCB Fuel Leaks List for Alameda County:

  - City of Oakland Housing Authority
    935 Union Street
    Oakland, California

  - Nabisco Brands, Inc.
    1267 14th Street
    Oakland, California

  - Carnation
    1310 14th Street
    Oakland, California

- **RWQCB Fuel Leaks List for Alameda County, March 1, 1991**

  The RWQCB Fuel Leaks List for Alameda County lists site names, addresses and types of reported fuel leaks from underground storage tanks. Five properties (including Carnation) in the study area are included on the RWQCB Fuel Leaks List (Plate 3).

The following properties were further investigated by reviewing the regulatory agency files:

1) **City of Oakland Housing Authority**
935 Union Street
Oakland, California

This property is approximately 0.25-mile south of the site. The file indicates that one 600-gallon steel gasoline tank was removed in July 1988; no holes were observed in the tank when it was removed. Soil samples from the excavation were collected and analyzed. TPH as gasoline was not detected at concentrations above the detection limit (10 milligrams per kilogram [mg/kg]). Toluene was detected at 64 micrograms per kilogram (µg/kg). No other petroleum analytes were detected.

Because of the distance of this property from the site and the minor concentrations detected, the potential for this property to adversely affect the Carnation site is minimal.

2) **Nabisco Brands, Inc.**
1267 14th Street
Oakland, California

This property is across Poplar Street from the site and approximately 600 feet from the previous underground tank location at Carnation. In July 1989, when two 10,000-gallon underground No. 5 fuel oil tanks were removed, soil contamination was reported along the north side of the excavation. The soil sample collected at this location contained 170 mg/kg oil and grease. Approximately 88 cubic yards of material were excavated from the bottom and sides of the tank pit and disposed offsite. A site investigation and assessment was required by the Alameda County Department of Environmental Health (ACDEH). Eleven soil borings were drilled and three monitoring wells were installed. Groundwater samples were collected and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), TPH as diesel, and oil and grease. None of the water samples had petroleum hydrocarbons above the level of detection. Groundwater flow was reported to be toward the northwest.

Because no petroleum hydrocarbons were detected in the groundwater at this facility, it does not appear that it is contributing to the hydrocarbon contamination observed at the Carnation facility.

3) **Cademartori Trucking**
1833 Peralta
Oakland, California

In July 1990, a 10,000-gallon diesel tank, a 1,000-gallon leaded gasoline tank, and a 5,000-gallon waste oil tank were excavated at the site. During tank removal, additional petroleum-stained soil was excavated and stockpiled onsite. Elevated concentrations of TPH as diesel (4,800 mg/kg) were detected in the stockpiled soil; 7.7 mg/l TPH as diesel was found in a groundwater sample from the fuel tank excavation; and 3.2 mg/l TPH as gasoline was found in groundwater from the waste oil tank excavation. A work plan to further investigate the site was submitted in October 1990. However, there is no indication that any additional work has been conducted.

Because this site is approximately 0.25-mile north of the Carnation facility, it is unlikely that it is contributing to the groundwater contamination identified at Carnation; however, no wells have been installed to assess groundwater chemistry or flow direction.

4) **Mr. David Doyle**
1518 E. 12th Street
Oakland, California

The owner of this property removed two underground gasoline tanks without a permit and subsequently had to conduct a site investigation. Six borings were drilled in the former tank location to characterize the area, with soil samples collected at a uniform depth of 11.5 feet below ground surface (bgs). The results indicated that TPH as gasoline was present at up to 646 mg/kg. In November 1989, the tank area was re-excavated to a depth of 11.5 feet, where a consistent clay layer was encountered. The sides of the excavation were slightly over-excavated, sampled, and the samples analyzed for BTEX and TPH as gasoline. Low concentrations of BTEX were detected, but TPH was not present above the level of detection. No additional work has been conducted at this site.

This site is approximately 0.25-mile from the Carnation facility and is likely not contributing to the groundwater contamination identified. However, no wells were installed to assess whether groundwater had been affected by the leaking gasoline tanks.

3.0 SCOPE OF WORK

HLA proposes the following tasks to complete the site characterization:

- Monthly water level and free-phase product measurements
- Quarterly groundwater monitoring
- Onsite borings - Drilling of soil borings and collection and chemical analysis of soil samples
- Aquifer testing and analysis - Performance of step-drawdown and 24-hour constant-rate aquifer tests and analysis of the groundwater drawdown and recovery data
- Offsite hydropunch - Collection and chemical analysis of groundwater samples
- Installation and sampling of new offsite monitoring wells
- Sampling of excavated soil pile
- Preparation of a characterization report
- Preparation of a site engineering evaluation and cost analysis report.

A Site Health and Safety Plan (SHSP) has been prepared to address the potential hazards that may be encountered during site assessment and remediation work at the Carnation facility. Its purpose is to alert onsite workers to the potential hazards and to provide established procedures to protect the workers. A copy of the SHSP is included as Appendix A.

In addition, a Quality Assurance/Quality Control Project Plan (QA/QC Plan) has been prepared for the Carnation facility investigation. The QA/QC Plan presents the quality assurance program and related quality control procedures to be followed during site investigation and remediation activities so that the technical data generated during the investigation and remediation activities are accurate, precise, complete, and representative of field conditions. A copy of the QA/QC Plan is included as Appendix B.

The following sections describe the specific investigation tasks to be performed.

3.1 Water Level Elevation and Free-Phase Product Measurement

As discussed in Section 2.3, Carnation implemented several interim remedial measures, including operation of a free-phase petroleum removal system and a groundwater extraction and treatment system. These remedial actions continued until August 1990 and resulted in removal of approximately 5,000 gallons of free-phase product and approximately 1.5 million gallons of groundwater. At the end of the interim removal program, it was reported that all mobile free-phase product beneath the facility had been recovered.

In April 1991, HLA collected water-level measurements at the site and detected free-phase petroleum product in several monitoring and product recovery wells. The reappearance of free-phase petroleum product after the apparent removal of all available product in 1990 may be due to: 1) the slow rate at which free-phase petroleum product flows into the wells, and/or 2) remobilization and concentration of free-phase petroleum product as a result of the recent (Spring 1991) rise in the groundwater table.

The distribution of free-phase product measured during April 1991 is shown on Plate 4. In general, the horizontal areal extent of free-phase product during April 1991 was similar to but less than that measured in 1990. The product thickness was greatest in Well MW-22 (5.06 feet), near the northern wall of the warehouse building (Plate 4). However, product was not and has not historically been observed in five offsite Wells MW-25 through MW-29), all of which are located relatively close to the Carnation warehouse (Plate 4). The consistent lack of free-phase petroleum product in the offsite wells suggests that the product is restricted to the onsite area and has not migrated offsite. The construction of the warehouse walls, pilings, and footings may explain the apparent containment of free-phase petroleum product beneath the warehouse. The walls, pilings, and footings may extend to depths that create a barrier to floating product migration. HLA will further investigate the building construction details.

HLA proposes to conduct water-level elevation and free-phase petroleum product thickness measurements monthly to monitor the thickness and distribution of free-phase petroleum product. HLA will redevelop appropriate monitoring wells and selected product recovery wells where free-phase product has been identified. Well redevelopment will allow assessment as to whether unrestricted entry of free-phase product into the wells is occurring and allow accurate determination of apparent free-phase product thicknesses. After redevelopment of the wells, free-phase product thickness will be measured. After collecting these data a meeting will be held with ACDEH to assess the significance of the free-phase product at the site.

Water-level and free-phase product measurements will be conducted using an electrical oil-water interface probe calibrated with a steel tape. Measurement procedures are described in detail in the QA/QC Plan (Appendix B). If during the course of the proposed site characterization activities free-phase petroleum product is measured offsite, HLA will initiate additional interim free-phase petroleum product removal. This interim free-phase product removal could initially involve a hand-bailing product removal program, to be followed by automated total fluids or two-pump systems. HLA believes that without site aquifer permeability and well production data, it would be premature at this time to propose a specific design of an automated free-phase product recovery system. Carnation's previous consultant has refused to provide permeability data collected at the site.

3.2 Quarterly Groundwater Monitoring

When groundwater contamination or floating product is found during underground tank removal, groundwater monitoring is required by the RWQCB and local agencies for investigation of underground tank sites (*RWQCB, August 1990*). To comply with these guidelines, monitoring of groundwater chemistry, groundwater elevations, and product thickness is required on a quarterly schedule. A letter dated February 1, 1989, from Mr. Rafat A. Shahid of the Alameda County Department of Environmental Health (ACDEH) to Mr. Howard Shmuckler of Carnation, states that groundwater from all monitoring wells must be sampled and analyzed at least quarterly. To comply with this, water-level elevations and free-product thicknesses will be measured in the 33 existing monitoring wells (Plate 2) and the wells will be sampled and analyzed quarterly. Monitoring results will be provided to ACDEH in quarterly monitoring reports. QA/QC procedures to be followed by HLA during monitoring and sampling are described in detail in the QA/QC Plan (Appendix B).

Prior to collection of groundwater samples, the depth to and thickness of free-phase petroleum and depth to water will be measured in each well using an oil-water interface probe. While purging the well prior to sampling, water levels and well production, an indication of formation permeability, will be monitored. Chemical analyses of soil and groundwater will be performed by National Environmental Testing, Inc. (NET), a state-certified laboratory in Santa Rosa, California. Groundwater samples from all monitoring wells not containing free-phase product will be analyzed for TPH as gasoline and diesel using EPA Test Method 8015. To determine if volatile halogenated compounds exist in groundwater, groundwater from up to nine monitoring wells will be analyzed using EPA Test Method 8240 (volatile organic compounds [VOCs]). Samples from the remaining wells not containing free-phase product will be analyzed for BTEX using EPA Test Method 8020. Also, samples from up to 10 wells will be analyzed for polar and nonpolar oil and grease using EPA Test Methods 503D and E to assess the distribution of animal fats reported to be present in the groundwater. Table 2 summarizes the proposed sample analyses. As described in the QA/QC Plan, a field blank will be collected for each day of sampling and one duplicate water sample will be analyzed for every 10 samples collected. We anticipate that the groundwater generated during the sampling can be discharged to the sanitary sewer after obtaining the necessary approval from the East Bay Municipal Utility District (EBMUD).

Many of the existing monitoring wells have had no detectable concentrations of petroleum hydrocarbons during previous sampling events. To confirm these findings, HLA recommends collecting and analyzing groundwater from all monitoring wells during the initial quarterly monitoring round. Depending on the results of the initial comprehensive sampling, HLA may recommend reducing the sampling frequency in wells where petroleum hydrocarbons and volatile halogenated compounds have not been detected. The results of the initial quarterly monitoring, along with recommended changes in the sampling frequency, will be presented to the ACDEH and the RWQCB.

3.3 Onsite Borings

To assess the lateral and vertical extent of petroleum hydrocarbons and PCBs in the soil, HLA proposes to drill 20 soil borings onsite and near the site; 9 of these borings will be continuously cored to better define subsurface conditions (Plate 5). Borehole drilling and sample collection will follow protocols described in detail in the QA/QC Plan (Appendix B). Fifteen of these borings will be drilled to assess the distribution of petroleum hydrocarbons in the soils; the remaining 5 borings will be used to assess the extent of PCBs in soils near PR-12.

The borings will be drilled using a truck-mounted hollow-stem auger rig. Soil samples will be obtained using split-barrel and continuous coring equipment. Five soil samples from each of the 15 borings will be collected at the following intervals: one sample from above the zone of contamination; three from within the zone of contamination; and one below the zone of contamination. On the basis of existing data, it is anticipated that the zone of contamination exists from approximately 5 to 15 feet bgs; therefore, the total depths of the borings will be approximately 20 feet bgs. The soil samples will be analyzed for TPH as gasoline and diesel using EPA Test Method 8015. In up to ten of the borings, the soil sample collected above the zone of contamination and the first soil sample collected within the zone of contamination will also be analyzed for polar and nonpolar oil and grease, using EPA Test Methods 503D and E. This information will be used to assess the distribution of animal fats in the soil.

The remaining 5 borings, to be drilled for assessment of PCBs, may be continuously cored. HLA estimates that three soil samples from each boring will be analyzed for PCBs using EPA Test Method 8080.

The soils generated during drilling will be covered and stored onsite until a decision is made concerning their disposal.

3.4 Aquifer Testing and Analysis

Aquifer testing will be conducted at the facility to evaluate aquifer hydraulic parameters so that remedial alternatives for the groundwater can be assessed. The testing will include a step-drawdown test, a 24-hour continuous rate test, and a recovery test. The purpose of the step-drawdown test is to assess the efficiency of the well and to select an appropriate pumping rate that will stress the aquifer sufficiently, without pumping the well dry. HLA proposes to use an existing monitoring well as the pumping well for the aquifer test. The well to be tested will be south (upgradient) of the main area of free-phase petroleum product. A suitably sized submersible pump will be installed in the selected well to conduct the tests. During the tests, the pumping rate and water-level decline in the pumping well will be monitored on a regular basis; water-level declines will also be measured in nearby wells. After pumping for approximately 24 hours, water-level recovery will be monitored for approximately 12 hours or until water levels have recovered to pre-pumping levels. We anticipate that the groundwater generated during the aquifer test can be discharged to the sanitary sewer with permission from the EBMUD.

The data collected will be analyzed to assess the transmissivity, hydraulic conductivity and storage coefficient of the aquifer. These results will be used to assess remedial alternatives for soil and groundwater cleanup.

3.5 Offsite Hydropunch

Carnation has installed five monitoring wells (MW-25 through MW-29) on 16th Street north (downgradient) of the facility (Plate 2). Groundwater samples from two of the wells (MW-25 and MW-26) contained dissolved hydrocarbons. To better assess the presence and extent of dissolved hydrocarbons in the offsite groundwater without installing additional wells, HLA proposes to collect groundwater samples using a Hydropunch. Hydropunch sampling allows groundwater chemistry to be assessed without having to install permanent monitoring wells. Proposed Hydropunch sampling locations will be determined after additional review of the existing data and determination of the accessibility north of 16th Street.

The hydropunch tool will be driven to the water table (approximately 10 to 15 feet bgs) and opened to allow groundwater to flow into a sampler. The sampler will be retrieved and the groundwater sample poured into a sample container and transported to the analytical laboratory under chain of custody. The Hydropunch samples will be analyzed for TPH as gasoline and diesel using EPA Test Method 8015 and for BTEX using EPA Test Method 8020. The data will then be used to select locations for additional offsite monitoring wells. The groundwater sample collection and QA/QC protocol is described in detail in the QA/QC Plan (Appendix B).

3.6 New Offsite Monitoring Wells

HLA estimates that up to four additional monitoring wells may need to be installed to further assess the lateral extent of the dissolved hydrocarbon plume. Well locations will be selected after reviewing the Hydropunch and quarterly monitoring data and determining accessibility north of 16th Street. The wells will be installed using standard procedures acceptable to the regulatory agencies. After installation, each well will be developed, surveyed, and sampled. Groundwater samples will be collected and analyzed for TPH as gasoline and diesel using EPA Test Method 8015 and for petroleum hydrocarbon constituents (BTEX) and other VOCs using EPA Test Method 8240. Borehole drilling and well construction protocols are described in detail in the QA/QC Plan (Appendix B).

3.7 Excavated Soil Pile Sampling

Approximately 60 cubic yards of soil removed from the underground tank excavations are currently stockpiled onsite. HLA proposes to sample and analyze the soil to assess residual chemical levels (if any) and disposal options. The sampling protocol will be as follows: The soil pile will be divided into two 30-cubic yard sections. Four soil samples will be collected 6 inches below the soil surface from each 30-cubic yard section. The soil samples will be collected in stainless-steel tubes, sealed with Teflon discs and plastic end caps, and placed in a cooler for delivery to the NET laboratory under chain of custody. The four tubes from each 30-cubic yard section will be composited at the laboratory and then analyzed for TPH as gasoline and diesel using EPA Test Method 8015, for BTEX using EPA Test Method 8020, for polar and nonpolar total oil and grease using EPA Test Methods 503D and E, and for total lead using EPA Test Method 6010.

4.0 REPORT PREPARATION

4.1 Site Characterization Report

Once site characterization activities are completed, a characterization report will be prepared and submitted to the ACDEH and RWQCB for their review. This report will document the procedures used and results of the water-level and free product measurements, quarterly groundwater sampling, soil boring investigation, aquifer testing, hydropunch, and new well installation.

4.2 Engineering Evaluation and Cost Analysis

HLA will prepare and submit an engineering evaluation and cost analysis to the ACDEH and RWQCB that will identify appropriate options for remediating the soil and groundwater. Remediation options that may be considered include free product recovery from wells and/or trenches, in situ bioremediation, soil venting, excavation and aeration and/or disposal, and groundwater pumping and treatment. This report will also compare costs among various remediation options, thus allowing selection of the most cost-effective remedial option for soil and groundwater contamination. Once this report has been reviewed by the regulatory agencies and agreement is reached regarding a preferred remedial alternative, remediation of the site may begin.

5.0 PROJECT SCHEDULE

HLA estimates the tasks identified will require approximately six months to complete. A schedule for completion of the identified tasks is presented on Plate 6.

6.0 REFERENCES

North Coast, San Francisco Bay, and Central Valley California Regional Water Quality Control Boards, 1990. *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites.* August 10.

TABLES

Table 1. Monitoring Well Completion Details

Well Number	Northing	Easting	Ground Surface Elevation (ft AMSL)	Measuring Point Elevation (ft ASML)	Date Drilled	Total Depth (ft)	Bentonite Seal Interval (ft BGS)	Screened Interval (ft BGS)	Slot Size (inches)	Sand Pack Size
MW- 1	2227.7	3067.1	16.82	16.49	3/15/89	47.0	3.5 - 5.5	7.5 - 47.0	0.030	#3 sand
MW- 2	2500.9	3233.9	15.52	15.11	3/22/89	25.0	4.0 - 5.0	7.0 - 25.0	0.030	#3 sand
MW- 3	2613.2	3114.7	14.66	14.30	3/21/89	25.0	4.0 - 5.0	7.0 - 25.0	0.030	#3 sand
MW- 4	2484.9	3023.1	14.84	14.42	3/20/89	44.0	4.0 - 5.5	7.0 - 44.0	0.030	#3 sand
MW- 5	2616.5	3310.7	14.82	14.41	3/21/89	25.0	3.5 - 4.5	7.0 - 22.0	0.030	#3 sand
MW- 6	2634.0	3259.1	14.79	14.12	3/17/89	17.0	4.0 - 5.0	7.0 - 17.0	0.030	#3 sand
MW- 7	2650.0	3199.2	14.74	14.29	3/16/89	17.0	4.0 - 5.0	7.0 - 17.0	0.030	#3 sand
MW- 8	2672.3	3129.8	14.77	14.20	3/17/89	17.0	4.0 - 5.0	7.0 - 17.0	0.030	#3 sand
MW- 9	2289.9	2956.1	15.77	14.96	3/17/89	25.0	4.0 - 5.0	7.0 - 25.0	0.030	#3 sand
MW-10	2373.5	2933.6	16.04	15.73	3/16/89	25.0	4.0 - 5.0	7.0 - 25.0	0.030	#3 sand
MW-11	2431.9	3127.6	15.06	14.55	3/21/89	25.0	na	7.0 - 25.0	0.030	#3 sand
MW-12	2450.8	3230.5	15.70	15.28	3/21/89	25.0	4.0 - 5.0	7.0 - 25.0	0.030	#3 sand
MW-13	2489.7	3290.0	15.48	14.85	3/21/89	25.0	4.0 - 5.0	7.0 - 25.0	0.030	#3 sand
MW-14	2619.1	3055.0	14.80	14.10	3/17/89	22.0	4.0 - 5.0	7.0 - 22.0	0.030	#3 sand
MW-15	2566.3	3041.6	14.82	14.17	3/17/89	22.0	4.0 - 5.0	7.0 - 22.0	0.030	#3 sand
MW-16	2689.0	3067.6	14.78	14.11	3/22/89	25.0	4.0 - 5.0	6.5 - 22.0	0.030	#3 sand
MW-17	na	na	na	na	na	na	na	na	na	na
MW-18	na	na	na	na	na	na	na	na	na	na
MW-19	na	na	na	na	na	na	na	na	na	na
MW-20	na	na	na	na	na	na	na	na	na	na
MW-21	na	na	na	na	na	na	na	na	na	na
MW-22	na	na	na	na	na	na	na	na	na	na
MW-23	na	na	na	na	na	na	na	na	na	na
MW-24	na	na	na	na	na	na	na	na	na	na
MW-OS25	2694.8	3150.6	13.25	na	8/23/89	22.5	5.0 - 6.5	7.5 - 22.5	0.020	#2/16 sand
MW-OS26	2676.8	3206.4	13.55	na	8/24/89	25.0	7.5 - 9.0	10.0 - 25.0	0.020	#2/16 sand
MW-OS27	2666.4	3271.2	14.33	na	8/28/89	24.5	6.5 - 8.0	9.0 - 24.0	0.020	#2/16 sand
MW-OS28	2704.7	3220.1	13.90	na	8/29/89	27.0	6.5 - 8.0	9.0 - 27.0	0.020	#2/16 sand
MW-OS29	2729.2	3146.2	13.38	na	8/30/89	25.0	6.5 - 8.0	9.0 - 25.0	0.020	#2/16 sand
MW-30	na	na	na	na	na	na	na	na	na	na
MW-31	na	na	na	na	na	na	na	na	na	na
MW-32	na	na	na	na	na	na	na	na	na	na
MW-33	na	na	na	na	na	na	na	na	na	na

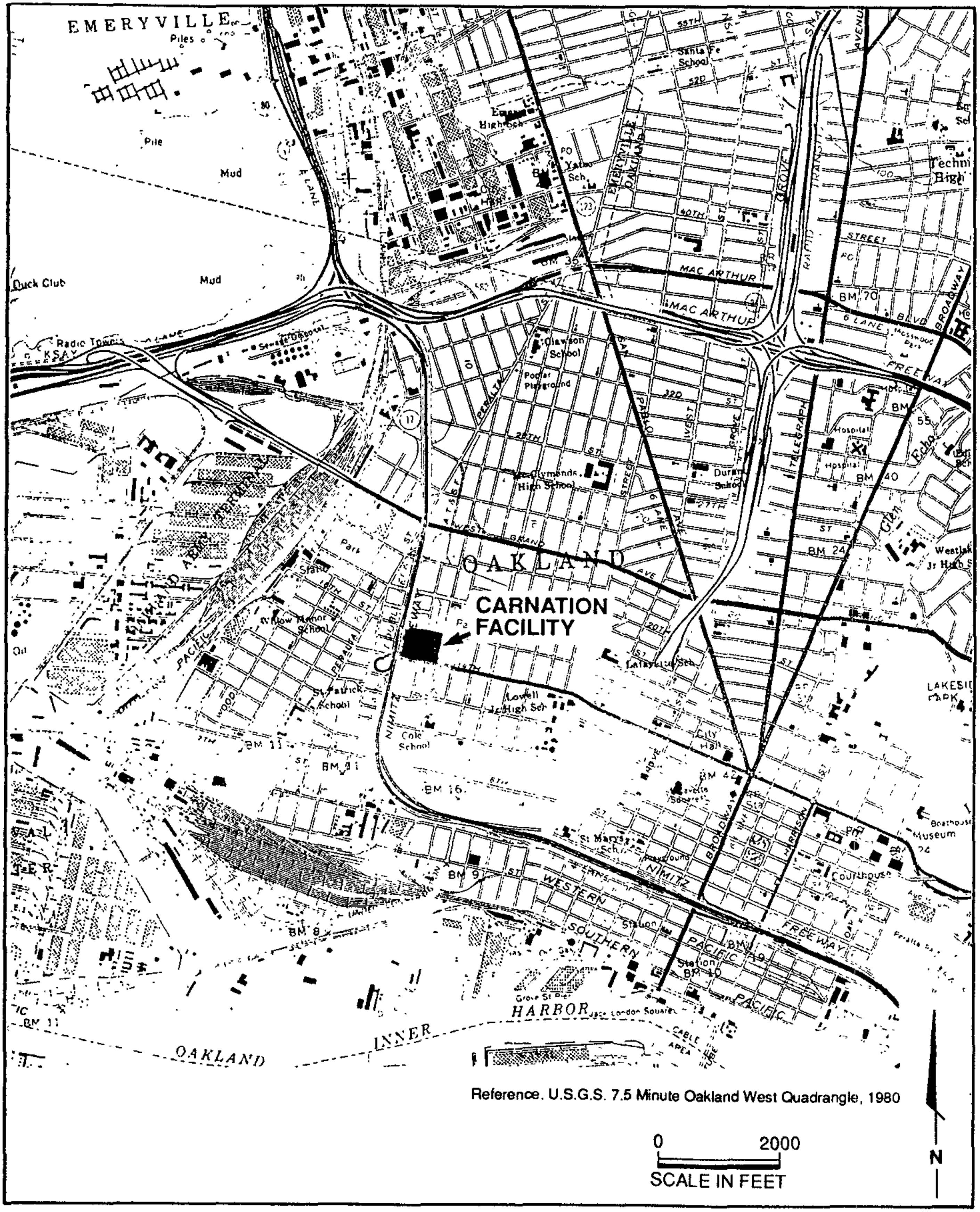
na = Data not available

Table 2. Proposed Groundwater Sample Analyses Initial Quarterly Monitoring Period

Chemical Analysis	Number of Wells
Total Petroleum Hydrocarbons as Gasoline and Diesel EPA Test Method 8015 g + d	33 ✓
Volatile Aromatics EPA Test Method 8020 BTEX	24 ✓
Volatile Organics EPA Test Method 8240 VOCs	9 ✓
Oil and Grease Polar and Non-Polar EPA Test Methods 503D and E ✓ O+G	10 ✓

Notes: Field and equipment blanks will be collected and analyzed for the above chemical parameters (as appropriate) as described in the QA/QC plan (Appendix B). Wells containing free-phase petroleum product will not be sampled.

PLATES



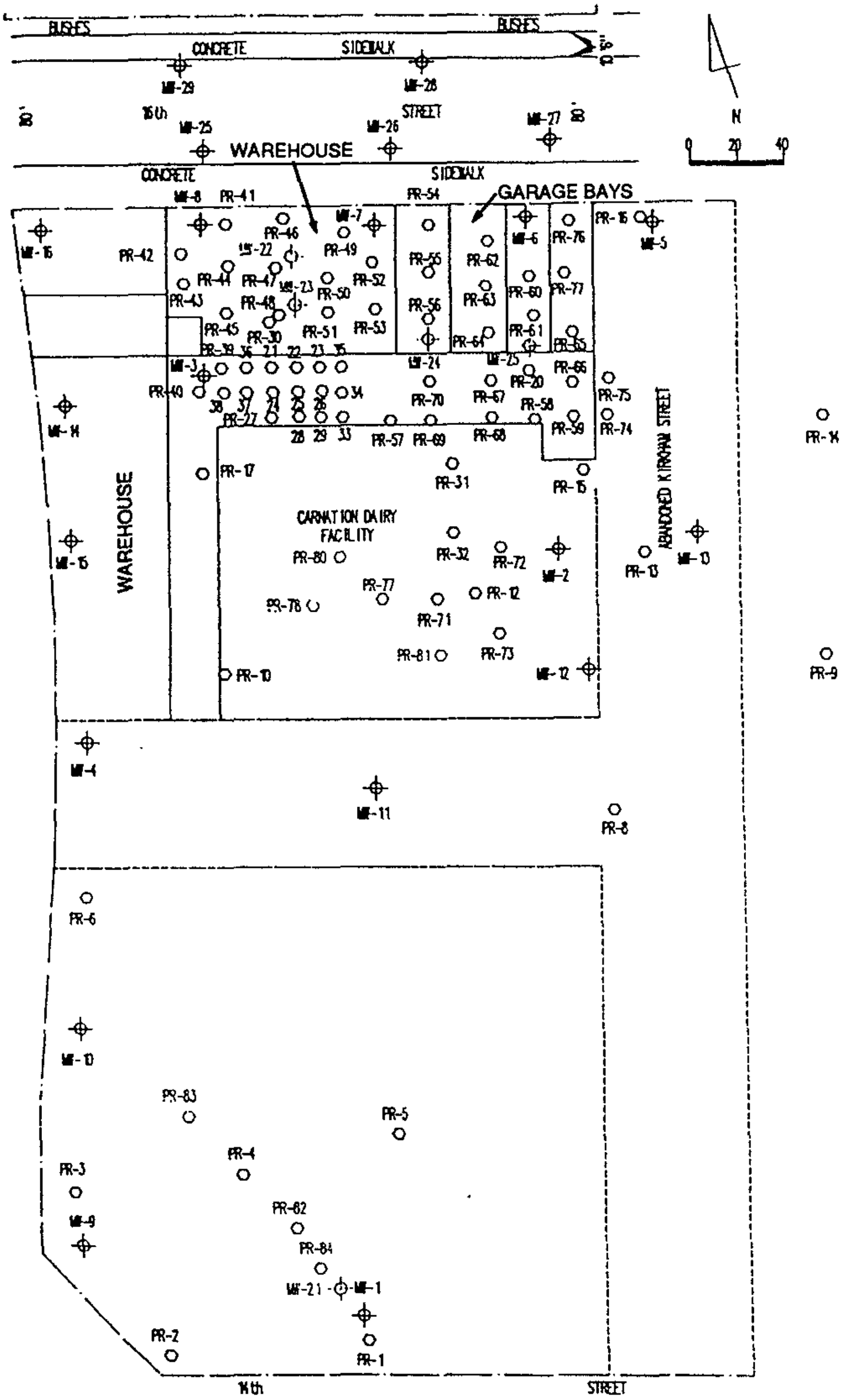
Reference. U.S.G.S. 7.5 Minute Oakland West Quadrangle, 1980

Harding Lawson Associates
Engineering and
Environmental Services

Site Location Map
Carnation Facility
Oakland, California

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE	PLATE
NJB	20294,003.02	D. A. Craig	4/91		1

21792



Source: Anania Geologic Engineering, 1990

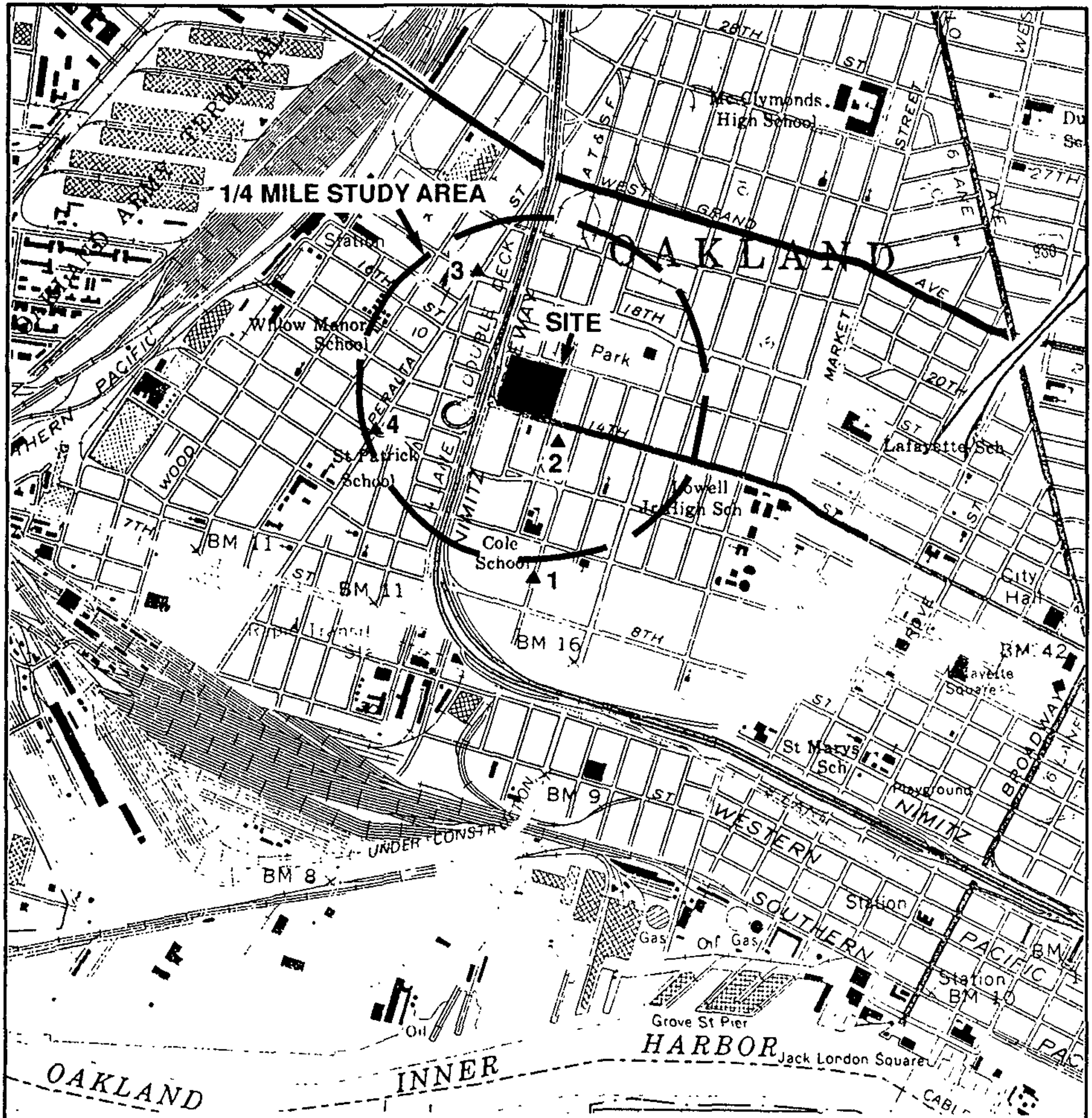
Harding Lawson Associates
Engineering and
Environmental Services

Site Map and Well Locations
Carnation Facility
Oakland, California

PLATE
2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
IC	20294,003.02	D. J. Craig	4/91	

21793



Reference: U.S.G.S. 7.5 Minute Oakland West Quadrangle, 1980

EXPLANATION

1. City of Oakland Housing Authority
2. Nabisco Brands
3. Cademartori Trucking
4. Doyle Property

0 2000

SCALE IN FEET

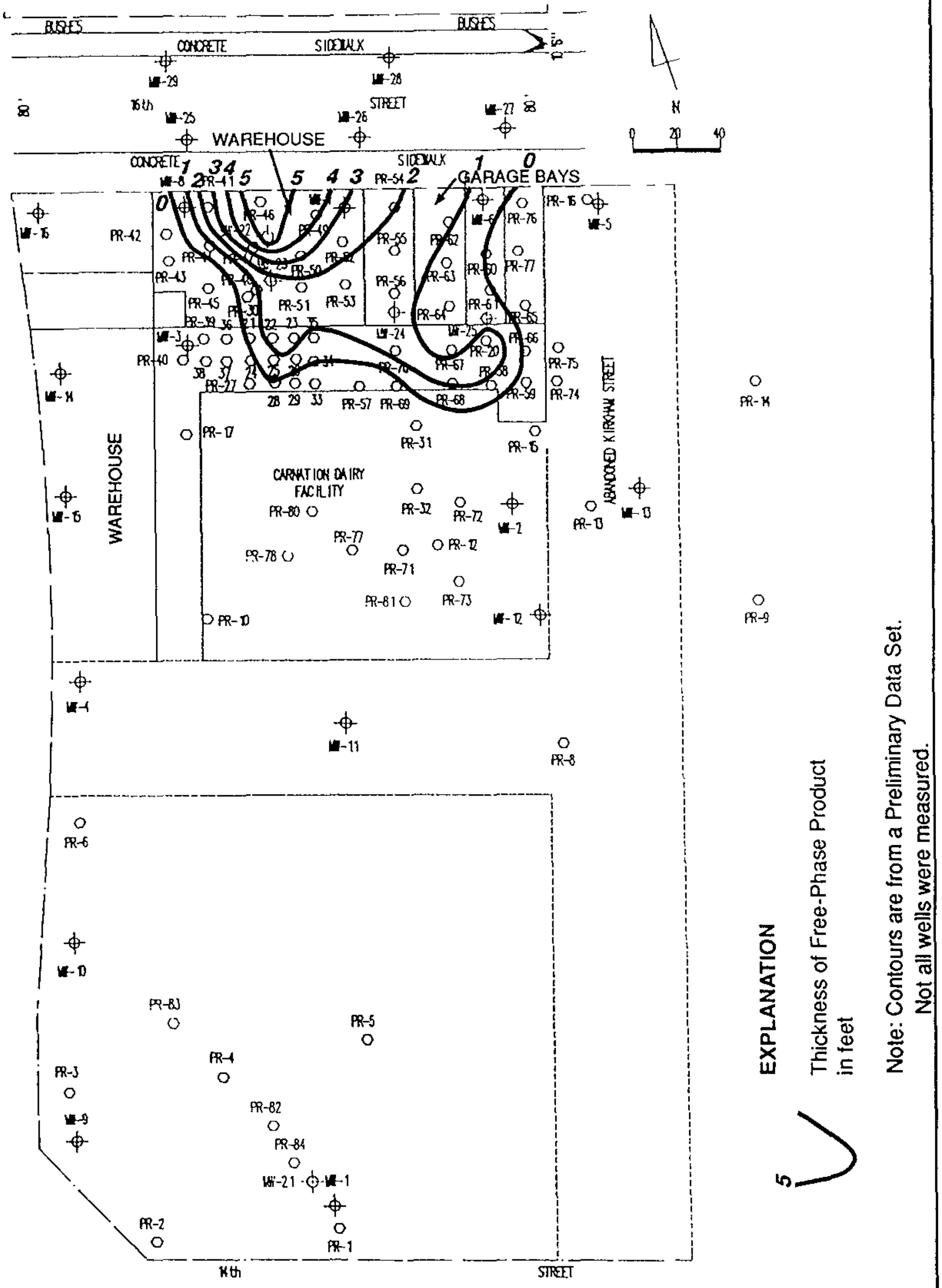
N

Harding Lawson Associates
Engineering and
Environmental Services

Site Vicinity Map and Listed
Environmental Properties
Carnation Facility
Oakland, California

PLATE
3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	20294,004.02	D. J. Craig	4/91	



EXPLANATION

Thickness of Free-Phase Product in feet

Note: Contours are from a Preliminary Data Set. Not all wells were measured.

Source: Anania Geologic Engineering, 1990

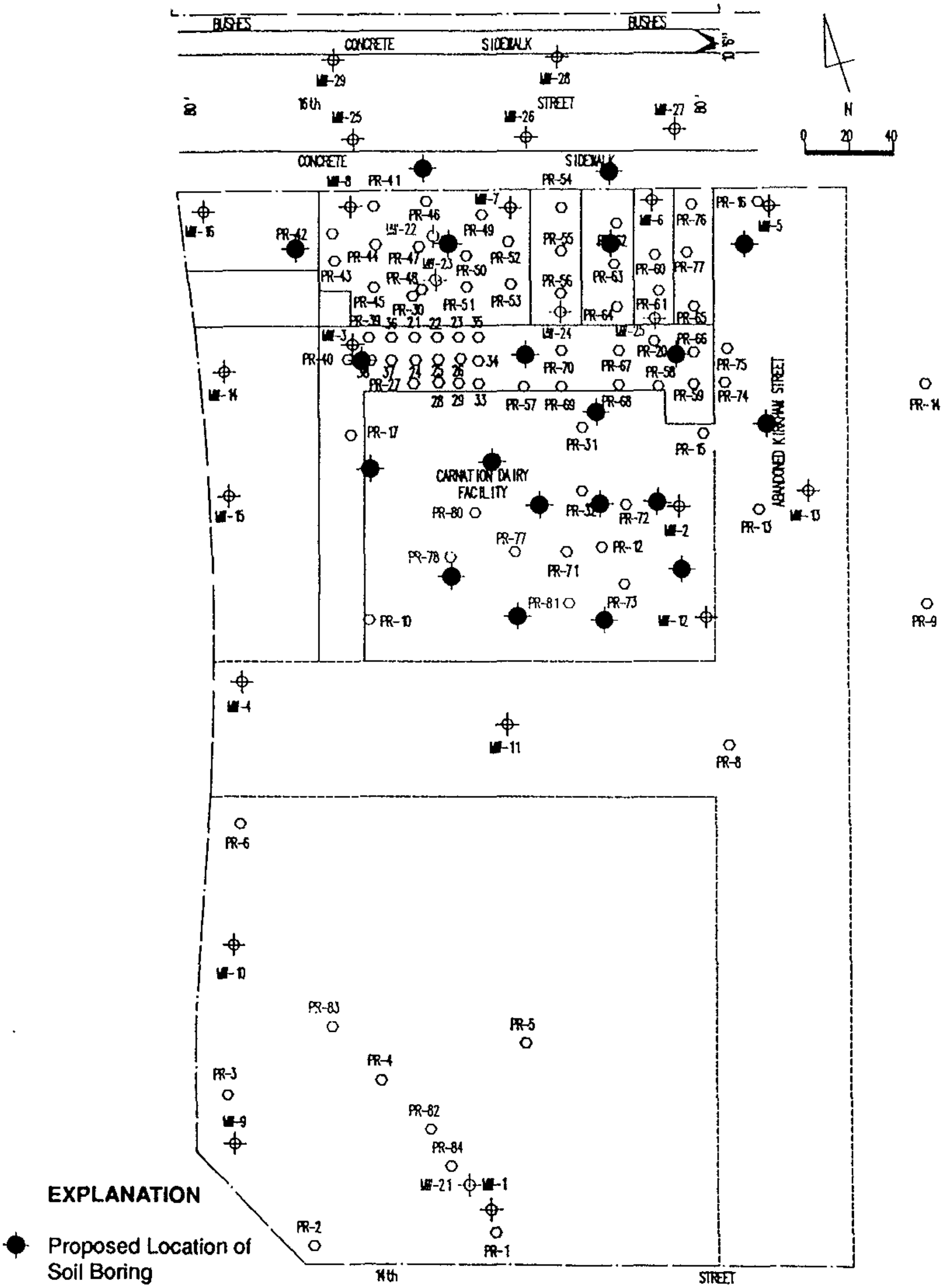
Harding Lawson Associates
Engineering and
Environmental Services

Distribution of Free-Phase
Petroleum Product, April 16, 1991
Carnation Facility
Oakland, California

PLATE
4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
IC	20294,003.02	D. J. Craig	4/91	

21794



EXPLANATION

● Proposed Location of Soil Boring

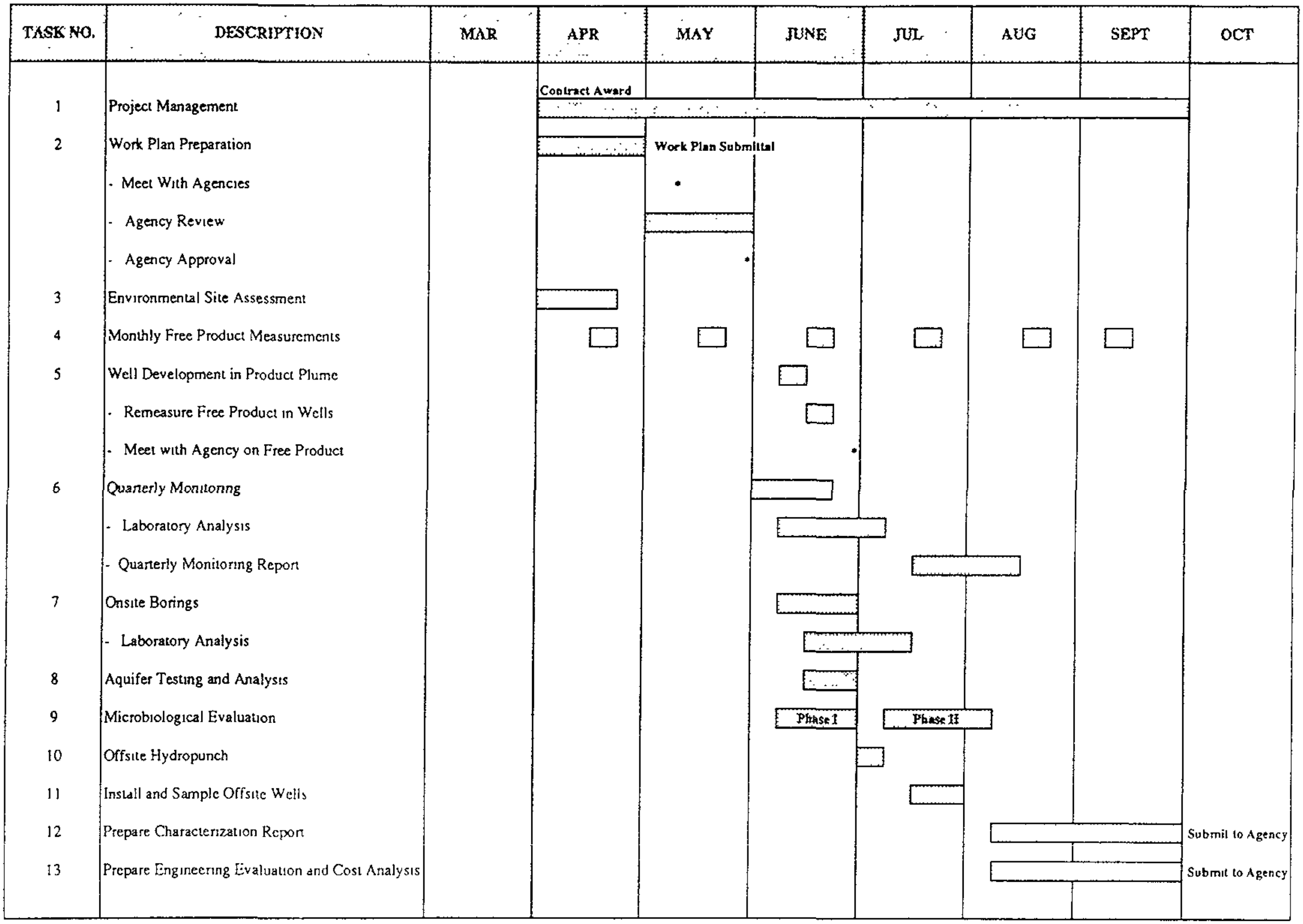
Source: Anania Geologic Engineering, 1990

Harding Lawson Associates
Engineering and
Environmental Services

Proposed Locations of Soil Borings
Carnation Facility
Oakland, California

PLATE
5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
IC	20294,003.02	D. J. Craig	4/91	



TASK NO.	DESCRIPTION
1	Project Management
2	Work Plan Preparation
	- Meet With Agencies
	- Agency Review
	- Agency Approval
3	Environmental Site Assessment
4	Monthly Free Product Measurements
5	Well Development in Product Plume
	- Remeasure Free Product in Wells
	- Meet with Agency on Free Product
6	*Quarterly Monitoring*
	- Laboratory Analysis
	- Quarterly Monitoring Report
7	Onsite Borings
	- Laboratory Analysis
8	Aquifer Testing and Analysis
9	Microbiological Evaluation
10	Offsite Hydropunch
11	Install and Sample Offsite Wells
12	Prepare Characterization Report
13	Prepare Engineering Evaluation and Cost Analysis

Harding Lawson Associates
Engineering and
Environmental Services

Project Schedule
Carnation Facility
Oakland, California

PLATE
6

DRAWN
LZ

JOB NUMBER
20294,003.02

APPROVED
D. V. Cang

DATE
4/91

REVISED DATE

22048

Appendix A

SITE HEALTH AND SAFETY PLAN
CARNATION FACILITY
OAKLAND, CALIFORNIA

Harding Lawson Associates (HLA)
SITE SAFETY PLAN

This Site Safety Plan is specifically prepared for:

Project Location Carnation Facility; Oakland, California

Job Number 20294

ALL PERSONNEL PARTICIPATING IN THE FIELD MUST BE TRAINED IN THE GENERAL AND SPECIFIC HAZARDS UNIQUE TO THE JOB AND, IF APPLICABLE, MEET RECOMMENDED MEDICAL EXAMINATION REQUIREMENTS. ALL SITE PERSONNEL AND VISITORS SHALL FOLLOW THE GUIDELINES, RULES, AND PROCEDURES CONTAINED IN THIS SAFETY PLAN. THE PROJECT MANAGER OR SITE SAFETY OFFICER MAY IMPOSE ANY OTHER PROCEDURES OR PROHIBITIONS THAT THEY BELIEVE ARE NECESSARY FOR SAFE OPERATIONS.

THIS PLAN IS PREPARED TO INFORM ALL FIELD PERSONNEL, INCLUDING HLA CONTRACTORS AND HLA SUBCONTRACTORS, OF THE POTENTIAL HAZARDS ON THE SITE. HOWEVER, EACH CONTRACTOR OR SUBCONTRACTOR MUST ASSUME DIRECT RESPONSIBILITY FOR HIS/HER OWN EMPLOYEES' HEALTH AND SAFETY.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

I. INTRODUCTION

A. SITE LOCATION: Carnation Facility; Oakland, California

B. PLAN PREPARED: Daniel J. Craig (Name) 4/12/1991 (Date)

C. PLAN APPROVED: R. Bruce Scheibach (Project Manager) 5/03/1991 (Date)

Chris Corpuz (DHSO) 5/03/1991 (Date)

D. PLAN REVISED: ______ Name ______ Date

E. REVISION APPROVED: ______ Project Manager ______ Date

______ DHSO ______ Date

F. THE POSSIBLE HAZARDS ON THIS JOB ARE EXPECTED TO BE: Chemical - soil, surface and groundwater, and air contaminated with petroleum hydrocarbons, PCBs and lead; mechanical - working around heavy equipment; electrical - working with electrical equipment, underground utilities.

G. REQUIRED PERSONAL PROTECTIVE ITEMS AND EQUIPMENT FOR THIS PROJECT: Hard hat, safety glasses, neoprene gloves, ear protectors (recommended around heavy equipment), breathable tyvek suit (when direct contact with contaminated dust/soils is possible), or tyvek saranax suit (when direct contact with contaminated liquid is probable), half mask respirator equipped with organic vapor and high efficiency filter cartridges. If air monitoring (section X) determines total organic vapor levels at 2.5 parts per million (ppm) for a 1-minute period or greater in the breathing zone, engineering control will be utilized.

i.e., flexible duct blower fans, pedestal fans. If engineering controls do not reduce the air contaminant to 2.5 ppm or below for a 1-minute period, air purifying respirators shall be donned. If total organic vapors are detected in the breathing zone at a 22.5 ppm reading for a 1-minute period, workers shall leave the area until airborne concentrations are reduced to below the 2.5 ppm level.

II. PERSONS RESPONSIBLE AND INVOLVED

A. PROJECT MANAGER R. Bruce Scheibach

Health and Safety Responsibilities All aspects of project to include health and safety. Will ensure all site workers and subcontractors are properly trained in health and safety.

B. SITE SUPERVISOR Personnel will vary.

Health and Safety Responsibilities Onsite project activities to include health and safety. Responsible for ensuring site workers comply with health and safety procedures.

C. SITE SAFETY OFFICER Personnel will vary.

Health and Safety Responsibilities Onsite health and safety activities. Responsible for ensuring site workers comply with health and safety procedures. Responsible for air monitoring.

D. OTHERS

Health and Safety Responsibilities

E. SUBCONTRACTORS Drilling companies

Health and Safety Responsibilities Health and safety activities of driller and driller's helpers.

III. FACILITY BACKGROUND

A. FACILITY BACKGROUND AND DESCRIPTION: Active dairy product production facility from 1915 to 1990. Warehouse and garages onsite. Underground fuel and oil storage tanks.

B. SITE HISTORY (USE OF SITE, ORIGIN OF CONTAMINATION): Dairy production facility. Underground waste oil tank and underground gasoline and diesel tanks presumed to have leaked.

C. HAZARDOUS INCIDENCE HISTORY (HISTORY OF INJURIES, EXPOSURE, CHEMICAL SPILLS, COMPLAINTS, ETC.):

Leaks of underground waste oil and fuel storage tanks.

D. PURPOSE OF ACTIVITY/OBJECTIVE OF HLA's WORK (CHARACTERIZATION, REMEDIAL ACTIONS, EXCAVATION, TRENCHING; INCLUDE LOCATION WITH RESPECT TO AREAS OF KNOWN OR SUSPECTED CONTAMINATION):

Characterize extent of soil and groundwater contamination.

E. SITE STATUS (ACTIVE, INACTIVE, UNKNOWN): Inactive

F. SURROUNDINGS (LOCATION WITH RESPECT TO CITY, ROADS, RESIDENCES, BUSINESSES, NATURAL FEATURES, GRADIENTS, TANKS, ETC.):

Light industrial area. Site bounded by 14th, 16th, Poplar, and Cypress streets in Oakland, California.

G. SITE MAP (ATTACHED MAP AT END OF THIS PLAN SHOWING SALIENT FEATURES, INCLUDING LOCATION OF HLA'S WORK AND LOCATION OF CONTAMINATED AREAS).

H. CLIMATE

AVERAGE WIND SPEED AND DIRECTION: Variable

	August	September	October	November
MEAN HIGH TEMPERATURE	71	70	64	56
MEAN LOW TEMPERATURE	55	51	48	41

IV. SITE CHEMICAL CONTAMINANTS

A. IDENTIFIED CHEMICAL CONTAMINANTS KNOWN TO BE PRESENT

List chemical contaminants that have been identified, their concentration, and the environmental media in which they are present. Hazardous property information for selected chemicals appears in the appendix. Review this information for all chemicals listed below. *If chemicals are not listed in the appendix, you must enter the hazardous* property information in the appendix in the spaces provided.

Chemical	Environmental Media (Enter Code)	Measured Concentration Minimum	Measured Concentration Maximum
free-phase waste oil	So, GW	ND	100%
free-phase gasoline fuel	So, GW	ND	100%
free-phase diesel fuel	So, GW	ND	100%
PCBs	So, GW	ND	66 ppm
Chemical constituents of gasoline and diesel	So, GW	ND	15 ppm

B. SUSPECTED CHEMICAL CONTAMINANTS ON SITE

List chemical contaminants that are suspected to be present.

Chemical	Environmental Media
see above list	

Code for environmental media:

Sl	Sludge
GW	Groundwater
SW	Surface water
LW	Liquid waste
So	Soil
A	Air
Other -	Specify

C. CHEMICAL CONTAMINANTS CHARACTERIZATION

Has the site been adequately characterized to the best of your knowledge?

Yes __X__ No ____

If yes, list applicable references or previous reports/studies.

Various Anania Geologic Engineering Reports.

V. GENERAL WORK PRACTICES

- Smoking, eating, drinking, chewing gum or tobacco will not be permitted within the work zones.

- Personnel should keep track of weather conditions and wind direction to the extent they could affect potential exposure.

- Personnel should be alert to any abnormal behavior on the part of other workers that might indicate distress, disorientation, or other ill effects.

- Personnel should never ignore symptoms which could indicate potential exposure to chemical contaminants. These should be immediately reported to their supervisor or the Site Safety Officer.

- Others (specific to tasks, i.e., trenching safety, drill rig safety, site entry, etc.)

VI. SITE CONTROL/WORK ZONES

A. DESCRIBE LOCATION OF EXCLUSION ZONE, HOT LINE, CONTAMINATION REDUCTION ZONE, AND DECONTAMINATION AREA AND SUPPORT ZONE. SHOW LOCATIONS ON SITE PLAN.

To be determined

B. DEFINE THE SITE CONTROL/SECURITY MEASURES (I.E., FENCING, LOCKED GATES, KEYS, SECURITY GUARDS, FLAGGING, ETC.

Site is surrounded buy approximately 10-foot high fence topped with barbed wire; security guard onsite.

C. DESCRIBE SAFETY PLAN LOCATIONS.

HLA office
Field personnel

VII. SITE RESOURCES

SITE RESOURCES LOCATIONS

Toilet facilities: Onsite

Drinking water supply: Onsite

Telephone: Guard Shack, Mobile

Radio:

Other:

VIII. HAZARD ANALYSIS

List all activities in the Job Activity Column and assign a number to each activity (example: 1. Ground Water Sampling)

Activity Number	Job Task	Mechanical	Electrical	Chemical	Temperature	Acoustical	Radioactive	02 Deficiency-Confined Space	Biohazard
1	Groundwater level measurements Groundwater sampling Aquifer testing	Heavy generator	Generator, pump	Petroleum hydrocarbons in groundwater	possible heat stress	Generator	NE	NE	NE
2	Drilling, Boring, Well Installation	Drilling	Underground power lines Overhead lines	Petroleum hydrocarbons, PCBs in soil and groundwater	Possible heat stress	Drilling	NE	NE	NE

NE Not Expected

IX. HAZARD MITIGATION

Identify procedures to mitigate all hazards listed in Section VI by placing the task number next to the appropriate mitigating measure. Listing of standard procedures is not inclusive. A specific procedure must be entered to mitigate each hazard identified in Section VIII.

Activity List Number	A. Mechanical Hazards
when applicable	Do not stand near backhoe buckets and earthmoving equipment.
1,2	Verify that all equipment is in good condition.
1,2	Do not stand or walk under elevated loads or ladders.
when applicable	Do not stand near unguarded excavation and trenches.
when applicable	Do not enter excavation or trenches over 5 feet deep that are not properly guarded, shored, or sloped.
when applicable	Consult DHSO if other mechanical hazards exist.

	B. Electrical Hazards
2	Locate and mark buried utilities before drilling.
2	Utilities located by: on
2	Maintain at least 10-foot clearance from overhead power lines.
2	Contact utility company for minimum clearance from high voltage power lines.
2	If unavoidably close to buried or overhead power lines, have power turned off, with circuit breaker locked and tagged.
1, 2	Properly ground all electrical equipment.
1, 2	Avoid standing in water when operating electrical equipment.
1, 2	If equipment must be connected by splicing wires, make sure all connections are properly taped.
1, 2	Be familiar with specific operating instructions for each piece of equipment.

	C. Chemical Hazards
1, 2	Use personal protective equipment indicated in Section 9.
2	Conduct direct reading air monitoring to evaluate respiratory and explosion hazards (list instrument, action level, monitoring location, and action to be taken in Section 10).
2	Consult DHSO for personal air monitoring.

NE = NOT EXPECTED

D. Temperature Hazards

1. Heat Stress

1, 2	When temperature exceeds 70° F, take frequent breaks in shaded area. Unzip or remove coveralls during breaks. Have cool water or electrolyte replenishment solution available. Drink small amounts frequently to avoid dehydration. Count the pulse rate for 30 seconds as early as possible in the rest period. If the pulse rate exceeds 110 beats per minute at the beginning of the rest period, shorten the work cycle by one-third.

2. Cold Stress

1, 2	Wear multilayer cold weather outfits. The outer layer should be of wind resistant fabric.
NE	0° to -30° F total work time is 4 hours. Alternate 1 hour in and 1 hour out of the low-temperature area. Below -30° F, consult industrial hygienist.
1, 2	Drink warm fluid. Provide warm shelter for resting. Use buddy system. Avoid heavy sweating.

E. Acoustical Hazards

1, 2	Use earplugs or earmuffs when noise level prevents conversation in normal voice at distance of 3 feet.

F. O_2 Deficiency - Confined Space Hazards

Confined spaces include trenches, pits, sumps, elevator shafts, tunnels, or any other area where circulation of fresh air is restricted or ability to readily escape from the area is restricted. Consult DHSO and Corporate Health and Safety Policy prior to entering confined space.

NE	Obtain permit for confined space entry
NE	Monitor O_2 and organic vapors before entering. If following values are exceeded, do not enter:

- O_2 less than 19.5 percent or greater than 25%.
- Total hydrocarbons greater than 5 ppm above background, if all air contaminants have not been identified.
- Concentrations of specific contaminants exceeding action level in Section 10 if all air contaminants are identified.

NE = NOT EXPECTED

NE	Monitor O_2 and organic vapors continuously while inside confined space. If values cited in Item 1 are exceeded, evacuate immediately. Record instrument readings.
NE	At least one person must be on standby outside the confined space who is capable of pulling workers from confined space in an emergency.
NE	Use portable fans or blowers to introduce fresh air to confined spaces whenever use of respirator is required.
NE	Work involving the use of flame, arc, spark, or other source of ignition is prohibited within a confined space.

G. Radiation Hazards

NE	If radiation meter indicates 2 mR/hr or more, leave the area and consult DHSO.

H. Biohazards

NE	Poison oak, poison ivy.
NE	Infectious waste.
1, 2	Rabid animals.
1, 2	Ticks, mosquitoes, and other insects (disease carriers or poisonous).
	Avoid breathing dust in dry desert or central valley areas (valley fever).
NE	Biological or animal laboratories.

NE = NOT EXPECTED

X. AIR MONITORING

Air monitoring should be conducted with instruments selected to measure contaminants that employees may be exposed to. Measurements should be taken within the breathing zones of workers. If action levels are reached for a 1-minute reading, appropriate action must occur.

A. GASES AND VAPORS

Instrument & Date of Calibration	Calibration Gas Standard	Frequency/ Duration of Air Monitoring	Action Level (a)(b) Above Background (Breathing Zone)	Action
OVA OVM	Methane		2.5 ppm for 1 minute period	Introduce engineering controls (i.e., blower fans) (Level D)
OVA OVM	Methane		2.5 ppm for 1 minute period	Don respirator (Level C)
OVA OVM	Methane		22.5 ppm for 1 minute period	Leave area (Level C)
				Upgrade to Level B
				Upgrade to Level A

(a) Action Levels for "known contaminants" should be based upon the contaminants Permissible Exposure Level (PEL) or Threshold Limit Values (TLVs).

(b) Action levels for unknown contaminants are based upon the following:

HNu or OVA Measurements in Breathing Zone
Reading for 1 minute

Background	Level D
>0-5 ppm above background	Level C
5-500 ppm above background	Level B
500-1000 ppm above background	Level A

Comments: ______________________________

B. EXPLOSION HAZARD

Instrument & Date of Calibration	Action Level Above Background (Ambient Air)	Frequency/Duration of Air Monitoring	Action
Combustible gas indicator	Greater than 20% LEL		Leave area

C. OXYGEN DEFICIENCY

Instrument & Date of Calibration	Action Level (Ambient Air)	Frequency/Duration of Air Monitoring	Action
O_2 meter	Less than 19.5% O_2 More than 23% O_2		Do not enter

D. OTHER INSTRUMENTS

Instrument & Date of Calibration	<u>Date</u>	Action Level (Breathing Zone/ Ambient Air)	Duration/Frequency of Air Monitoring	Action
Draeger pump/tubes				
Radiation monitor				
Heat stress meter				
Noise meter				
H_2S meter				
pH analyzer				
Others				

XI. REQUIRED PERSONAL PROTECTIVE AND RELATED SAFETY EQUIPMENT

Place the activity number from Section VI next to each item of personal protective equipment required for that task. All personal safety equipment must meet ANSI standards or equivalent.

LEVEL: ______ A ______ B 2 C 1, 2 D

Comments: ______

Head

1, 2 Hardhat

Eye/Face

1, 2 Safety Glasses
______ Chemical Goggles
______ Faceshield

Hand

1, 2 Neoprene
______ Viton
______ Nitrile
______ Underglove
______ PVC
______ Other = ______

Body

______ Full Encapsulating Suit: ______
______ Two Piece Rainsuit, Material = ______
______ One Piece Splash Suit, Material = ______
1, 2 Hooded Tyvek Suit
1, 2 Hooded Tyvek/Saranax Suit
______ Hooded Tyvek/Polyethylene Suit
______ Cloth Coveralls
______ High Visibility Vest
______ Other ______

Lung

______ SCBA (open circuit, pressure demand): ______
______ Full Face Respirator, cartridge = ______
______ Supplied Air, Airline
2 Half Mask Respirator, cartridge = Organic vapors
______ Other ______

Ear

1, 2 Earplug, type = foam
______ Earmuff, type = ______

Foot

1, 2 Steel-toed Boots, type = ______
______ Disposable Overboots, type = ______

Other Safety Equipment

___2___ Ventilation blower/fan
______ Traffic cones
______ Barrier tape
______ Blast alarm
______ Ground fault circuit interrupter

______ Lifeline harness
______ Radiation Dosimeter

Comments: ______

XII. DECONTAMINATION PROCEDURES

A. EQUIPMENT (SAMPLING, CONSTRUCTION, ETC.) DECONTAMINATION (SOLVENTS USED, EQUIPMENT USED, METHOD OF DISPOSAL). ATTACH SITE DECONTAMINATION MAP AS NECESSARY.

Steam clean, phosphate-free soap

B. PERSONNEL DECONTAMINATION (SOLVENTS USED, METHOD OF SOLVENT DISPOSAL; INCLUDE DECONTAMINATION METHOD OF PPE AND DISPOSAL OF PPE). ATTACH DECONTAMINATION MAP AS NECESSARY.

Soap and water

C. INVESTIGATION-DERIVED MATERIAL DISPOSAL

1. Drill cuttings/well water: Drill cuttings stockpiled prior to disposal, well water to poly tank prior to disposal.
2. Decontamination solutions: Soap and water
3. Other:

XIII. DOCUMENTATION

HLA PERSONNEL TRAINING AND MEDICAL RECORDS ARE AT HLA Novato. RECORDS WILL BE MAINTAINED ON SITE AS NECESSARY.

A. PROJECT PERSONNEL LIST AND SAFETY PLAN DISTRIBUTION RECORD

1. HLA Employees

All project staff must sign, indicating they have read and understand the Site Safety Plan. A copy of this Site Safety Plan must be made available for their review and readily available at the job site.

Employee Name/Job Title	Date Distributed	Signature

2. Contractors, Subcontractors

A copy of this safety plan shall be provided to contractors and subcontractors who may be affected by activities covered under the scope of this Site Safety Plan. All contractors and subcontractors must comply with applicable OSHA, EPA, and local government rules and regulations.

Firm Name	Contact Person	Date Distributed

B. <u>HEALTH AND SAFETY MEETING</u> - ALL PERSONNEL PARTICIPATING IN THE PROJECT MUST RECEIVE INITIAL HEALTH AND SAFETY ORIENTATION. THEREAFTER, A BRIEF TAILGATE SAFETY MEETING IS REQUIRED AS DEEMED NECESSARY BY THE SITE SAFETY OFFICER (OR AT LEAST ONCE EVERY 10 WORKING DAYS).

Date	Topics	Name of Attendee	Firm Name	Employee Initials

C. VISITOR - IT IS HLA's POLICY THAT VISITORS MUST FURNISH THEIR OWN PERSONAL PROTECTIVE EQUIPMENT. ALL VISITORS ARE REQUIRED TO SIGN THE VISITOR LOG AND COMPLY WITH THE SAFETY PLAN REQUIREMENTS. IF THE VISITOR REPRESENTS A REGULATORY AGENCY CONCERNED WITH SITE HEALTH AND SAFETY ISSUES, THE SITE SAFETY OFFICER SHALL ALSO IMMEDIATELY NOTIFY DHSO.

VISITOR LOG

Name of Visitor	Firm Name	Date of Visit	Signature

XIV. CONTINGENCY/EMERGENCY INFORMATION

A. REQUIRED EMERGENCY EQUIPMENT LOCATION

Safety shower/eyewash:
First aid kit: in vehicle
Fire extinguisher: in vehicle
Other:

B. EMERGENCY TELEPHONE NUMBERS

Ambulance:	911	
Police:	911 (415) 273-3211	
Fire department:	911 (415) 444-1616	
Hospital:	Peralta Hospital (415) 451-4900 Merritt Peralta Center (415) 655-4000	
Client contact:	Mr. Richard Flaget (818) 549-6000	
Poison Control Center:	(800) 233-3360	
in San Francisco:	(415) 821-8324	
CHEMTREC:	(800) 424-9300	
Project Manager	Office 899-7319	Home (707) 762-1948
DHSO	Office 899-7381	Home

C. * STANDARD PROCEDURES FOR REPORTING EMERGENCIES:

When calling for assistance in an emergency situation, the following information should be provided:

1. Name of person making call
2. Telephone number at location of person making call
3. Name of person(s) exposed or injured
4. Nature of emergency
5. Actions already taken

Recipient of call should hang up first--not the caller.

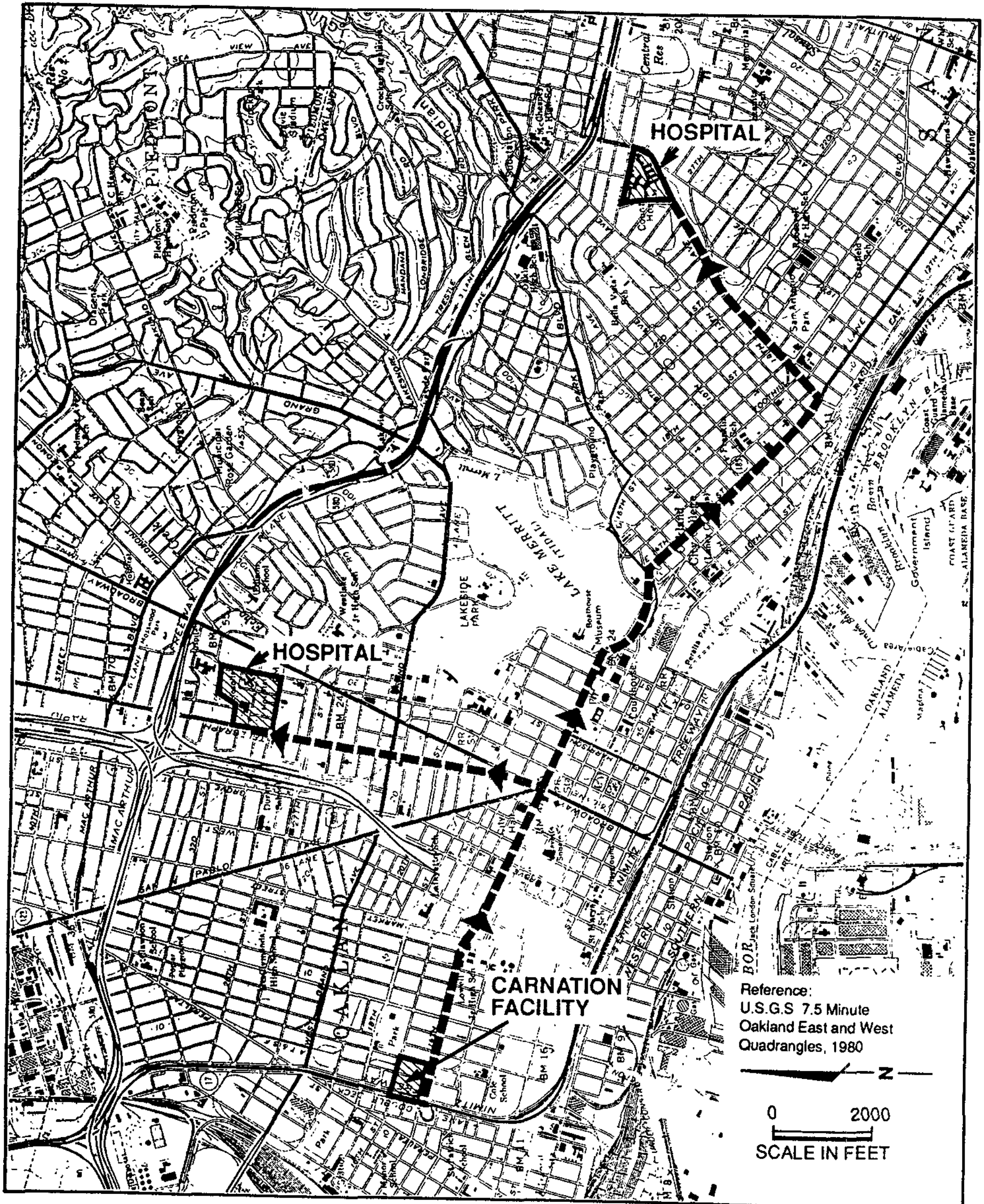
D. EMERGENCY ROUTES: ATTACH MAP SHOWING ROUTE TO NEAREST HOSPITAL. DESCRIBE NARRATIVELY THE ROUTE TO THE HOSPITAL. HAS HOSPITAL BEEN CONTACTED TO DETERMINE IF THEY WILL HANDLE A CHEMICAL EXPOSURE?

Travel east on 14th Street on Telegraph. Turn left and travel north on Telegraph approximately 1.0 mile to Merritt Peralta Center.

E. CONTINGENCY PLANS AS APPROPRIATE: DESCRIBE CONTINGENCY PLANS FOR EMERGENCIES SUCH AS: FIRES, EMERGENCY CARE, INJURY, PPE, OR OTHER EQUIPMENT FAILURE. INCLUDE EMERGENCY SIGNALS AND EVACUATION ROUTES. IF FORMAL CONTINGENCY PLAN DOCUMENT HAS BEEN PREPARED, ATTACH A COPY.

In case of injury, apply first aid as needed and/or transport injured worker to hospital. In case of fire, extinguish and/or notify fire department.

21795



Reference:
U.S.G.S 7.5 Minute
Oakland East and West
Quadrangles, 1980

Harding Lawson Associates
Engineering and
Environmental Services

Hospital Route Map
Site Safety Plan
Carnation Facility
Oakland, California

PLATE
A1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	20294,003.02		4/91	

Appendix A-1

HAZARDOUS PROPERTY INFORMATION

This appendix contains hazardous property information for selected compounds. Place a check mark next to each compound identified in Section IV, and review the hazardous property information for those compounds. If you have identified compounds in Section IV that are not listed in the appendix, you must list the compounds and enter the appropriate information.

(INCLUDE COPIES OF MATERIAL SAFETY DATA SHEETS FOR SELECTED COMPOUNDS IN ADDITION TO COMPLETION OF APPENDIX A-1.)

HAZARDOUS PROPERTY INFORMATION

Check if present	Material	Water Solubility[a]	Specific Gravity	Vapor Density	Flash Point °F	Vapor Pressure[e]	LEL UEL	LD_{50} mg/kg	TLV-TWA[g]	IDLN Level	Odor Threshold or Warning Concentration	Hazard[j] Property	Dermal[k] Toxicity	Acute[l] Exposure Symptoms
	VOLATILE ORGANIC PRIORITY POLLUTANTS													
	Acrolein	22%	0.8410	1.9	-15	214 mm	2.8% 31%	46	0.1 ppm	5 ppm	0.1-16.6 (0.21-0.5)	BCED	BJ	ABDFGHIKLMNOPQR
	Acrylyenitrile	7.1%	0.8060	1.8	30	83 mm	3% 17%	82	2 ppm	4,000 ppm	19-100	BCEGO	DIG	FGIKLMNOR
X	Benzene	820 ppm	0.8765	2.8	12	75 mm	0.339% 7/1%	3800	11 ppm	2,000 ppm	4.68	BCGO	CIG	BCDFHIKLMNOQR
	Bromomethane	0.1 g	1.732	3.3	none	1.88 atm	13.5%c 14.5%		5 ppmh	2,000 ppm	no odor	CD		BCDEIJKLMNOQR
	Bromodichloromethane	Insoluble	1.980	--	none	n/a	non flam	916	none established	none specified		CGO		BIMN
	Bromoform	0.01g	2.887	--	none	5 mm	non flam	1147	0.5 ppm	n/a	530	CED		BCDKLM
	Carbon Tetrachloride	0.08%	1.5967	5.3	none	91 mm	non flam	2800	5 ppmh	300 ppm	21.4-200	CD	JGH	ABCFGHKMO
	Chlorobenzene	0.01 g	1.1058	3.9	84	8.8 mm	1.3% 9.6%	2910	75 ppm	2,400 ppm	0.21-60	BCD	CIF	BCFIKLMNOPQR
	Chloroethane	0.6 g	0.8978	2.2	-58	1.36 atm	3.8% 15.4%		1000 ppm	20,000 ppm		BCD		BFHIKMNP
	2-Chloroethylvinyl Ether	Insoluble	1.0475	3.7	80	30 mm	--	250	none established	none specified		BCD		NIM
	Chloroform	0.8 g	1.4832	4.12	none	160 mm	non flam	800	10 ppmh	1,000 ppm	50-307 fatigue (>4096)	CD		BCDGIKLMN
	Chloromethane	0.74%	0.9159	1.8	32	50 atm	7.6% 19%		50 ppmh	10,000 ppm	10-100 no odor (500-1000)	BCD	DHF	ABCDEFGIJKLOQR
	Dibromochloromethane	Insoluble	2.451	--	--	--	--	848	none established	none specified		BCD		BFHIMNPQ
	1,1-Dichloroethane (DCA)	0.1 g	1.1757	8.4	22	182 mm	6% 16%	725	100 ppm	4,000 ppm	5 ppm	BCD		AGHIMNO

HAZARDOUS PROPERTY INFORMATION

Check if present	Material	Water Solubility[a]	Specific Gravity	Vapor Density	Flash Point °F	Vapor Pressure[e]	LEL UEL	LD50 mg/kg	TLV-TWA[g]	IDLN Level	Odor Threshold or Warning Concentration	Hazard[j] Property	Dermal[k] Toxicity	Acute[l] Exposure Symptoms
	1,2-Dichloroethane	0.8%	1.2554	3.4	55	87 mm	6.2% 16%	670	10 ppmh	1,000 ppm	6 ppm	BCDG		BCFGOLMNQ
	1,1-Dichloroethylene (DCE)	2250 mg/l @77of	--	3.4	3	591 mm	7.3% 16.0%	200	5 ppmh	none specified		BCD		BIMN
	Trans-1,2-Dichloroethylene	Slightly soluble	1.2565	--	36	400 mm	9.7% 12.8%		none established	none specified	.0043 mg/l	BCD		ABFILOQ
	1,2 Dichloropropane	0.26%	1.583	3.9	60	40 mm	3.4% 14.5%	1900	75 ppm	2,000 ppm	50	BCD		ABGHIKMNO
	Cis-1,3-Dichloropropane	Insoluble	1.2	3.8	83	28 mm	5% 14.5%		1 ppmh	none specified		BCD		ABGIKLMNP
	Trans-1,3-Dichloropropane	Insoluble	1.2	3.8	83	28 mm	5% 14.5%		1 ppmh	none specified		BCD		ABGIKLMNP
X	Ethylbenzene	0.015 g	0.867	3.7	59	7.1 mm	1.0% 6.7%	3500	100 ppm	2,000 ppm		BCD	CIF	ABFHIKLMNPQR
	Methylene Chloride	Slightly soluble	1.335	2.9	none	350 mm	12%c unavailable	167	100 ppmh	5,000 ppm	25-320 (200)	CED	CIF	BCIKLMNPR
	1,1,2,2-Tetrachloroethane	0.19%	1.5953	5.8	none	5 mm	non flam		1 ppmh	150 ppm	3-5	CD		ABCFHIKLMNOQ
	Tetrachloroethylene	0.15 g/ml	1.6227	5.8	none	15.8 mm	non flam	8850	50 ppmh	500 ppm	4.68%-50 (160-690)	CD		ACFHIKLMNP
	1,1,1-Trichloroethane (TCA)	0.7 g	1.3390	4.6	none	100 mm	8.0%c 10.5%	10300	350 ppm	1,000 ppm	20-400 (500-1000)	BCED		ABEFHIKLNOP
	1,1,2-Trichloroethane	0.45	1.4397	4.6	none	19 mm	6%c 15.5%	1140	10 ppm	500 ppm	-0-	C		DEFGHIKMNOP Q
	Trichloroethylene (TCE)	0.1%	1.4642	4.5	90d	58 mm	12.5% 90%	4920	50 ppmh	1,000 ppm	21.4-400	BC		BFKLNOPQ
	Trichlorofluoromethane	0.11 g	1.494	--	none	0.91 atm	non flam		1000 ppm	10,000 ppm	135-209	CD		BFHKLQ

HAZARDOUS PROPERTY INFORMATION

Check if present	Material	Water Solubility[a]	Specific Gravity	Vapor Density	Flash Point °F	Vapor Pressure[e]	LEL UEL	LD$_{50}$ mg/kg	TLV-TWA[g]	IDLN Level	Odor Threshold or Warning Concentration	Hazard[j] Property	Dermal[k] Toxicity	Acute[l] Exposure Symptoms
X	Toluene	0.05 g	0.866	3.2	40	22 mm	1.3% 7.1%	5000	100 ppm	2,000 ppm	0.17-40 fatigue (300-400)	BC	BHE	DEFHIKLMNOPQ
	Vinyl Chloride	negligible	0.9100	2.24	-108	3.31 atm	3.6% 33%	500	1 ppm	none specified	260	BCEG	DJG	ABFHIKLMN
METALS														
	Arsenic	b	5.727	n/a	none	n/a	f		10 g/m^3	none specified		CEG	CJG	ACDGJMOQR
	Beryllium	b	1.85	n/a	none	n/a	f		2 g/m^3	none specified		C		IJMNR
	Cadmium	b	8.642	n/a	none	n/a	f	225	0.5 mg/m^3	40/mg^3		C		ABGHIKLMNQR
	Chromium	b	7.20	n/a	none	n/a	f		0.5 mg/m^{3}h	500/mg^3		C		FMNQ
	Copper	b	8.92	n/a	none	n/a	f		0.1 mg/m^3	none specified		C		FGIJMOQR
	Lead	b	11.3437	n/a	none	n/a	f		50 g/m^3	none specified		C		ACDFGKOQR
	Mercury	b	13.5939	7.0	none	0.0012 mm	f		50 g/m^{3}h	28 mg/m^3		C		AGLMNQ
	Nickel	b	8.9	n/a	none	n/a	f		1 mg/m^3	none specified		C		DGHLMNQ
	Silver	b	10.5	n/a	none	n/a	f		0.01mg/m^3	none specified		C		IN
	Thallium	b	11.85	n/a	none	n/a	f		0.01mg/m^3	20 mg/m^3		C	BG	ABGLNOQ
	Zinc	b	7.14	n/a	none	n/a	f		none established	none specified		C		DF

HAZARDOUS PROPERTY INFORMATION

Check if present	Material	Water Solubility[a]	Specific Gravity	Vapor Density	Flash Point °F	Vapor Pressure[e]	LEL UEL	LD_{50} mg/kg	TLV-TWA[g]	IDLN Level	Odor Threshold or Warning Concentration	Hazard[j] Property	Dermal[k] Toxicity	Acute[l] Exposure Symptoms	
MISCELLANEOUS															
	Asbestos	Insoluble	2.5	n/a	none	n/a	non flam		0.2-2 fibers/cc	none specified		CG		MN	
	Cyanides	58-72%		n/a	none	n/a	non flam		5 mg/m^3			CE		FKLMPQ	
X	PCB (generic)	slightly	--	n/a	none	n/a	non flam		1.0 g/m^3i	none specified		CG		CHLPQ	
	Phenol	8.4%	1.0576	3.2	175	0.36 mm	1.8% 8.6%	414	5 ppm	100 ppm	0.47-5 (48)	C		ABCDGIKMNOQR	
X	Xylene	0.00003%	0.8642	3.7	84	9 mm	1.1% 7%	5000	100 ppm	10,000 ppm	0.5-200 (200)	BCD		ABFHIKLMNPQ	
	Acetone	soluble	0.8	2.0	-4	400 mm	2.6% 12.8%	9750	750 ppm	10,000 ppm	100	BCD	DI	H	
	Chromic Acid	soluble	1.67-2.82		n/a	none	n/a flam	non	established	none specified	none		ACEG		GIH
X	Diesel Fuel	insoluble	0.81-0.90		--	130	-- 6-7.5	0.6-1.3	established	none specified	none	0.08	BC	ABC	IN
X	Gasoline	insoluble	0.72-0.76		3.4	-45	variable 7.6%	1.4%		300 ppm specified	none x 0.25	0.005-10	CD	AB	IN
	Kerosene	insoluble	0.83-1.0	--	100-165		5 5.0%	0.7%	established	none specified	none	1.0	BCD	AB	IN

HAZARDOUS PROPERTY INFORMATION EXPLANATIONS AND FOOTNOTES

Water solubility is expressed in different terms in different references. Many references use the term "insoluble" for materials that will not readily mix with water, such as gasoline. However, most of these materials are water soluble at the part per million or part per billion level. Gasoline, for example, is insoluble in the gross sense, and will be found as a discreet layer on top of the groundwater. But certain gasoline constituents, such as benzene, toluene, and xylene will also be found in solution in the groundwater at the part per million of part per billion level.

a. Water solubility expressed as 0.2 g means 0.2 grams per 100 grams water at 20° C.

b. Solubility of metals depends on the compound in which they are present.

c. Several chlorinated hydrocarbons exhibit no flash point in conventional sense, but will burn in presence of high energy ignition source or will form explosive mixtures at temperatures above 200¯F.

d. Practically non-flammable under standard conditions.

e. Expressed as mm Hg under standard conditions.

f. Explosive concentrations of airborne dust can occur in confined areas.

g. Values for Threshold Limit Value-Time Weighted Average (TLV-TWA) are OSHA Permissible Exposure Limits except where noted in h and i.

h. TLV-TWA adopted by the American Conference of Governmental Industrial Hygienists, which is lower than the OSHA PEL.

i. TLV-TWA recommended by the national Institute for Occupational Safety and Health (NIOSH). A TLV or PEL has not been adopted by ACGIH or OSHA.

j.
A - corrosive
B - flammable
C - toxic
D - volatile
E - reactive
F - radioactive
G - carcinogen
H - infectious

k. Dermal Toxicity data is summarized in the following three categories:

Skin Penetration

-	A	negligible penetration (solid-polar)
+	B	slight penetration (solid-nonpolar)
++	C	moderate penetration (liquid/solid-nonpolar)
+++	D	high penetration (gas/liquid-nonpolar)

Systemic Potency

E - slight hazard - LD_{50} = 500-15,000 mg/kg
lethal dose for 70 kg man = 1 pint-1 quart
F - moderate hazard - LD_{50} = 50-500 mg/kg
lethal dose for 70 kg man = 1 ounce-1 pint
G - extreme hazard - LD_{50} = 10-50 mg/kg
lethal dose for 70 kg/man = drops to 20 ml

Local Potency

H - slight - reddening of skin
I - moderate - irritation/inflammation of skin
J - extreme - tissue destruction/necrosis

I. Acute Exposure Symptoms

A - abdominal pain
B - central nervous system depression
C - comatose
D - convulsions
E - confusion
F - dizziness
G - diarrhea
H - drowsiness
I - eye irritation
J - fever
K - headache
L - nausea
M - respiratory system irritation
N - skin irritation
O - tremors
P - unconsciousness
Q - vomiting
R - weakness

Appendix A-2
Hazard Analysis Examples

Hazard Analyses

List all activities in the Job Activity Column and assign a number to each activity (example: 1. Drilling, Soil Sampling and Well Installation)

Identify how each category of hazard exists at each activity.

Activity Number	Job Task	Mechanical	Electrical	Chemical	Temperature	Acoustical	Radioactive	02 Deficiency-Confined Space	Biohazard
1	Drilling, Soil Sampling, and Well Installation	Rig Equipment, materials handling	Overhead/buried power lines at two locations	Potentially in soils and ground water	Heat stress	Rig noise	NE	NE	NE
2	Well Development	Pumping equipment	Generator	Potentially in soils and ground water	Heat stress	Pumping equipment	NE	NE	NE
3	Ground-Water Sampling from Monitoring Wells	NE, potentially pumping equipment	NE		Heat stress	NE	NE	NE	NE
4	Geophysical Survey	Portable equipment weight & bulkiness	Portable equipment	NE	NE	NE	nuclear gauges	NE	Mosquitos, snakes
5	Excavation of Contaminated Soil, Gasoline Station	Excavation stability, mechanical equip.	Utilities	Heat stress dilute product		Excavation equipment	NE	Excavation can be a confined space	NE
6	Inspect Excavation of Landfill (Domestic Non-hazardous Waste)	Exavation stability shoring stability	NE	Same as 1, broad range organic/ inorganic	Heat stress	NE	Pot. from hospital and other wastes	Excavation can be a confined space	Microbes, insects, rodents, birds

NE = Not expected

Appendix B
QUALITY ASSURANCE/QUALITY CONTROL PROJECT PLAN (QA/QC)
CARNATION FACILITY
OAKLAND, CALIFORNIA

Appendix B
QUALITY ASSURANCE/QUALITY CONTROL PROJECT PLAN

This appendix contains the Quality Assurance/Quality Control Project Plan (QA/QC) for the Carnation Facility, 1310 14th Street, Oakland, California. The QA/QC Plan describes the procedures that will be followed during the remedial investigation, specifies the quality control samples that will be collected and analyzed, and describes the evaluation of the QC data.

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1.0 WATER-LEVEL AND FREE PRODUCT MEASUREMENT PROCEDURES

Water levels and free product thicknesses may be measured using a steel tape or electric oil-interface sounder. The following protocols will be employed while collecting water-level measurements for the investigation:

Steel Tape

- A graduated steel tape is the standard equipment used for water-level measurements and when required, for a quality control check of other methods.
- The steel tape will be periodically checked for kinks. Kinked tapes will not be used. If an approximate depth to water is known, the bottom 1 to 2 feet of the tape will be chalked; otherwise, the bottom 5 feet will be chalked before each measurement. The tape will be slowly lowered into the well to avoid contact with a possibly wet casing.
- If oil products or films exist above the water phase, a separate measurement with water-finding paste, a clear acrylic bailer, and/or an oil-water interface probe will be made to determine both depth to oil and depth to water.
- Portions of the tape that are submerged below fluid levels in wells will be cleaned according to the procedure described in Section 4.0.
- Tapes will be maintained in a clean and functional condition.
- Measurements of water levels will be repeated until two consecutive measurements are in agreement to the nearest 0.02 foot.

Oil-Interface Probe

- A battery-powered oil-interface probe may be used for water-level measurements when a steel tape cannot be used because of product in the well. The probe has firmly affixed or permanent marks on the sounder line at regular intervals of 5 feet or less.
- Calibration checks for the oil-interface probe will be made periodically. The markings will be checked for the proper spacing by physically comparing the spacings with a graduated steel tape. For calibration purposes, a water-level measurement made with the oil-interface probe

will be compared to the same measurement made with a steel tape. These checks will be made at the beginning of each sampling sequence and after any incident that may affect the accuracy of the instrument (e.g., cable stretching, entanglement, sensor tip replacement).

- Portions of the cable that are submerged below fluid levels in wells will be cleaned according to the procedure described in Section 4.0.
- Oil-interface probes will be maintained in a clean and functional condition.

2.0 GROUNDWATER SAMPLING PROCEDURES

Groundwater samples will be collected as follows:

- Measuring and sampling equipment will be decontaminated prior to sample collection from each well (Section 4.0).
- The initial water level in the monitoring well will be measured (Section 1.0) and the purge volume (equivalent of three casing volumes) will be calculated.
- Prior to sampling, a submersible pump or stainless steel bailer will be used for purging a minimum of three casing volumes from each monitoring well. Selection of a pump or bailer will depend on the volumes to be removed and the rate of water production from the monitoring well.
- Indicator parameters (temperature, conductivity, and pH) will be monitored during purging to verify complete purging of static water in the monitoring well. Temperature will be reported to 0.1 degree Celsius. Conductivity will be reported to two significant figures in μmhos/cm at 25°C. Field pH measurements will be reported to 0.1 standard units.
- If a monitoring well is purged dry before three casing volumes have been removed, the sample will be collected after the well has recovered to within 80 percent of the initial (prior to purging) water level or after 24 hours, whichever comes first. However, samples to be analyzed for volatile organic compounds will be obtained as soon as there is enough water in the well for the sample.
- Water samples will be collected with a stainless steel or Teflon bailer after the pump (if used) has been removed from the monitoring well.
- Samples to be analyzed for dissolved metals will be filtered in the field using a 0.45 micron membrane filter prior to filling sampling containers. The samples will be preserved immediately after filtering. Other sample containers will be filled directly from the bailer. Sample containers, volumes, and preservation methods are specified in Table B-1.

The following information will be entered on the Groundwater Sampling Form (Appendix B-1) at the time of sampling:

- *Sampler's name or initials*
- Time and date of sample collection
- Sample location (e.g., well number)

- Sample number
- Approximate volume in each sample container
- Type of analysis to be performed
- Preservatives, if any
- Purged volume and time of purging
- Unusual conditions (e.g., color, odor, solids)
- Groundwater and free-phase product levels prior to sampling
- Field conditions (e.g., weather, air temperature)
- Sampling equipment used
- Indicator parameter measurements (e.g., pH, temperature, conductivity).

Each sample will be packaged and transported as described below:

- Collect samples in appropriate containers (provided by analytical laboratory).
- Print clearly in waterproof ink on the label the preservative, if any, that has been added the sample number, the HLA job number, the initials of the sample collector, and the date and time the sample was collected.
- Seal and package sample containers as appropriate.
- Fill out groundwater sampling form and chain of custody record as described in Section 5.0.
- Place samples into coolers in which the temperature is maintained using sealed, reusable ice packs.
- Seal the top two copies of the chain of custody form inside a zip-lock bag. Use strapping tape to attach the packet to the inside of the cooler lid.
- Coolers will be delivered to the analytical laboratories by HLA or laboratory personnel.

3.0 DRILLING SOIL SAMPLING, AND MONITORING WELL INSTALLATION PROCEDURES

This section describes the routine procedures that will be followed in drilling soil borings and installing groundwater monitoring wells. These procedures are designed so that borings are properly logged, soil samples are properly collected, and the wells are properly installed. The types, locations, and numbers of borings and monitoring wells are described in Section 3.0 of the text.

3.1 Drilling Procedures

The hollow-stem auger drilling method will be used for the shallow soil borings and the monitoring wells. Soils encountered during drilling will be classified by the field geologist, hydrogeologist, or engineer (hereafter referred to as geologist) using the Unified Soil Classification System (USCS; Plate B1) and under the supervision of a geologist registered in California. Observations, which include the following information, as appropriate, are recorded on a standard boring log form (Appendix B-1):

- Boring or monitoring well designation
- Boring or monitoring well location
- Drilling and sampling methods
- Names of geologist and driller
- Dates and times drilling started and completed
- Depth where groundwater was first encountered
- Sample description: depth, color, estimated grain size and relative distribution of sizes, estimated moisture content, estimated relative density
- Variations in drilling rates and rig behavior

Soil borings will be sampled using a split-barrel sampler or continuous corer. Soil sampling procedures are described in Section 3.2, below. Depths at which soil samples are to be collected are described in Section 3.0 of the text.

3.2 Soil Sampling

Soil samples will be collected for lithologic description and/or chemical analysis. Samples will be collected during installation of the soil borings and monitoring wells using the hollow-stem auger drill rig. The sampling methods are described below:

- For lithologic logging, split-barrel drive samples will be collected and examined at observed changes in lithology or at least every 5 feet. The split-barrel sampler will be mechanically driven with a rig-mounted hammer. Cuttings will be examined between sample intervals to qualitatively verify soil descriptions and to help identify changes in strata. Soil samples will be examined and classified according to the USCS System.

- Samples for chemical analysis will be collected using a split-barrel or continuous core sampler. The split-barrel sampler may be any one of several types, diameters, and lengths that are available. For chemical analysis samples, the sampler will be lined with three stainless steel tubes (6 inches long, 3.25 inches in diameter). After the sampler has been retrieved from the boring, the deeper one or two tubes will usually be kept. Both ends of the tubes will be sealed with plastic caps lined with Teflon or aluminum foil; the caps will be fixed to the tube with tape to prevent moisture loss. The sample tubes will be appropriately labeled.

Sample handling, packaging, and transport are described in Section 5.0.

3.3 Monitoring Well Installation

Monitoring wells will be installed to investigate the presence of dissolved hydrocarbons in the shallow (i.e., first encountered) groundwater. Monitoring well locations will be determined after analysis of the hydropunch sample data. Prior to drilling, a well permit will be obtained from the Alameda County Flood Control

District - Zone 7. The monitoring wells will be drilled using a hollow-stem auger drill rig.

The monitoring wells will be constructed using 4-inch diameter (minimum) Schedule 40 flush-threaded PVC casing and screen (factory slotted) with a bottom cap and 1 foot long silt trap. Slot size will be selected depending on evaluation of the shallow soils in the interval to be screened. Centralizers will be placed at the bottom of the screens. The casing will be set in place by lowering it through the hollow-stem of the auger to the selected depth. A sand pack of water-washed sand (sized to be compatible with aquifer materials and screen slot size) will be placed adjacent to the entire screened interval, extending at least 2 feet above the top of the screen. The sand pack will be placed by carefully pouring sand down the annulus between the hollow-stem auger and the well casing. The hollow-stem augers will be raised periodically and an auger flight removed to allow the sand to fill the annulus between the casing and the borehole wall. Sand levels within the borehole will be confirmed periodically by sounding with a weighted tape.

A minimum 2-foot thick bentonite seal will be placed above the sand pack. Because the bentonite seal is anticipated to be placed above the static water level, crushed bentonite will be used and potable water will be added to saturate the seal, thus promoting swelling and the formation of a competent seal. The bentonite seal will be placed in the same manner as the sand pack. Levels will be sounded periodically with a weighted tape and bridges will be broken with a weighted tape, tremie pipe, or similar device. The bentonite will be allowed to hydrate for 30 to 60 minutes to allow for expansion prior to addition of grout.

The annulus above the bentonite seal will be sealed with cement/bentonite grout. Because the grout seal is anticipated to be above the static water level, the grout will be thoroughly mixed with tap water at the surface and carefully poured into the annulus above the bentonite seal to the ground surface. As required by Alameda County regulations, emplacement of this surface seal may be witnessed by the ACDEH.

Monitoring wells will be completed at grade and will be secured with a locking well cover. The locking well cover will be set in the surface seal. After the grout has set for at least 12 hours, each well will be developed as described in Section 3.4. The identification number of each well will be permanently marked on the cap of the well casing and on the locking well cover.

A reference point on the top of the well casing will be surveyed by a registered land surveyor to obtain elevations relative to the mean sea level (MSL) datum to an accuracy of ±0.01 feet. This information is necessary for measuring groundwater elevations. This reference point will be permanently marked on the well casing. Northing and easting locations of wells will also be surveyed (to nearest 1.0 foot).

3.4 Well Development

After the grout has set for at least 12 hours, each well will be developed by surging, pumping, and/or bailing. The well will be bailed if it does not produce water at a rate sustainable by pumping. Each well will be developed until the discharged water is visibly clear and free of sediment. The adequacy of well development will be determined by the site geologist.

4.0 DECONTAMINATION AND DISPOSAL PROCEDURES

4.1 Equipment Decontamination Procedures

All equipment that may come in contact with potentially contaminated soil or water will be decontaminated prior to and after use. Decontamination will consist of steam cleaning (high pressure, hot water washing) or phosphate-free detergent wash, and distilled deionized (DI) or clean water rinse, as appropriate. Decontamination will be conducted in such a manner that decontamination fluids can be disposed as described in Section 4.2 below.

Drilling, sampling, and monitoring well installation equipment will be decontaminated as follows:

- Downhole equipment on drill rigs (e.g., augers, drill rods, and drill bits) will be steam cleaned prior to use at the site. Visible soil and grease will be removed at this time.
- Soil sampling equipment (e.g., split-barrel sampling tubes and continuous-core equipment) will be cleaned prior to each use and between sampling events. The sampler will be steam cleaned or washed in a phosphate-free detergent solution and rinsed in DI water. Visible soil will be removed at this time. Wash solutions and rinse water will be replaced prior to each boring.
- Casing, screen, couplings, and caps used in monitoring well installation will be steam cleaned prior to installation. Visible foreign matter will be removed at this time.
- The exterior surfaces and accessible interior portions of submersible pumps will be steam cleaned prior to each use or prior to each sampling round.
- Bailers will be steam cleaned or washed in phosphate-free detergent solution and rinsed twice in DI water prior to each use. Rope or string (used with bailers) that has been in contact with the water in the well will be discarded, and replaced with new string after each sample is collected.
- Steel tapes and oil-interface probes will be rinsed in DI water or wiped clean after each use. Generally, only the wetted end of these devices will require cleaning.

4.2 Disposal Procedures

Drill cuttings, purged groundwater, decontamination fluids, and used personal protective equipment will be temporarily stockpiled onsite or stored onsite in 55-gallon drums or a poly tank until an acceptable means of disposal has been identified. The 55-gallon drums will be clearly labeled and stored in the Carnation warehouse until final disposal is arranged. It is anticipated that the purged groundwater and decontamination fluids may be discharged to the sanitary sewer after the necessary permits are obtained. If hazardous, the soils will be transported to a permitted disposal facility within 90 days of receipt of chemical analytical results. Analytical results from the soil samples may be used for waste profiling for disposal; the specific requirements for disposal will depend on the chemicals, if any, identified as well as individual requirements of the disposal facilities.

5.0 SAMPLE CUSTODY PROCEDURES

This section describes standard operating procedures for sample custody during the investigation. Sample custody procedures will be followed through sample collection, transfer, analysis, and ultimate disposal. The purpose of these procedures is to assure that 1) the integrity of samples is maintained during their collection, transport, and storage prior to analysis, and 2) that sample material is properly disposed after analysis. Sample custody is divided into field procedures and laboratory procedures, as described below.

5.1 Field Custody Procedures

Sample quantities, types, and locations have been selected before the field work commences. As few people as possible will handle the samples. The field geologist will be responsible for the care and custody of the samples until they are properly transferred to a representative of the chemical laboratory. Custody transfer will be documented on the chain of custody record.

5.1.1 Field Documentation

Each sample will be sealed and labeled properly immediately after collection. Sample identification documents will be carefully prepared so that identification and chain of custody records can be maintained, and sample disposition can be controlled. Forms will be filled out with waterproof ink. The following identification documents (Appendix B-1) will be utilized during the investigation:

- Sample Labels
- Field Investigation Daily Reports
- Groundwater Sampling Forms
- Chain of Custody Forms

These documents are described below.

Sample Labels

Sample labels are necessary to prevent misidentification of samples. Preprinted sample labels will be provided. Where necessary, the label will be protected from water and solvents with clear label-protection tape. Each label contains the following information:

- Project (job) name
- Job number
- Name of collector
- Date and time of collection
- Place of collection (job site)
- Sample number, well/boring number, depth (if applicable).

Field Investigation Daily Report

A field investigation daily report will be used to record daily activities and will be retained in the project files. Entries can include the following information:

- Project (job) name
- Job number
- Name of author, date, and time of entry
- Location of activity
- Names and affiliations of personnel on site, including visitors
- Sample collection or measurement methods
- Number of samples collected
- Sample identification numbers

- Sample distribution (laboratory)
- Field observations and comments.

Chain of Custody Record

A chain of custody record will be filled out for and accompany every sample submitted to the analytical laboratory. The chain of custody record comprises the documentation necessary to track sample possession from the time of collection to analysis. A carbon copy of the chain of custody record will be retained in the project files. The record contains the following information:

- Project (job) name
- Job number
- Names of samplers
- Signature of collector, sampler, or recorder
- Project manager's name
- Sample number or identification
- Date of collection
- Boring/well number
- Sample type (e.g., soil, water)
- Analyses requested
- Inclusive dates of possession
- Signature of person receiving sample
- Date/time of sample receipt.

Corrections to Documentation

Original data recorded in field documents, chain of custody records, and other forms will be written in waterproof ink. None of these documents will be altered, destroyed, or discarded, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on a document compiled by one individual, that individual will make the correction simply by crossing a line through the error, entering the correct information, and initialing and dating the change. The erroneous information will not be obliterated. Any subsequent error(s) discovered on a document will be corrected by the person discovering the error. All corrections will be initialed and dated.

5.1.2 Sample Transfer and Shipment

Samples will always be accompanied by a chain of custody record. When transferring samples, the individuals relinquishing and receiving the samples will sign and date the chain of custody record. Samples will be packaged properly for shipment and dispatched to the laboratory for analysis. Custody seals are not deemed necessary when the samples are in continuous possession of HLA or laboratory personnel.

5.2 Laboratory Custody Procedures

A designated sample custodian will accept custody of the shipped samples and verify that the information on the sample label matches that on the chain of custody record(s). Pertinent information as to sample condition, method of shipment, and sample breakage will be noted by the sample custodian. The custodian will enter the appropriate data into the laboratory sample tracking system. The laboratory custodian will use the sample number on the sample label and/or assign a unique laboratory number to each sample. The custodian will transfer the sample(s) to the proper analyst(s) or store the sample(s) in the appropriate secured area.

Laboratory personnel will be responsible for the care and custody of samples from the time they are received until the sample is exhausted. Samples and extracts will be retained by the analytical laboratory for up to 30 days after the data are reported by the laboratory. Unless notified by HLA, excess or unused samples will be disposed by the laboratory in a manner consistent with appropriate government regulations. Data sheets and laboratory records will be retained as part of the permanent documentation for at least three years. The laboratory used will be state certified for the analyses requested.

6.0 CALIBRATION PROCEDURES

6.1 Field Instruments

Several field instruments will be used during the investigation. Calibration procedures for these instruments are described below and a summary of these procedures is presented in Table B-2.

6.1.1 Portable Gas Analyzers

Different portable gas analyzers will be available for onsite use during field operations. These may include a Foxboro Analytical, Century Organic Vapor Analyzer (OVA), a Photovac TIP, Organic Vapor Monitor (OVM), and an HNU Model P1-101 hydrocarbon analyzer. These instruments will be used for general qualitative survey tasks (e.g., health and safety monitoring). The instruments will be calibrated on a daily basis according to manufacturer's instructions as follows:

- Connect the probe to the meter, turn meter on, check the battery level, and allow instrument to warm up to 10 to 15 minutes.
- Adjust the zero setting on meter.
- Introduce calibration gases to the instrument to perform a two-point calibration and adjust instrument as appropriate. The calibration will be performed on the lower concentration gas standard first, then the higher concentration gas standard.
- Re-check the zero setting.
- Any meters that cannot be calibrated will be returned to the HLA warehouse for service and replaced with a properly functioning meter.

6.1.2 Water-Level and Free Product Measurement Instruments

Oil-interface probe calibration:	Check against steel surveyor's tape prior to use.
Graduated steel tape calibration:	Reference to new steel tape; manufacturer-supplied temperature correction will be applied, if applicable for field conditions.

6.1.3 pH Meters

pH meter calibration:	Calibrated daily using factory- or laboratory-supplied buffer solutions of pH 4, 7, and 10 which will be renewed weekly. Temperature correction will be applied during measurement, if appropriate.

6.1.4 Electrical Conductivity Meters

Electrical conductivity meter calibration:	Calibrated daily or prior to each use using laboratory-supplied standard. Temperature correction applied during measurement, if appropriate.

6.1.5 Water Temperature Measurement Instruments

Mercury thermometer calibration:	Factory calibration once and checked at least annually.
Temperature meter and thermistor calibration:	Checked weekly against mercury thermometer.

6.2 Preventive Maintenance

The maintenance of the equipment is performed and documented in logbooks in HLA's Novato warehouse. All equipment receives a maintenance checks prior to leaving the warehouse to minimize equipment breakdowns in the field. Instruments found to be inoperable in the field will be taken out of use.

7.0 ANALYTICAL PROCEDURES

Chemical analyses will be performed on soil and groundwater samples (Section 3.0 of the text). All analyses will be performed using EPA, State, or other approved methods. The analytical program for the Carnation site will use a laboratory that is certified by the state for the analyses requested. Selected soil samples will be analyzed for lead, PCBs, total oil and grease (polar and nonpolar), total petroleum hydrocarbons (TPH) as gasoline and diesel, and benzene, toluene, ethylbenzene, and xylenes (BTEX). Groundwater samples will be analyzed for dissolved lead, VOCs, BTEX, total oil and grease (polar and nonpolar), and TPH as gasoline and diesel.

Analytical QA/QC procedures for the laboratories will be based on the laboratory's specific QA/QC procedures and EPA's method manuals for determination of various chemical and physical parameters. Both field and laboratory QC checks will be employed to evaluate the performance of the laboratory's analytical procedures (Section 9.0). The QC checks represent the controlled samples introduced into the sample analysis stream that will be used to calculate the accuracy and precision (Section 10.0) of the chemical analysis program.

8.0 QUALITY ASSURANCE OBJECTIVES

The overall QA objectives are to develop and implement procedures for obtaining and evaluating data in an accurate, precise, and complete manner so that analytical data, sampling procedures, and field measurements provide information that is comparable to and representative of actual field conditions. The definitions for accuracy, precision, completeness, comparability, and representativeness are as follows (quoted from EPA's *Draft Supplement to: Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80):

- Accuracy - the degree of agreement of a measurement with accepted reference or true value.
- Precision - a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Usually expressed in terms of the standard deviation.
- Completeness - the amount of valid data obtained from a measurement system compared to the amount that was expected and needed to be obtained to meet the project data goals.
- Comparability - expresses the confidence with which one data set can be compared to another.
- Representativeness - refers to a sample or group of samples that reflects the characteristics of the media at the sampling point. It also includes how well the sampling point represents the actual parameter variations which are under study.

The goals for accuracy and precision have been established for the results of chemical analyses of QC samples. These goals (Table B-3) have been subdivided by sample media, analytical methods, and internal versus external QC samples. The actual precision and accuracy will be calculated using the data from the QC samples specified in Section 10.0, using the equations presented in Section 10.0.

The goals for accuracy and precision do not reflect the acceptable variations in data quality that occur when chemicals are detected at or near the achieved detection limits. For example, the analysis of a field (external) duplicate sample may result in low precision (high relative percent difference [RPD]) when the results are acceptable (e.g., duplicate values of 0.5 and 5.0 parts per billion results in an RPD of 164 percent).

The required level of completeness will vary with the data quality needs of each task. The goal is 100 percent completeness; that is, the goal is to obtain all the information that was identified as necessary. For example, if a water level, pH, conductivity, and temperature were measurements that were needed at the time of sampling and all those were obtained, then that task is 100 percent complete.

Comparable data will be obtained by the consistent use of standard analytical methods and by reporting all values in consistent units. For example, no mixtures of standard and metric units will be reported for depths, distances, elevations, etc. Analytical data will be reported in consistent units of parts per million (ppm or mg/l), parts per billion (ppb or μg/l), or the units given in the approved reference methodology. Results of standard and non-standard analyses will not be compared.

Representative data will be obtained by following proper and consistent procedures for drilling, well installation, sample collection, and other types of data collection as well as application of approved, standard analytical methods.

9.0 QUALITY CONTROL CHECKS

Two types of QC checks will be employed to evaluate the performance of the laboratories' analytical procedures: external QC checks and internal QC checks. The QC checks represent the controlled samples that will be used to calculate the accuracy and precision of the chemical analysis program. The QC check samples will be analyzed on the basis of the number of samples submitted to the laboratory.

9.1 External QC Checks

External QC checks will be accomplished by submission of controlled samples that will be introduced blind to the laboratory from the field (i.e., field QC samples). Two types of samples will be used: blanks and duplicates. All QC samples will be given a unique sample number in the field which will not indicate to the laboratory that the sample is a QC check. The two types of external QC samples are described below.

9.1.1 External Blanks

External blanks (equipment and field) will be collected and submitted blind to the analytical laboratory. Blanks will consist of deionized, organic-free water supplied by the laboratory. One equipment blank will be submitted to the laboratory for every 20 water samples or one equipment blank per day (whichever is more frequent). Equipment blanks will be collected from the last decontamination rinsate of water sampling equipment. The "blank" water from the laboratory will be used to fill the equipment or poured over sampling equipment and then placed in appropriate containers. One field blank will be submitted with each shipment of groundwater samples collected from the monitoring wells. A field blank is obtained by transferring the blank water provided by the laboratory into another sample container; this transfer is performed in the field.

9.1.2 External Duplicates

One groundwater duplicate sample will be collected and submitted with each set of groundwater samples to be analyzed. Field duplicate soil samples will not be collected because of the natural heterogeneity of soils and the variability in chemical concentrations observed in previous investigations.

9.2 Internal QC Checks

Specific requirements and procedures for internal (laboratory) QC will be monitored by the laboratory to ensure that the analytical data are generated with known quality and that corrective actions will be taken whenever needed. HLA staff chemists will assess the QC information provided by the laboratory.

9.2.1 Standards

Calibration standards and check standards, with known concentrations, will be prepared in the laboratory from standard solutions obtained from EPA, National Bureau of Standards (NBS), or equivalent. The use of these standards will be in accordance with the requirements of the analytical method.

9.2.2 Internal Blanks

Internal blanks are used to detect system bias introduced in the laboratory. A laboratory pure-water blank will be processed through all sample preparation procedures and analyzed as a method blank. A reagent blank can be used in place of the method blank for nonaqueous samples. In general, one blank will be analyzed per lot of samples, or one per day, whichever is more frequent.

9.2.3 Internal Spikes

An internal spike will be prepared in the laboratory by the addition of known amounts of target analytes into a blank sample prior to laboratory preparation. Percent recoveries will be calculated for these target analytes as a measure of the accuracy of the analytical method. The spiked samples, may also be analyzed in duplicate for an assessment of the precision of the analytical method.

10.0 PROCEDURES FOR QA/QC ASSESSMENT OF CHEMICAL DATA

10.1 Assessment of Accuracy and Precision

The accuracy and precision of the chemical data will be evaluated (see Section 8.0 for definitions) for both the field sample collection and analytical laboratory programs. The primary goal of this evaluation is to assess whether the data reported during the investigation are representative of conditions in the study area. To meet this goal, a combination of qualitative evaluations and statistical procedures will be used to check the quality of the chemical data. Statistical analysis of internal laboratory QC samples will be used to validate the analytical procedures used by each laboratory. Statistical analysis of field QC samples will be used to evaluate the field sampling and handling procedures, as well as the laboratory analytical procedures. Data validation will consist of review of RPDs, Percent Recoveries, holding times, and other sample documentation. If problems arise and the data are found to deviate from previous analyses or surrounding conditions, the data may be annotated. The procedures for evaluating both the field and laboratory QA/QC data are the same and are presented below for blanks, duplicates and spikes.

10.1.1 Blanks

The evaluation procedure for blanks is a qualitative review of the chemical data reported by the laboratories. The procedure for assessing blank samples will be as follows:

1) Examine the data from the blank samples.
2) Identify any blank samples that have chemicals detected in the sample.
3) If no chemicals are detected in any blank samples then this portion of the QC evaluation is complete.

4) If chemicals are detected in blank samples, the Project Manager or designee will notify the laboratory and will review other recent results from blank samples from that laboratory to determine if this is an isolated incident. If necessary, based on the significance of the problem, additional blank samples may be submitted to the laboratory to verify that the problem exists and/or to determine if the problem has been corrected.

5) If any chemicals are found in blank samples, the compounds(s), concentration(s) and the field data for that period of time will be assessed for potential problems with data interpretation. Data will not be removed from the data base based on chemicals detected in blank samples.

10.1.2 Duplicates

The procedure for assessing duplicate samples will be as follows:

1) Tabulate duplicate data and calculate the positive difference, average, and relative percent difference (RPD) for each duplicate pair:

$$\text{RPD} = \frac{(x_1 - x_2)}{\bar{x}} \times 100$$

where: x_1 = concentration for sample 1 of duplicate
x_2 = concentration for sample 2 of duplicate
$\bar{x}$ = mean of sample 1 and 2

2) Calculate the mean for the RPDs for all duplicate pairs.

3) Identify duplicates that are greater than the precision goals (Table B-3).

4) Qualitatively evaluate the significance of data that fall outside the precision goals. If data quality problems arise, the analytical laboratory will be notified for corrective action, as appropriate. Data will not be removed from the data base as a result of these procedures.

10.1.3 Spikes

The procedure for assessing spike samples will be as follows:

1) Tabulate spike sample data and calculate the percent recovery as shown below for each spiking compound:

$$\text{percent recovery} = \frac{(T - X)}{A} \times 100$$

where:
T = total concentration found in spiked sample
X = original concentration in sample prior to spiking
A = actual spike concentration added to sample

2) Calculate the mean for the percent recovery for each spiking compound.

3) Plot the percent recovery data and QC goals (from Table B-3) on the control charts.

4) Identify spikes that do not meet the percent recovery goals.

5) Qualitatively evaluate the significance of data that fall outside the goals. If the QC goals are exceeded, the laboratory will be notified and the data from that period of time will be evaluated for the compound that exceeds the limits and corrective action will be taken, as appropriate. Data will not be removed from the data base as a result of these procedures.

11.0 CORRECTIVE ACTIONS

If any occasions arise that indicate field or laboratory measurement error has occurred, one or more of the corrective action(s) described below will take place. Corrective actions will be taken on a case-by-case basis and will be documented for the project files.

11.1 Field Situations

The need for corrective action will be identified as a result of the field observations as well as by other means (e.g., equipment malfunction). If problems become apparent that are identified as originating in the field, immediate corrective action will take place. If immediate corrective action does not resolve the problem, appropriate personnel will be assigned to investigate and evaluate the cause of the problem. Once a corrective action is implemented, the effectiveness of the action will be assessed so that the problem is addressed.

11.2 Laboratory Situations

The need for corrective action may be indicated by samples that do not meet the QC goals (precision and accuracy) and/or from routine laboratory audits. Corrective action may include, but is not limited to;

- Reanalyzing the samples, if holding-time criteria permit.
- Evaluating and amending sampling and analytical procedures.
- Accepting data with an acknowledged level of uncertainty.
- Resampling and analyzing.

In the event that the above corrective actions are deemed unacceptable, an alternate laboratory may be selected to perform necessary or appropriate verification analyses.

Appendix B

TABLES

Table B-1. Sample Containers, Preservation, and Holding Times for Groundwater and Soil Samples

Sample Matrix	Type of Analysis	Type and Size of container	Number of Containers and Sample Volume (per sample)	Preservation	Maximum Holding Time
Soil	EPA 8020 and 8080	Stainless steel tubes	Stainless steel tubes	Cool to 4°C	14 days
Soil	Total lead, oil and grease	Stainless steel tubes	Stainless steel tubes	None	None
Water	EPA 8020 and 8240	40 ml glass vial, Teflon-lined septa	Two (2) vials filled completely, no air space; 80 ml total	Cool to 4°C	14 days
Water	Oil and grease	250 ml polyethylene bottle	One (1); bottle is filled approximately 7/8 full	Nitric Acid to below pH of 2 (approximately 2 ml concentrated HNO_3 per liter after filtering with 0.45 micron filter); cool to 4°C	6 months

Table B-2. Field Measurement Calibration Procedures and Precision

Field Measurement	Instrument	Calibration Procedure	Precision
Water Level Survey	Oil Interface Probe	Reference to Steel Tape	0.02 foot
	Steel Tape	Reference to New Tape	0.02 foot
Location and Elevation of Sample Site	Level and rod	Surveyor Calibration	0.01 foot
Soil Sample Depth	Steel or Fiberglass Tape Length of Drill rod	Reference to New Tape Reference to Steel Tape	Variable, depending on depth and surface irregularities; 0.5 foot
pH	pH Meter	3-Point Buffer Solutions	0.1 pH unit
Electrical Conductivity	Conductivity Meter	Potassium Chloride Reference Solution	8 percent
Water Temperature	Temperature meter and Thermistor	Reference to Mercury Thermometer	0.1°C
Portable Gas Analyzers	Foxboro Analytical Century OVA Photovac TIP, or HNU Model P1-101 Hydrocarbon analyzer	3 Dilutions of Standard Calibration Gas	1 ppm

Table B-3. Quality Assurance Goals

I. PRECISION

Analysis of Duplicates for:	Acceptable Relative Percent Difference (percent) Soil Internal	Water Internal	Water External[1]
Lead	40	30	100
Methods 8020 and 8240, Total Petroleum Hydrocarbons (as gasoline and diesel)	30	20	100

II. ACCURACY

Analysis of Spike Samples (Matrix, External, etc.) for:	Acceptable Percent Recovery (percent) Soil Internal	Water Internal	Water External[2]
Lead	70-130	70-130	NA[3]
Methods 8020 and 8240, Total Petroleum Hydrocarbons (as gasoline and diesel)	50-180	60-150	NA[3]

---

[1] Quality Assurance goals based on prior experience and laboratory performance because EPA or State recommended goals are not included in the approved method.

[2] Quality Assurance Goals are from EPA's *Test Methods for Evaluating Solid Waste*, SW-846, Third Edition, November 1986. For ease of presentation, where multiple target analytes are included in an analysis, the goals for specific analytes have been compiled and the given range rounded to the nearest factor of 10. Evaluation of QC results will be performed on an analyte-specific basis.

[3] Not Applicable: No goal is established because the analysis of this type of Quality Control Sample is not anticipated.

Appendix B

ILLUSTRATION

MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN No. 200 SIEVE	**GRAVELS** MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN No. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN No. 200 SIEVE	**SILTS AND CLAYS** LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION - ASTM D2487-85

Perm	-	Permeability
Consol	-	Consolidation
LL	-	Liquid Limit (%)
PI	-	Plasticity Index (%)
G_s	-	Specific Gravity
MA	-	Particle Size Analysis
■	-	"Undisturbed" Sample
☒	-	Bulk or Classification Sample

Shear Strength (psf)
Confining Pressure

TxUU	3200	(2600)	- Unconsolidated Undrained Triaxial Shear
	(FM) or (S)		- (field moisture or saturated)
TxCU	3200	(2600)	- Consolidated Undrained Triaxial Shear
	(P)		- (with or without pore pressure measurement)
TxCD	3200	(2600)	- Consolidated Drained Triaxial Shear
SSCU	3200	(2600)	- Simple Shear Consolidated Undrained
	(P)		- (with or without pore pressure measurement)
SSCD	3200	(2600)	- Simple Shear Consolidated Drained
DSCD	2700	(2000)	- Consolidated Drained Direct Shear
UC	470		- Unconfined Compression
LVS	700		- Laboratory Vane Shear

Harding Lawson Associates
Engineering and
Environmental Services

Unified Soil Classification Chart
Carnation Facility
Oakland, California

PLATE
B1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
LZc	20294,003.02	D. A. Craig	4/91	

APPENDIX B-1

EXAMPLES OF FIELD FORMS

This appendix contains the following example field forms:

- Field Log of Boring (sheet 1 and subsequent sheet)
- Field Well Completion Form
- Sample Label
- Field Investigation Daily Report
- Groundwater Sampling Form
- Chain of Custody Form

FIELD LOG OF BORING

SHEET______ OF______

LOCATION OF BORING:

PROJECT:

BORING NO.

TOTAL DEPTH:

JOB NO.:

LOGGED BY:

PROJ. MGR.:

EDITED BY:

DRILLING CONTRACTOR:

DRILL RIG TYPE:

DRILLERS NAME:

SAMPLING METHODS:

HAMMER WT.:

DROP:

STARTED, TIME:

DATE:

COMPLETED, TIME:

DATE:

BORING DEPTH (ft.)			
CASING DEPTH (ft.)			
WATER DEPTH (ft.)			
TIME:			
DATE:			

BACKFILLED, TIME: DATE: BY:

SURFACE ELEV.:

DATUM:

CONDITIONS:

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION	DRILLING RATE (min/ft)				DEPTH IN FEET	GRAPHIC LOG	
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										10		

FF7

HARDING LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED)

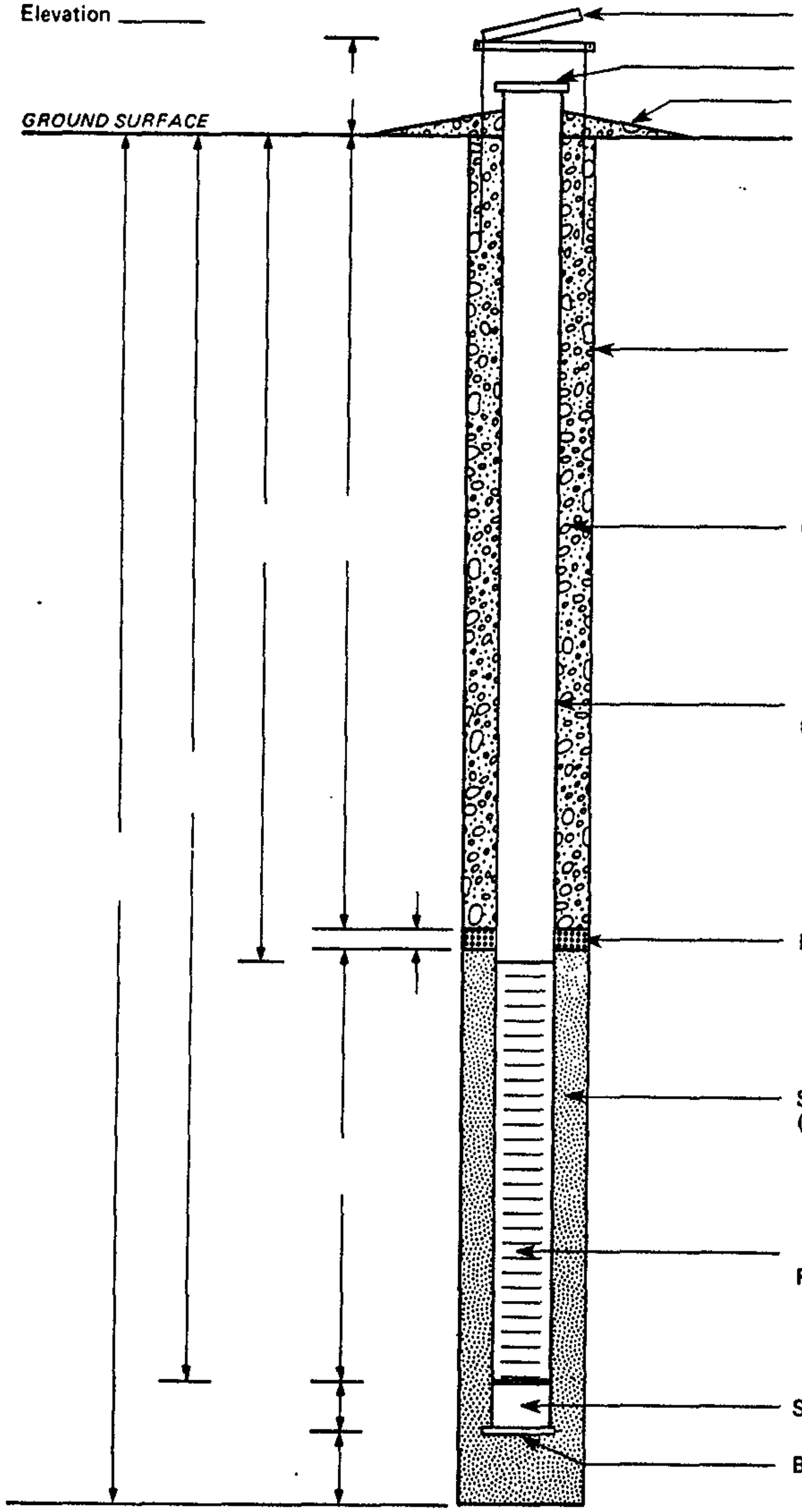
SHEET_____ OF_____

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG	PROJECT:	NO.	BORING NO.
										1				
										2				
										3				
										4				
										5				
										6				
										7				
										8				
										9				
										0				
										1				
										2				
										3				
										4				
										5				
										6				
										7				
										8				
										9				
										0				

PF8

HARDING LAWSON ASSOCIATES

Top of PVC Casing
Elevation ______



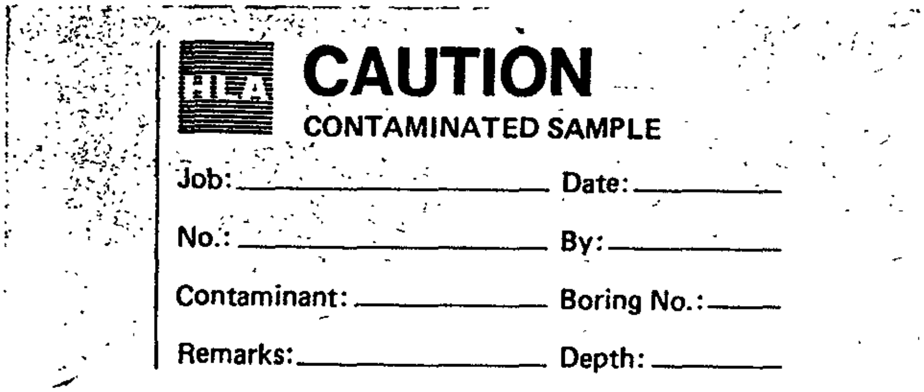
NOT TO SCALE

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE

Sample Labels



CAUTION

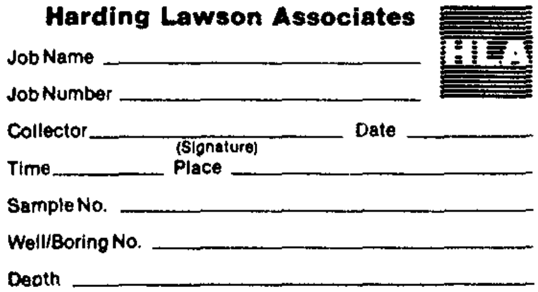
CONTAMINATED SAMPLE

Job: ____________ Date: ________

No.: ____________ By: ________

Contaminant: ____________ Boring No.: ______

Remarks: ____________ Depth: ________



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Job Name ____________________

Job Number ____________________

Collector ____________ Date ________
(Signature)

Time ________ Place ____________

Sample No. ____________________

Well/Boring No. ____________________

Depth ____________________

Sheet ______ of ______

Project: ______ Job No.: ______
Subject: FIELD INVESTIGATION DAILY REPORT Date: ______
Equipment Rental: ______ Company: ______ To: ______
Equipment Hours: ______ F.E. Time from: ______ to: ______ By: ______

(outside service and expense record must be attached for any outside costs)

Attachments:

Initial

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GROUND-WATER SAMPLING FORM

Well No. ____
Well Type: ☐ Monitor ☐ Extraction ☐ Other ____
Well Material: ☐ PVC ☐ St. Steel ☐ Other ____
Date ____ Time ____
Sampled by ____ (Initials)

Job Name ____
Job Number ____
Recorded by ____ (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☐ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other ____
Total Depth of Casing (TD in feet BTOC): ____
Water Level Depth (WL in feet BTOC): ____
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other ____

PURGE METHOD

☐ Bailer - Type: ____
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.: ____
☐ Other - Type: ____

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other ____
Depth in feet (BTOC): ____ Screen Interval in feet (BTOC):
from ____ to ____

PURGE VOLUME CALCULATION

$$\left(\underset{\text{TD (feet)}}{\underline{\qquad}} - \underset{\text{WL (feet)}}{\underline{\qquad}}\right) \times \underset{\text{D (inches)}}{\underline{\qquad}}^{2} \times \underset{\text{\# Vols}}{\underline{\qquad}} \times 0.0408 = \underset{\text{Calculated Purge Volume}}{\underline{\qquad\qquad}} \text{ gallons}$$

PURGE TIME

____ Start ____ Stop ____ Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

____ gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (μmhos/cm)	T ☐ °C ☐ °F	Other____

Minutes Since Pumping Began	pH	Cond. (μmhos/cm)	T ☐ °C ☐ °F	Other____
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): ____
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☐ Other ____

WELL SAMPLING

SAMPLING METHOD

☐ Bailer - Type: ____
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.: ____

☐ Same As Above
☐ Grab - Type: ____
☐ Other - Type: ____

SAMPLE DISTRIBUTION

Sample Series: ____

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

OFFICE COPY

Harding Lawson Associates
7655 Redwood Boulevard
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CHAIN OF CUSTODY FORM

Lab: ____________________

Samplers: ____________________

Job Number: ____________________

Name/Location: ____________________

Project Manager: ____________________

Recorder: ____________________
(Signature Required)

SOURCE CODE	MATRIX				#CONTAINERS & PRESERV.			SAMPLE NUMBER OR LAB NUMBER			DATE			
	Water	Sediment	Soil	Oil	Unpres.	H_2SO_4	HNO_3	Yr	Wk	Seq	Yr	Mo	Dy	Time

STATION DESCRIPTION/ NOTES

ANALYSIS REQUESTED					
EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH

LAB NUMBER			DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
Yr	Wk	Seq				

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME
RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME
RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME
RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME

DISPATCHED BY: *(Signature)*	DATE/TIME	RECEIVED FOR LAB BY: *(Signature)*	DATE/TIME

METHOD OF SHIPMENT

Laboratory Copy White   Project Office Copy Yellow   Field or Office Copy Pink

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DISTRIBUTION

WORK PLAN
CARNATION FACILITY
OAKLAND, CALIFORNIA
May 16, 1991

Copy No. 4

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QUALITY CONTROL REVIEWER

David F. Leland

David F. Leland, P.E.
Associate Engineer