EMCON
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1364

March 17, 1997
Project 22619-100.001

Mr. Tom Peacock
Alameda County Environmental Health
Environmental Protection Division
1131 Harbor Way Parkway
Alameda, California 94502-6577

Re: McLemore Trust/Hard Chrome Engineering, 750 107th Avenue, Oakland, California

Dear Mr. Peacock:

On behalf of the McLemore Trust, EMCON has prepared the following work plan for an environmental investigation to be conducted at the McLemore Trust/Hard Chrome Engineering property located at 750-107th Avenue, Oakland, California (see Figure 1).

Background

Based on the Preliminary Environmental Characterization, BSK & Associates, September 29, 1992, and Summary and Evaluation of Environmental Conditions and Recommendations for Future Actions, Levine Fricke, July 2, 1996, it appears that groundwater and, to a lesser extent, soil beneath the site is impacted with chromium. As part of the previous investigations, soil borings SB-1 through SB-5 were drilled, and groundwater monitoring wells MW-1 through MW-3 were installed at the site. Site soil and groundwater impacted with chromium appears to be primarily located near a concrete-lined pit within the Hard Chrome facility (see Figure 1). Elevated concentrations of beryllium detected in soil collected from well boring MW-3, and concentrations of tetrachloroethylene detected in water collected from each of the three groundwater monitoring wells, are likely the result of off-site activities.

Purpose

The McLemore Trust is performing this environmental investigation with the goal of conducting a voluntary clean-up of site soil and groundwater impacted with chromium. This workplan has been prepared to communicate our approach and to obtain agreement from the Alameda County Environmental Protection Division (County). The objective of this investigation is to define the lateral and vertical extent of chromium impact to the subsurface using cost-effective, innovative sampling and testing methods. Once the impact to site soil and groundwater has been defined, a report of the investigation activities will be prepared and

a meeting will be requested with the County to outline EMCON's plan for remediating the site.

In addition to the above tasks, EMCON will collect groundwater samples from the three existing groundwater monitoring wells at the site and submit the data, along with the results of the soil and groundwater investigation, to the County, the Regional Water Quality Control Board - San Francisco Bay Region, and to the California Department of Health Services - Division of Toxic Substances Control (DTSC).

The following scope of work has been developed to accomplish the tasks set forth above.

SCOPE OF WORK

Task 1 - Prefield Activities

Prior to commencing field activities, EMCON will retain a utility-locating service to mark underground utilities, obtain soil boring and well installation permits, and schedule a driller.

Task 2 - Field Work

To define the extent of impact to soil, and to assist in the selection of an appropriate option to remediate soil in the area of the concrete sump, EMCON proposes to drill soil borings around the perimeter of the sump, collect soil samples, and test the samples for hexavalent chromium in the field using a Hach® colorometric test kit. Concentrations of hexavalent chromium as low as 0.5 milligrams per kilogram can be measured with the Hach test kit. The Hach field test kit will be used to determine the need for additional borings and to assist in selecting soil samples for laboratory analysis.

To determine the lateral extent of chromium-impacted groundwater beneath the site, and to assist in the selection of an appropriate groundwater remedial action, EMCON proposes to drill soil borings, collect grab samples of groundwater, analyze the samples for hexavalent chromium in the field using the Hach field test kit, and convert up to three of the borings to 2-inch-diameter groundwater monitoring wells. Concentrations of hexavalent chromium in groundwater as low as 0.02 milligrams per liter can be measured using the Hach test kit.

In addition, to define the vertical extent of contamination on site, EMCON will install a double-cased groundwater monitoring well downgradient of existing monitoring well MW-2

(see Figure 1). A discussion of EMCON's exploratory boring and groundwater monitoring well installation methods are included in Appendix A.

Subtask 2.1 - Additional Soil Investigation

Up to five soil borings are proposed to be drilled to just above first-encountered groundwater (assumed to be approximately 18 feet below ground surface [bgs]). Initially, three soil borings will be drilled immediately adjacent to the sump: on the north, east, and south sides of the sump. Based on the results of the Hach field test, two additional borings may be drilled to further define the lateral extent of impact north and south of the sump. Further definition to the east of the sump is limited due to the residential housing, while analytical results from previous boring MW-2 and SB-5 are sufficient to define the extent of impacted soil to the west (see Figure 1).

just 3 - then five if needed.

The two soil borings to be drilled on the northwest side of the sump, and the one boring to be drilled on the northeast side of the sump (see Figure 1) will be advanced using 8-inch-diameter hollow-stem augers powered by a limited access (Rhino) drill rig.

The two soil borings to be drilled southeast of the concrete sump will be advanced using 6-inch-diameter hollow-stem augers powered by a RAM-SET portable drill rig. One boring is proposed to be drilled within the 1½-foot concrete catchment pit north of the plating tank at the southeast end of the 1½-foot catchment basin, while the other boring is proposed to be drilled immediately southeast of (and behind) the plating tank at the southeast end of the 1½-foot concrete catchment basin (see Figure 1).

For each of the borings drilled onsite, it will be necessary to cut an access hole through the asphalt or concrete slab. Once the borings have been completed, each boring will be backfilled from the bottom to within approximately 0.5 feet bgs with neat cement, and from 0.5 feet bgs to the surface with concrete.

Soil samples will be collected at 5-foot intervals and logged in the field by an EMCON geologist using the Unified Soil Classification System. All field operations will be overseen by a California Registered Geologist. Two soil samples from each of the three perimeter borings (total of six soil samples) will be submitted to an analytical laboratory to confirm the limits of impacted soil have been defined. Submitted samples will be analyzed for pH, for total chromium by U.S. Environmental Protection Agency (USEPA) Method 6010, and for hexavalent chromium by USEPA Method 7196. The soil sample exhibiting the highest field (Hach) reading, and the soil sample from just above first-encountered groundwater from each of the five borings, will be submitted for analysis.

Subtask 2.2 - Shallow Groundwater Investigation

To define the lateral extent of impact to groundwater beneath the site, EMCON proposes to drill up to five borings (see Figure 1). In addition to collecting soil samples as described above, EMCON proposes to collect groundwater grab samples from first-encountered groundwater in each boring and analyze the samples in the field using the Hach test kit described above. Based on the results of the field tests, up to three of the borings will be converted to 2-inch-diameter groundwater monitoring wells.

The exploratory borings will be advanced using 8-inch-diameter hollow-stem augers powered by the Rhino limited-access drill rig due to constraints imposed by drilling within the plating facility. The sampling equipment will be cleaned between sampling intervals by washing with Alconox and rinsing with clean water. Drilling and sampling equipment will be steam cleaned between soil borings to prevent cross-contamination, and the rinsate collected and contained in 55-gallon drums pending analytical results. In addition, soil cuttings will be stored in 55-gallon drums pending results of the analysis of a composite soil sample collected from the drill cuttings. Soil cuttings and decontamination water will be properly disposed of based on analytical results.

Task 3 - Groundwater Monitoring Well Installation

Based on the results of the shallow groundwater sampling, up to three 2-inch-diameter shallow groundwater monitoring wells, and one 2-inch-diameter, dual-cased, deep groundwater monitoring well will be installed at the site.

Subtask 3.1 - Shallow Groundwater Well Installation

To define the lateral extent of impact to groundwater beneath the site, EMCON proposes to convert three of the five shallow groundwater sample borings to 2-inch-diameter groundwater monitoring wells. Final well locations will be based on the field screening results from the shallow groundwater grab sampling and access constraints.

The shallow groundwater monitoring wells will be constructed using 15 feet of 0.02 slotted screen set with approximately 5 feet of screen above and 10 feet of screen below shallow groundwater.

Subtask 3.2 - Deeper Groundwater Well Installation

To determine whether the lower aquifer is impacted with hexavalent chromium, EMCON will install a double-cased, 2-inch-diameter groundwater monitoring well downgradient

(northwest) of well MW-2 (see Figure 1). Conductor casing will be set to a minimum depth of 25 feet bgs (or within a minimum 5-foot-thick aquitard) and grouted to seal off the first water-bearing zone and limit potential for cross-contamination to deeper water-bearing zones. A 2-inch-diameter groundwater monitoring well, constructed with 10 feet of 0.02 slotted screen, will be installed through the conductor casing and set to a minimum depth of 15 feet below the bottom of the suspected aquitard.

Subtask 3.3 - Monitoring Well Development and Sampling

Development of the new wells will consist of bailing, surging with a surge block, pumping, or a combination of these techniques. After well development is complete, the wells will be allowed to stabilize and will then be purged and sampled. Groundwater samples will be analyzed for total chromium using USEPA Method 6010, and for hexavalent chromium using USEPA Method 7196. Within Appendix B is a discussion of EMCON's groundwater sampling methodology. Water generated during the development and sampling process will be contained in Department of Transportation-rated 55-gallon drums pending disposed based on analytical results.

Task 4 - Quarterly Groundwater Monitoring

EMCON will collect groundwater samples from the existing groundwater monitoring wells, record water levels from the new and existing wells, and include the results of the monitoring event with the remedial investigation report described below.

Task 5 - Presentation of Remedial Action Plan to the County

Once the soil and groundwater investigation has been completed, a report will be prepared for submission to the County. It will contain the data collected, our interpretation of the data, and a remedial action plan. The remedial action plan will propose cleanup levels for soil and groundwater and methods of remediation. A detailed plan of the remediation methods and a corresponding schedule will be developed.

Schedule

Following approval of the workplan by the County, EMCON will apply for soil boring and well installation permits. Obtaining permits may take two to four weeks. It is anticipated that once the permits are received, it will take approximately one week for a drill rig to become

available. EMCON anticipates that performing the field activities will require approximately four days. Analytical results will be received approximately two weeks after the samples have been submitted for chemical analysis. The report will be prepared approximately two to three weeks after receipt of certified analytical reports.

If you have any questions or comments, please feel free to contact Harold Duke at (916) 928-3300.

Sincerely,

EMCON

Harold R. Duke
Project Geologist

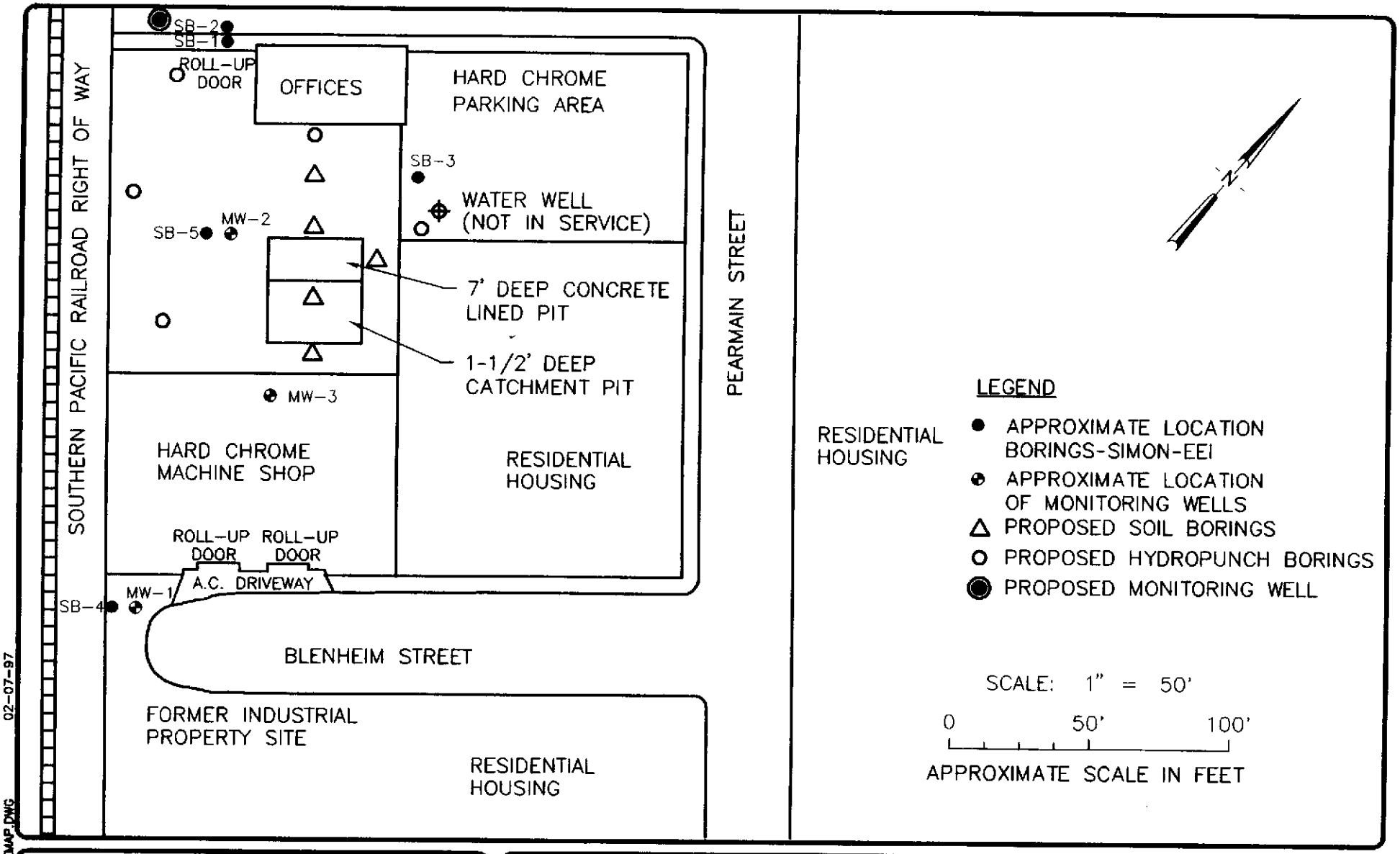
Jay Johnson, RG
Senior Project Supervisor

REGISTERED GEOLOGIST
JULIAN C. ISHAM
No. 007
CERTIFIED
HYDRO
GEOLOGIST
STATE OF CALIFORNIA

Attachments:

Figure 1	Site Location Map
Figure 2	Site Map
Appendix A	Exploratory Boring and Well Installation Procedures
Appendix B	Sampling and Analysis Procedures

cc: Ms. Janis D. Magdich; Freeman, Brown, Sperry & D'Aiuto
Ms. Cheryl McLemore— address?
Ms. Patricia Nettles; CA-DTSC
Ms. Sumadhu Arigala; RWQCB-SFBR



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MCLEMORE TRUST
HARD CHROME ENG. INC.,
750 107TH AVENUE
OAKLAND, CALIFORNIA
SITE MAP

FIGURE
1
PROJECT NO.
22619-100.01

APPENDIX A

EXPLORATORY BORING AND WELL INSTALLATION PROCEDURES

APPENDIX A

EXPLORATORY BORING AND WELL INSTALLATION PROCEDURES

The general procedures used in site assessments for drilling exploratory borings, collecting samples, and installing monitoring wells are described in this appendix. These general procedures are used to provide consistent and reproducible results; however, conditions may exist where variations of these procedures are applicable. The following procedures are supervised by a California state-registered geologist.

Exploratory Soil Borings

Exploratory soil borings for sites characterized by relatively shallow (less than 100 feet deep) groundwater are generally drilled using 8- to 12-inch-diameter, continuous-flight, hollow-stem auger drilling equipment. The drilling method for sites in which depth to groundwater is greater than 100 feet is determined on a case-by-case basis. Soil samples for logging will be obtained from auger-return materials and by advancing a modified California split-spoon sampler equipped with brass or stainless steel liners into undisturbed soil beyond the tip of the auger. Soils will be logged by an EMCON geologist according to the Unified Soil Classification System and standard geological techniques. Exploratory soil borings not used for monitoring well installation will be backfilled to the surface with a bentonite-cement slurry pumped into the boring through a tremie pipe.

The soil sampling equipment will be cleaned with a detergent water solution, rinsed with clean water, and equipped with clean liners between sampling intervals. Augers and samplers will be steam cleaned between each boring to reduce the possibility of cross-contamination. Steam cleaning effluent will be contained in 55-gallon drums and temporarily stored on site. The disposal of the effluent will be the responsibility of the client.

Drill cuttings generated during the drilling procedure will be stockpiled on site. Stockpiled drill cuttings will be placed on and covered with plastic sheeting. The stockpiled soil is typically characterized by collecting and analyzing composite samples from the stockpile. EMCON will recommend an appropriate method for disposition of the cuttings based on the analytical results. The client will be responsible for disposal of the drill cuttings.

Soil samples for chemical analysis will be collected in brass or stainless steel liners, sealed with Teflon® tape and plastic end caps, labeled, placed on ice, and delivered to a state-certified analytical laboratory, along with the appropriate chain-of-custody documentation. Soil samples selected for chemical analysis will be determined from a headspace analysis using a hand-held photoionization detector (PID). The soil will be placed in a glass jar, sealed, and placed in a warm atmosphere. After approximately 15 minutes, which is generally sufficient for volatiles to escape from the soil, the PID probe will be inserted into the glass jar. The total volatile hydrocarbons present are detected by the PID and reported in parts per million. The PID will be calibrated to an isobutylene standard.

Generally two soil samples from each soil boring will be submitted for chemical analysis. Soil samples selected for analysis typically represent the highest PID reading recorded for each soil boring and the sample just above first-encountered groundwater.

Monitoring Well Installation

Monitoring wells will be completed by installing 2- to 6-inch-diameter Schedule 40 polyvinyl chloride (PVC) casing. The 2-inch-diameter flush-threaded casing is generally used for wells dedicated for groundwater monitoring purposes. Larger diameter casings will be used for monitoring wells that will potentially be used for hydraulic testing and groundwater extraction. The screened sections of casing are factory machine slotted and will be installed approximately 5 feet above and 10 feet below first-encountered water level. The screened interval will allow for seasonal fluctuation in water level and for monitoring floating product. A filter pack of graded sand will be placed in the annular space between the PVC casing and the borehole wall. Sand will be added to the borehole through the hollow stem of the augers to provide a uniform filter pack around the casing and to stabilize the borehole. The sand pack will be placed to a maximum of 2 feet above the screens, followed by a minimum 1-foot seal consisting of bentonite pellets.

Cement grout containing 5 percent bentonite or concrete will be placed above the bentonite seal to the ground surface. A concrete traffic-rated vault box will be installed over the monitoring well(s). A watertight locking cap will be installed over the top of the well casing. Reference elevations for each monitoring well will be surveyed when more than two wells will be located on site. Monitoring well elevations will be surveyed by EMCON or a subcontractor to the nearest 0.01 foot relative to mean sea level or a site datum.

Exploratory boring logs and well construction details will be prepared for the final written report. Figures A-1 and A-2 are examples of the exploratory boring log and well details forms, respectively.

147693

LOG OF EXPLORATORY BORING

PROJECT NUMBER — BORING NO. 3

PROJECT NAME Example — PAGE 1 OF 1

BY — DATE — SURFACE ELEV. ft.

RECOVERY (ft/ft)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							CLAY (CH) firm, high plasticity, fine, dark grey to black, moist.	
1								
2		11		5			@ 5': stiff, wet.	
3							CLAYEY SAND(SC) medium dense to dense, fine, moderate plasticity, grey, wet to saturated, sand is subrounded to subangular, with some fine, well rounded igneous gravel lenses, pockets of undecomposed wood, lenses of silty sand, trace mica flakes, slightly organic odor.	
4		36		10				
5		18					SANDY CLAY(CL) very stiff, moderate plasticity, fine to medium, greyish green.	
6		12		15				
							CLAY(CL) stiff, moderate plasticity, green.	
7								
				20			BOTTOM OF BORING AT 19.5 FEET.	

REMARKS

EMCON Associates

LOG OF EXPLORATORY BORING SAMPLE SHEET

FIGURE A-1

PROJECT NO.

140709

WELL DETAILS

EMCON
Sacramento

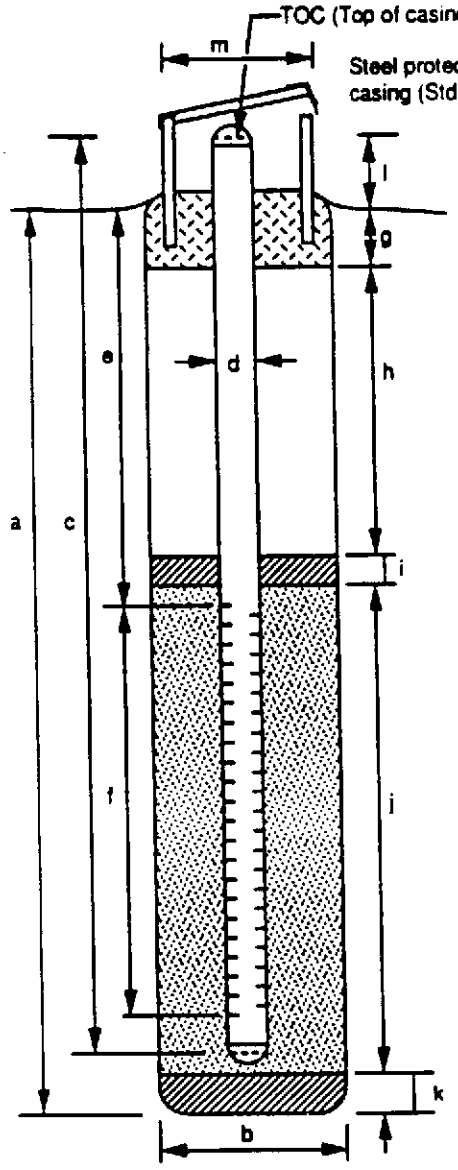
PROJECT NUMBER _____ BORING / WELL NO. _____

PROJECT NAME _____ TOP OF CASING ELEV. _____

LOCATION _____ GROUND SURFACE ELEV. _____

WELL PERMIT NO. _____ DATUM _____

INSTALLATION DATE _____



EXPLORATORY BORING

a. Total depth _____ ft.

b. Diameter _____ in.

Drilling method _____

WELL CONSTRUCTION

c. Total casing length _____ ft.

Material _____

d. Diameter _____ in.

e. Depth to top perforations _____ ft.

f. Perforated length _____ ft.

Perforated interval from _____ to _____ ft.

Perforation type _____

Perforation size _____

g. Surface seal _____ ft.

Material _____

h. Backfill _____ ft.

Material _____

i. Seal _____ ft.

Material _____

j. Gravel pack _____ ft.

Gravel pack interval from _____ to _____ ft.

Material _____

k. Bottom seal/fill _____ ft.

Material _____

l. Casing stickup _____ ft.

m. Protective casing diameter _____ in.

Form prepared by _____

EMCON Associates

WELL DETAILS SAMPLE SHEET

FIGURE
A-2

APPENDIX B

SAMPLING AND ANALYSIS PROCEDURES

APPENDIX B

SAMPLING AND ANALYSIS PROCEDURES

The sampling and analysis procedures for water quality monitoring programs are contained in this appendix. The procedures will provide for consistent and reproducible sampling methods; proper application of analytical methods; accurate and precise analytical results; and finally, these procedures will provide guidelines so that the overall objectives of the monitoring program are achieved.

The following documents have been used as guidelines for developing these procedures:

- *Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities*, Environmental Protection Agency (EPA)-530/SW-611, August 1977
- *Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document*, Office of Solid Waste and Emergency Response (OSWER) 9950.1, September 1986
- *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, EPA SW-846, 3rd edition, November 1986
- *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*, EPA-600/4-82-057, July 1982
- *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, revised March 1983
- *Leaking Underground Fuel Tank (LUFT) Field Manual*, California State Water Resources Control Board, revised October 1989

Sample Collection

Sample collection procedures include equipment cleaning, water level and total well depth measurements, and well purging and sampling.

Equipment Cleaning

Sample bottles, caps, and septa used in sampling for volatile and semivolatile organics will be triple rinsed with high-purity deionized water. After being rinsed, sample bottles will be dried overnight at a temperature of 200°C. Sample caps and septa will be dried overnight at a temperature of 60°C. Sample bottles, caps, and septa will be protected from solvent contact between drying and actual use at the sampling site. Sampling containers will be used only once and discarded after analysis is complete.

Plastic bottles and caps used in sampling for metals will be soaked overnight in a 1 percent nitric acid solution. Next, the bottles and caps will be triple rinsed with deionized water. Finally, the bottles and caps will be air dried before being used at the site. Plastic bottles and caps will be constructed of linear polyethylene or polypropylene. Sampling containers will be used only once and discarded after analysis is complete.

Before the sampling event is started, equipment that will be placed in the well or will come in contact with groundwater will be disassembled and cleaned thoroughly with detergent water, and then steam cleaned with deionized water. Any parts that may absorb contaminants, such as plastic pump valves, etc., will be cleaned as described above or replaced. If a positive displacement (bladder) pump is used the inside surfaces of the pump tubing will be cleaned by heating the tubing overnight at 120°C with a low-flow, inert air source.

Once the bladder pump is cleaned and reassembled, a pump blank will be obtained by pumping organic-free water through the bladder pump assembly. The pump effluent will be sampled and analyzed by EPA Method 601 or EPA Method 602. The pump effluent analysis results must register below the method reporting limit for each parameter before the pump is taken to the site for use.

During field sampling, equipment surfaces that are placed in the well or contact groundwater will be steam cleaned with deionized water before the next well is purged or sampled.

Water Level and Total Well Depth Measurements

Before purging and sampling occurs, the depth to water, and the total well depth will be measured using a water level measuring system.

The electric sounder is a transistorized instrument that uses a reel-mounted, two-conductor, coaxial cable that connects the control panel to the sensor. Cable markings are stamped at 1-foot intervals. The water level will be measured by lowering the sensor into the monitoring well. A low-current circuit is completed when the sensor contacts the water, which serves as an electrolyte. The current is amplified and fed into an indicator light and audible buzzer, signaling when water has been contacted. A sensitivity

control compensates for highly saline or conductive water. The electric sounder will be decontaminated by being rinsed with deionized water after each use.

Liquid measurements will be recorded to the nearest 0.01 foot in the field logbook. The groundwater elevation at each monitoring well will be calculated by subtracting the measured depth to water from the surveyed elevation of the top of the well casing. (Every attempt will be made to measure depth to water for all wells on the same day.) Total well depth will then be measured by lowering the sensor to the bottom of the well. Total well depth, used to calculate purge volumes and to determine whether the well screen is partially obstructed by silt, will be recorded to the nearest 0.1 foot in the field logbook.

Well Purging

Before the sampling event, a bladder pump, pneumatic displacement pump, or Teflon bailer will be used to purge standing water in the casing and gravel pack from the monitoring well. Monitoring wells will be purged according to the protocol presented in Figure B-1. In most monitoring wells, the amount of water purged before sampling will be greater than or equal to four casing volumes. Some monitoring wells are expected to be evacuated to dryness after removing fewer than four casing volumes. These low-yield monitoring wells will be allowed to recharge for up to 24 hours. Samples will be obtained as soon as the monitoring wells have recharged to a level sufficient for sample collection. If insufficient water has recharged after 24 hours, the monitoring well will be recorded as dry for the sampling event.

Field measurements will be recorded in a waterproof field logbook. Figure B-2 shows an example of the Water Sample Field Data Sheet on which field data are recorded. Field data sheets will be reviewed for completeness by the sampling coordinator after the sampling event is completed.

The pH, specific conductance, and temperature meter will be calibrated each day before field activities begin. The calibration will be checked once each day to verify meter performance. Field meter calibrations will be recorded on the Water Sample Field Data Sheet.

Well Sampling

A Teflon bailer or bladder pump will be the only equipment acceptable for well sampling. When samples for volatile organic analysis are being collected, the pump flow will be regulated at approximately 100 milliliters per minute to minimize pump effluent turbulence and aeration. Glass bottles of at least 40-milliliters volume and fitted with Teflon-lined septa will be used in sampling for volatile organics. These bottles will be filled completely to prevent air from remaining in the bottle. A positive meniscus forms when the bottle is completely full. A convex Teflon septum will be placed over the positive meniscus to eliminate air. After the bottle is capped, it is inverted and tapped to verify that it contains

no air bubbles. The sample containers for other parameters will be filled, filtered as required, and capped.

When required, dissolved concentrations of metals will be determined using appropriate field filtration techniques. When a Teflon bailer is used, the sample will be filtered by emptying the contents of the bailer into a pressure transfer vessel. A disposable 0.45-micron acrylic copolymer filter will be threaded onto the transfer vessel at the discharge point, and the vessel will be sealed. Pressure will be applied to the vessel with a hand pump and the filtrate will be directed into the appropriate containers. Each filter will be used once and discarded.

When a bladder pump is used to collect samples for dissolved constituents, filtering will be performed by attaching a disposable 0.45-micron acrylic copolymer filter directly to the pump effluent line with a pressure fitting. As the pump cycles, the effluent will be pressured through the filter and directed into the appropriate containers. Each filter will be used once and discarded.

Sample Preservation and Handling

The following section specifies sample containers, preservation methods, and sample handling procedures.

Sample Containers and Preservation

Sample containers vary with each type of analytical parameter. Container types and materials will be selected to be nonreactive with the particular analytical parameter tested.

Sample Handling

Sample containers will be labeled immediately following collection. Samples will be kept cool with cold packs until received by the laboratory. Cold packs will be replaced each day to maintain refrigeration. At the time of sampling, each sample will be logged on a Chain-of-Custody Record that will accompany the sample to the laboratory.

Samples will be transferred from the site to a state-certified laboratory by the sampling team. Sample shipments from EMCON to laboratories performing the selected analyses routinely occur within 24 hours of sample receipt. The laboratory manager will check the holding times for requested analyses so that they are not exceeded.

Sample Documentation

The following procedures will be used during sampling and analysis to provide chain-of-custody control during sample handling from collection through storage. Sample documentation will include the use of the following:

- Field logbook to document sampling activities in the field
- Labels to identify individual samples
- Chain-of-custody record sheets for documenting possession and transfer of samples
- Laboratory analysis request sheets for documenting analyses to be performed

Field Logbook

In the field, the sampler will record the following information on the Water Sample Field Data Sheet (see Figure B-2) for each sample collected:

- Project number
- Client's name
- Location
- Name of sampler
- Date and time
- Well accessibility and integrity
- Pertinent well data (e.g., casing diameter, depth to water, well depth)
- Calculated and actual purge volumes
- Purging equipment used
- Sampling equipment used
- Appearance of each sample (e.g., color, turbidity, sediment)
- Results of field analyses (temperature, pH, specific conductance)
- General comments

The field logbook will be signed by the sampler.

Labels

Sample labels will contain the following information:

- Project number
- Sample number (i.e., well designation)
- Sampler's initials
- Date and time of collection
- Type of preservative used (if any)

Sampling and Analysis Chain-of-Custody Record

The Sampling and Analysis Chain-of-Custody Record (see Figure B-3), initiated at the time of sampling, contains, but is not limited to, the well number, sample type, analytical request, date of sampling, and the name of the sampler. The record sheet will be signed, timed, and dated by the sampler when transferring the samples. Custody transfers will be recorded for each individual sample; for example, if samples are split and sent to more than one laboratory, a chain-of-custody record sheet will accompany each sample. The number of custodians in the chain of possession will be minimized. A copy of the Sampling and Analysis Chain-of-Custody Record is returned to EMCON with the analytical results.

Groundwater Sampling and Analysis Request Form

A Groundwater Sampling and Analysis Request Form (see Figure B-4) or purchase order, or both, will accompany the samples delivered to each laboratory. These forms serve as official communication to the laboratory of the particular analysis/analyses required for each sample.

At a minimum, the Groundwater Sampling and Analysis Request Form includes the following information:

- Date submitted
- Specific analytical parameters
- Well number
- Sample source

Analytical Methods

Samples collected as part of the monitoring program will be analyzed consistent with accepted analytical procedures. The following publications are the primary references for analytical procedures:

- *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, revised March 1983
- *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*, EPA-600/4-82-057, July 1982
- *Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods*, EPA SW-846, 3rd edition, November 1986
- *LUFT Manual*, State Water Resources Control Board, State of California LUFT Task Force, revised October 1989

The laboratories selected to perform the analytical work will be certified by the Department of Health Services (DHS) for hazardous waste testing.

Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) measures will be taken to confirm the integrity of the field and laboratory data generated during the monitoring program. The procedures used to assess data quality are described in this section. An evaluation of the field and laboratory quality assurance data will be included in the technical reports.

Field Quality Assurance Procedures

Field quality assurance procedures will be included in each monitoring event and include documenting field instrument calibration, and collecting and analyzing trip blanks, field blanks, and duplicate samples.

Trip and field blanks. Trip and field blanks will be used during the sampling events to detect contamination introduced through sampling procedures, external field conditions, sample transportation, container preparation, sample storage, and the analytical process.

Trip blanks will be prepared at the same time and location as the sample containers for a particular sampling event. Trip blanks will accompany these containers to and from that event, but at no time opened or exposed to the atmosphere. One trip blank for volatile organic parameters will typically be included for each sampling event.

Field blanks will be prepared in the same manner as trip blanks but will be exposed to the ambient atmosphere at a specified monitoring point during sample collection to determine the influence of the external field conditions on sample integrity. One field blank for volatile organic parameters will typically be included for each day of sampling.

Duplicate samples. Duplicate samples will be collected to document field precision. For each sampling event, duplicate monitoring well samples will be collected at a specified frequency, typically 5 percent. Where possible, field duplicates will be taken at sampling points known or suspected to contain constituents of interest. Duplicates will be packed and shipped "blind" to the laboratory for analysis with the samples from that particular event (i.e., these samples will not exhibit any special markings indicating that they are quality control samples).

Laboratory Quality Control Procedures

Laboratory QC procedures will include those required under the DHS Hazardous Waste Testing Program. Specific laboratory quality assurance procedures are included in the laboratory's QA/QC manual, including reporting surrogate recoveries, matrix spike recoveries, and matrix spike duplicates (or duplicate) results.

Method blanks will be analyzed daily to assess the effect of the laboratory environment on the analytical results. Method blanks will be performed for each parameter analyzed.

Each sample to be analyzed for organic parameters will contain surrogate spike compounds. The surrogate recoveries will be used to determine if the analytical instruments are operating within limits. Surrogate recoveries will be compared to control limits established and updated by the laboratory based on its historical operation.

Matrix spikes will be analyzed at a frequency of approximately 10 percent. Matrix spike results will be evaluated to determine whether the sample matrix is interfering with the laboratory analysis and to provide a measure of the accuracy of the analytical data. Matrix spike recoveries will be compared to control limits established and updated by the laboratory based on its historical operation.

Laboratory duplicates will be analyzed at a frequency of approximately 10 percent. Spike duplicate results will be evaluated to determine the reproducibility (precision) of the analytical method. Reproducibility values will be compared to control limits established and updated by the laboratory based on its historical operation.

Laboratory QA/QC data will be included with the analytical results. This QA/QC data will include method blanks, surrogate spike recoveries (for organic parameters only), matrix spike recoveries, and matrix spike duplicates.

MONITORING WELL PURGING PROTOCOL

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MEASURE AND RECORD DEPTH TO WATER AND WELL TOTAL DEPTH

CHECK FOR FLOATING PRODUCT

YES

DO NOT SAMPLE WELL FOR DISSOLVED CONSTITUENTS.

NO

CALCULATE PURGE VOLUME BY USING THE FOLLOWING EQUATION:

$$P = \pi r^2 h \times 7.48 \times 3$$

where:

- P = calculated purge volume (gallons)
- π = 3.14
- r = radius of well casing in feet
- h = height of water column in feet

EVACUATE WATER FROM WELL EQUAL TO THE CALCULATED PURGE VOLUME WHILE MONITORING GROUND-WATER STABILIZATION INDICATOR PARAMETERS (pH, CONDUCTIVITY, TEMPERATURE) AT INTERVALS OF ONE CASING VOLUME.

WELL EVACUATED TO PRACTICAL LIMITS OF DRYNESS BEFORE REMOVING CALCULATED PURGE VOLUME

NO

FINAL TWO SETS OF GROUND-WATER STABILIZATION INDICATOR PARAMETER MEASUREMENTS MEET THE FOLLOWING CRITERIA:

pH	= ±	0.1 pH units
COND.	= ±	10 %
TEMP.	= ±	1.0 °F

YES

WELL PURGING CRITERIA MET; PROCEED TO WELL SAMPLING

NO

CONTINUE PURGING; EVACUATE ADDITIONAL CASING VOLUME OF WATER, MONITORING INDICATOR PARAMETERS FOR STABILITY.

YES

WELL RECHARGES TO A LEVEL SUFFICIENT FOR SAMPLE COLLECTION WITHIN 24 HOURS OF EVACUATION TO DRYNESS.

YES

FIELD TEST FIRST RECHARGE WATER FOR INDICATOR PARAMETERS, THEN PROCEED TO WELL SAMPLING.

NO

RECORD WELL AS DRY FOR PURPOSES OF SAMPLING.

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WELL PURGING PROTOCOL

FIGURE

B-1

WATER SAMPLE FIELD DATA SHEET

Rev. 1, 3/90

PROJECT NO: _____ SAMPLE ID: _____

PURGED BY: _____ CLIENT NAME: _____

SAMPLED BY: _____ LOCATION: _____

TYPE: Ground Water ____ Surface Water ____ Treatment Effluent ____ Other _____

CASING DIAMETER (inches): 2 ____ 3 ____ 4 ____ 4.5 ____ 6 ____ Other _____

CASING ELEVATION (feet/MSL) : _____ VOLUME IN CASING (gal.) : _____

DEPTH TO WATER (feet) : _____ CALCULATED PURGE (gal.) : _____

DEPTH OF WELL (feet) : _____ ACTUAL PURGE VOL. (gal.) : _____

DATE PURGED: _____ End Purge (2400 Hr) _____ Sample Time (2400 Hr) _____

DATE SAMPLED: _____

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, X-DUP-1) : _____

FIELD MEASUREMENTS

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)

D. O. (ppm): _____ COLOR, COBALT (0 - 100): _____ Clear Cloudy Yellow Brown ... Heavy Moderate Light Trace...

ODOR: _____ TURBIDITY, NTU (0 - 200): _____

PURGING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon®)

____ Centrifugal Pump ____ Bailer (PVC)

____ Submersible Pump ____ Bailer (Stainless Steel)

____ Well Wizard™ ____ Dedicated

Other: _____

SAMPLING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon®)

____ DDL Sampler ____ Bailer (Stainless Steel)

____ Dipper ____ Submersible Pump

____ Well Wizard™ ____ Dedicated

Other: _____

WELL INTEGRITY : _____ LOCK # : _____

REMARKS. _____

SIGNATURE _____ Checked by _____

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WATER SAMPLE FIELD DATA SHEET

FIGURE B-2

EMCON ASSOCIATES

FIELD METER LOG

		TEMPERATURE		pH RESULTS						SPECIFIC CONDUCTIVITY			DI WATER
DATE	METER #	THERMOMETER NBS	METER	READ 7	CALIB. 7	READ 7	CALIB. 10	READ 4	CALIB. 4	STD.	READ STD.	CALIB. STD.	SPEC. COND.

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FIELD METER LOG

FIGURE B-3

SAMPLING AND ANALYSIS CHAIN OF CUSTODY RECORD

EMCON ASSOCIATES

PROJECT NO _____ SAMPLE TYPE _____ CAS LABORATORY NO _____

Sample Information			Bottle Information				Lab Information		Chain of Custody Documentation							
Sample ID	Lab ID	Parameters	No.	Type	Pres.	Filt.	Lab	PO #	Sampler	Date	Rec'd By	Date	Comments	Rec'd By	Date	Comments

Sampled By _____ Relinquished By _____ Relinquished By _____ Relinquished By _____

Laboratory Representative _____ Received By _____ Received By _____ Received By _____

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CHAIN-OF-CUSTODY DOCUMENT

FIGURE B-4