A·C·C
ENVIRONMENTAL
CONSULTANTS

February 11, 1994

Ms. Madhulla Logan
Hazardous Materials Specialist
Alameda County Health Care Services Agency
80 Swan Way, Room 200
Oakland, CA 94621

RE: Work Plan for Additional Subsurface Site Investigation
and Risk Assessment
Former Island Gun Club, 500 Maitland Drive, Alameda CA

Dear Ms. Logan:

Enclosed, please find the Work Plan for additional subsurface site investigation, installation of two additional monitoring wells, groundwater sampling, and preparing a Human Health and Environmental Risk Assessment for the above referenced property.

If you have any question regarding this Work Plan, please do not hesitate to contact me.

Sincerely,

Misty Kaltreider
Geologist

cc: Mr. Ravi Arulanantham - Alameda County Health Care Services Agency
Mr. Rich Hiett - Regional Water Quality Control Board
Mr. Aidan Barry - Harbor Bay Isle Associates
Mr. Bob Warnick - City of Alameda
Mr. Dick Rudloff - City of Alameda
Ms. Donna Dehn - Health/Sciences Consulting

Encl.

1000 Atlantic Avenue, Suite 110 • Alameda, CA 94501 • (510) 522-8188 • FAX: (510) 865-5731

A·C·C ENVIRONMENTAL CONSULTANTS

WORK PLAN
SUBSURFACE SITE INVESTIGATION AND
RISK ASSESSMENT
FORMER ISLAND GUN CLUB
500 MAITLAND DRIVE
ALAMEDA CALIFORNIA

Prepared for:

Ms. Madhulla Logan
Hazardous Materials Specialist
Alameda County Health Care Services Agency
80 Swan Way, Room 200
Oakland, CA 94621

February 1994

Prepared by: Misty Kaltreider
Project Geologist

Reviewed by: Gary Pischke, CEG #1501
Certified Engineering Geologist

REGISTERED GEOLOGIST
GARY PISCHKE
No. 1501
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

1000 Atlantic Avenue, Suite 110 • Alameda, CA 94501 • (510) 522-8188 • FAX: (510) 865-5731

TABLE OF CONTENTS

FIGURES

APPENDICES

ADDITIONAL SITE INVESTIGATION AND RISK ASSESSMENT - WORK PLAN FORMER ISLAND GUN CLUB PROPERTY, ALAMEDA

1.0 INTRODUCTION

ACC Environmental Consultants, Inc. ("ACC") is pleased to present to Ms. Madhulla Logan of Alameda County Health Care Services Agency (ACHCSA) this Work Plan for an additional subsurface site investigation and preparation of a Risk Assessment at the Former Island Gun Club property, 500 Maitland Drive, Alameda, California (Figure 1). The purpose of this project is to further evaluate the extent and background levels of lead, copper and polynuclear aromatic hydrocarbons (PNAs) in soil and groundwater, and to define the remediation strategies that will be required prior to commencement of construction of the proposed RV storage facility.

The investigation includes conducting a groundwater study to evaluate the groundwater gradient and determine flow fluctuations. In addition, research will be conducted to determine location of domestic and industrial wells within the nearby vicinity.

Once information is obtained from the groundwater study, two additional monitoring wells will be installed on-site. The additional monitoring wells will be used to evaluate the extent of groundwater chemicals of concern and establish background levels of constituents within the groundwater.

Once background levels of groundwater constituents and groundwater information are established, an Environmental Health and Human Health Risk Assessment will be performed.

2.0 BACKGROUND

The Gun Club Site (Site) consists of a 5 acre parcel of land located at the northwest corner of Maitland Drive and Harbor Bay Parkway on the Bay Farm Island portion of Alameda. The Site was used as a gun shooting club from 1926 to approximately 1986.

Samples taken during previous environmental studies at the Site have detected concentrations of lead, copper and (PNAs) in surface soil. In addition, samples taken from ground water monitoring wells at the Site have indicated lead and copper above established guidelines (California Plan Numerical Water Quality Objectives, 1991).

Currently the site is open and unpaved. The Gun Club operations were terminated on June 20, 1982, per City of Alameda agreement in Resolution No. 2138. The site has remained vacant since that time. The Site is proposed to be capped and used as a mini-storage and Recreational Vehicle (RV) parking lot.

3.0 SCOPE OF WORK

3.1 <u>Groundwater Study</u>

From previous groundwater monitoring and gradient evaluations performed from the on-site monitoring wells, groundwater flow direction has varied. To evaluate if the groundwater under the site is tidally influenced and the preferred groundwater flow direction, ACC will conduct a groundwater tidal influence study on the monitoring wells on-site. The study will include monitoring the groundwater elevation in one on-site monitoring well for a period of 24 hours using a data logger. In addition, research will be conducted to evaluate domestic and industrial usage of groundwater within a one mile radius. Research of available maps and historical aerial photographs of the area will be reviewed to evaluate the locations of the former shoreline with respect to the current site and historical site usage. This information will be used to establish potential receptors of contaminates within the surface and groundwater for the Risk Assessment.

3.2 Groundwater Investigation - Technical Approach

To establish baseline background levels of constituents and to further evaluate the groundwater contaminate plume, ACC will install two additional monitoring wells on-site. Proposed locations of the monitoring well is illustrated on Figure 2, attached.

The additional monitoring wells will be installed in areas which are anticipated to provide additional information on lateral extent of contamination from former site usage, and to establish background levels of copper, lead, and PNAs within the similar fill type material for evaluations of risk.

The monitoring wells will be installed using a truck-mounted drill rig equipped with 8-inch hollow stem augers. The auger and other tools used in the hole will be steam cleaned before use and between borings to minimize the possibility of cross-contamination. See Appendix A, Soil Sampling in Boreholes, attached. Figure 2 illustrates the proposed well locations.

4.0 DRILLING PROGRAM

4.1 Subsurface Investigation

The total depths of the monitoring wells will be contingent upon lithology and the depth to groundwater. It is currently anticipated that the total depth of the wells will be approximately 15 feet below ground surface. The well installations will be conducted in a manner consistent with ACHCSA and the Regional Water Quality Control Board (RWQCB) guidelines (see Appendix B, Well Construction).

During drilling, relatively undisturbed soil samples will be collected at 2-foot depth intervals, distinct lithologic changes and at the soil/groundwater interface. Sampling will begin at three feet below grade and continue to the bottom each boring, approximately 15 feet below ground surface (see Appendix A, "Soil Sampling in Boreholes and During Construction of Monitoring Wells") using a modified California split spoon sampler, equipped with three internal brass tubes, each 6 inches long and 2 inches in diameter. The sampler will be advanced 18 inches into undisturbed soil with a 140-pound hammer.

After recovery from the borehole, the least disturbed or lowermost sample liner will be preserved for chemical analysis. All soil samples collected above the saturated zone will be analyzed for polynuclear aromatic hydrocarbons (PNA)s using EPA Test Method 8250, copper and lead for total and soluble threshold limit concentrations (TTLC and STLC WET Method). The soils in the remaining two brass liners will be visually characterized and then evaluated with a portable photoionization detector (PID).

The soil samples retained for chemical analysis will be preserved in the following manner. Both ends of the liner will be covered with Teflon tape and plastic caps. The sample will then be labeled with a unique sample number and pertinent sample information, placed in a plastic Ziploc bag, entered on a chain-of-custody form, and packed in a chilled ice chest pending transport to a certified analytical laboratory.

The geologist will prepare a log of the subsurface conditions encountered during drilling and will classify the soil according to the Unified Soil Classification System and Munsell Soil Color Charts.

Selected soil samples will be submitted to Sequoia Analytical Laboratory, a CAL-EPA certified accredited analytical testing laboratory for analysis of PNAs by EPA method 8250, and TTLC and STLC copper and lead using EPA method 7421/6010.

Cuttings will be stockpiled on and covered with plastic pending analytical results.

4.2 Monitoring Well Construction

After the soil sampling is complete, the two borings will be converted into two-inch diameter monitoring wells. The total depth of the monitoring wells will be contingent upon lithology and depth to groundwater. It is anticipated that the total depth of the wells will be approximately 15 feet below ground surface. The borings for the monitoring wells will be drilled to a depth of 15 feet or the first aquitard below ground surface with a hollow stem auger as groundwater is estimated at 5 feet below ground surface. The wells will be sealed with minimal 2 foot seal, or as field conditions dictate, to best meet the ACHCSA and the Regional Water Quality Control Board guidelines.

The monitoring wells will be screened with 0.020 slot Schedule 40 PVC from approximately 3 to 15 feet below the ground surface. Packing material consisting of # 2/12 sand will be used as annular fill and will be added from the bottom of the screened depth to at least one foot above the top of the screen. A surface seal consisting of bentonite/volclay grout will be added to the top of the sand pack. The wells will be completed with a traffic safe "Christy" box cemented over the top of each wells.

The specifics of the construction and development of the monitoring wells are discussed in detail in Appendix B, "Well Construction". Per ACHCSA Monitoring Well Guidelines, the wells will not be sampled until at least 24 hours have elapsed after completion of construction and development.

After purging each well, water samples will be collected and analyzed for PNAs using EPA Test Method 8250 and TTLC, STLC, and total lead and copper, as requested by RWQCB (see Appendix C, Water Sampling in Wells and Boreholes).

All purge water generated during the sampling process will be contained on site in DOT-approved 55-gallon drums. Disposal of this purge water will be governed by the laboratory results for the associated water sample.

4.3 Groundwater Monitoring

Subsequent to the installation of the monitoring wells, the newly installed wells will be surveyed to an established benchmark, with an accuracy of 0.01 foot. Groundwater samples will be collected quarterly for a minimum of one year from the newly installed wells and the existing monitoring wells. Groundwater samples will be submitted to a CAL/EPA analytical laboratory for PNAs by EPA Test Method 8250, STLC, TTLC, and total copper and lead.

Prior to each sampling event, the water level elevation in all the wells will be measured. ACC will collect, store, and transport the water samples in accordance with existing regulatory guidelines (see Appendix C, "Water Sampling in Wells and Boreholes").

5.0 HEALTH AND SAFETY PLAN

A site health and safety plan which encompasses the proposed work at the site and complies with the requirements of 29 CFR Part 1910.120 is presented in Appendix D.

6.0 TECHNICAL REPORT

A technical report discussing the findings of the groundwater study, subsurface findings and the monitoring well installations and the initial groundwater sampling event at the site will be submitted to the client for review and acknowledgement prior to sending the final report to ACHCSA and the Regional Water Quality Control Board.

7.0 RISK ASSESSMENT

7.1 <u>Purpose and Objectives</u>

The purpose of the Human Health and Environmental Risk Assessment (RA) is to provide information on the potential human health and environmental risks posed by constituents detected at the Site. The objectives of this assessment are to:

Evaluate current risk

Evaluate the short-term and long-term risk associated with the proposed development plan.

Provide risk-based information to determine the need for remedial action at the site.

Provide risk-based cleanup levels for the site.

7.2 <u>Format</u>

The risk assessment will be performed using EPA guidance such as *Risk Assessment Guidance for Superfund: Volume I -- Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives and Actions* (EPA, 1991a); *Part A, Baseline Risk Assessment* (EPA, 1989), and potentially *Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities* (CalEPA, 1992a). The format of this report is based on this guidance.

The RA is anticipated to be a "stand-alone" document.

7.3 <u>Technical Approach and Scope</u>

Surface and subsurface soil and ground water data are available from the two Phase I reports and a Phase II report. These data will be evaluated according to EPA guidelines for useability in the risk assessment (EPA, 1990), however, it is anticipated that all data are usable for risk assessment purposes based on existing laboratory QA/QC. The chemicals of potential concern (COPCs) at the site were defined prior to sampling as those chemicals indicative of past site use; copper, lead and PNAs. To focus the risk assessment, COPCs will be selected from these chemicals by a frequency of detection screen, a comparison to background concentrations (if available), and a toxicity-concentration score (EPA, 1989).

Chemicals present at a detection frequency below 10 percent, are at or below the average concentration in background samples, or those that contribute to less than 99% of a toxicity-concentration score will not be considered further in the risk assessment. The toxicity-concentration screening step will use maximum concentrations of each constituent detected on site and will be done by media.

From preliminary evaluations, surface soil data (defined as 1-2 foot composite sample) will be grouped according to areas defined as "hot spots" in the Phase II report for statistical summaries. This includes two areas of lead contamination and one of PNA contamination. The attached figure delineates the three data groupings for soil. Grouping is done to preserve the integrity of the contaminated areas, to accurately reflect the concentration of chemicals within the site and to refrain from diluting the potential exposure point concentrations by averaging all data from the site. Data below the detection limit will be included in the statistical summary at a value of 1/2 the detection limit. This methodology is commonly used as values below the detection limit are equally likely to be between zero and the detection limit.

Ground water data from the five monitoring wells will be grouped together since the fill area represents a contiguous water bearing zone.

A data set for use in the risk assessment will be generated with limited statistics calculated for each chemical in the data set. An attempt will be made to assess the contribution of naturally occurring inorganic constituents (background) to the concentrations reported in the data set.

The objective of the exposure assessment is to identify pathways of exposure to contaminants detected on-site and potential receptors. It will begin with a listing of the physical and chemical characteristics of each chemical that affects its' transport/transfer/ transformation potential. The discussion of the potential fate and migration of the chemicals will utilize existing site characteristics, hydrologic information, and chemical data or simple conservative transport models to estimate the potential for intermedia transfer and the expected concentrations.

The results of the fate and transport evaluation will identify potential pathways that may lead to contact with chemicals at the site and pathways that may occur because of migration from the site. Receptors will then be identified, both current and potential future considering development plans for the Site.

As stated above, the Site is currently open and unpaved. Adolescents have been observed trespassing on the site. Current exposure pathways may include incidental ingestion of soil, inhalation of dust arising from the soil, and dermal contact with soil by children trespassing on the site. Dermal contact will not be quantified in this assessment as the metals, copper and lead, do not present a significant route of exposure. Further, data are insufficient to adequately characterize the dermal absorption of PNAs and the potential carcinogenic response from the dermal pathway (EPA, 1992). No contact with ground water on-site currently occurs. Downgradient wells will be identified to determine if any exist and their uses. Potential exposure will be determined from existing data and the existence of an exposure route. Currently during precipitation events, surface water runoff occurs through a drainage ditch to the city storm-water system. This system will be evaluated for potential environmental exposure pathways.

Parameters estimating exposure will be those currently identified by either EPA or California EPA (EPA, 1991b; Cal EPA, 1992a). A table will be prepared for discussion with the regulators prior to use in the assessment. Pathways or routes without recommended parameter values or deviations from recommended values will be documented. Estimation of the reasonable maximum exposure (RME) will be made.

According to existing land use plans, zoning ordinances, and federal restrictions, the property may only be developed for industrial use. The proposed development plans for the site conform to existing land use plans and restrictions. The site is slated to become a mini-storage and RV park. The entire site is to be graded and asphalt paved with erection of mini-storage buildings and associated structures. Short-term exposures during construction will be quantified for incidental ingestion of soil and inhalation of dust arising from contaminated soil. Workers would not encounter ground water.

It is anticipated that no exposures will occur after construction of the mini-storage and RV park because COPCs will not be released. Therefore, quantification of long-term exposures will not be done as exposure pathways will not be complete. This will be discussed and documented to the extent possible. The only potential failure that could occur after construction is cracking of the asphalt pavement. This could allow infiltration of precipitation, leaching to groundwater, and migration off-site. Potential off-site use of groundwater is limited to irrigation. Concentrations in groundwater will be estimated using WET analyses. A comparison of these concentrations with suggested concentrations for irrigation waters (if available) will be made.

The three soil groupings will be used for the purpose of determining exposure point concentrations. The upper 95 percent upper confidence limit (95 UCL) of the arithmetic mean concentration for each chemical within each the soil grouping will be calculated. The 95 UCL will be used as the exposure point concentration unless this concentration is greater than the maximum value observed; then the maximum observed value will be used. All RME values will be rounded to two significant figures, whereas maximum observed values will be used as reported.

Toxicity information will be based primarily on data published in the Integrated Risk Information System (IRIS) and the latest edition of the Health Effects Assessment Summary Tables (EPA, 1993). If toxicity information is not available from these sources, values promulgated into California regulations and Cal EPA criteria for carcinogens will be used (CalEPA, 1992b). A list of chemicals without available toxicity values will be prepared. Chemicals without toxicity values will not be considered quantitatively in the assessment. Toxicity values (slope factors and reference doses) will not be developed for this assessment.

Brief toxicity profiles for the RA COPCs will be prepared. The profiles will focus on health impacts from exposure to chemicals through anticipated routes (either current or future). Data on both carcinogenic and noncarcinogenic effects will be included in the profiles, as well as information on developmental effects, if available. PNAs will be profiled as a group (broken into carcinogenic and noncarcinogenic) as only limited toxicological information is available for the majority of compounds classed as PNA.

Risk will be quantified according to the methods outlined in EPAs' Risk Assessment Guidance (EPA, 1989). Risk quantification will take into account the exposure route, contact rate, exposure point concentration, toxicity of each constituent and end point of toxicity. Risk is assumed to be additive and therefore, total carcinogenic risk will be summed for all chemicals within an exposure pathway. Cumulative risk will be calculated by summing total pathway risk for each scenario Noncarcinogenic effects will also be summed for each pathway within a scenario and for the scenario. If noncarcinogenic risk for a pathway exceeds unity, chemicals will be separated according to their target organ effects and re-summed. If the risk from a specific pathway or media cannot be quantified, the qualitative effects will be discussed. Risk from lead will be evaluated using the Cal EPA spreadsheet.

Risk assessments contain inherent uncertainties. The use of toxicity data, exposure parameters, and numerous other assumptions introduce a measure of uncertainty in the resulting risk calculations. The magnitude and direction of the uncertainties influence on the resulting risk will be discussed and presented qualitatively.

7.4 Determination of Cleanup Levels

The determination of cleanup will be based on the results of the risk assessment. Methodology used to estimate cleanup levels will be examined after the need for cleanup has been established.

8.0 REFERENCES

California Environmental Protection Agency. 1992a. Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities. Department of Toxic Substances Control (DTSC), Sacramento, CA.

California Environmental Protection Agency. 1992b. California Cancer Potency Factors, June 18, 1992. Office of Environmental Health Hazard Assessment, Department of Toxic Substances Control (DTSC), , Sacramento, CA.

EPA. 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). EPA/540/1-89/002, Office of Emergency and Remedial Response, Washington, DC.

EPA. 1990. Guidance for Data Useability in Risk Assessments, Interim Final. EPA/540/G-90/008, Office of Emergency and Remedial Response, Washington, DC.

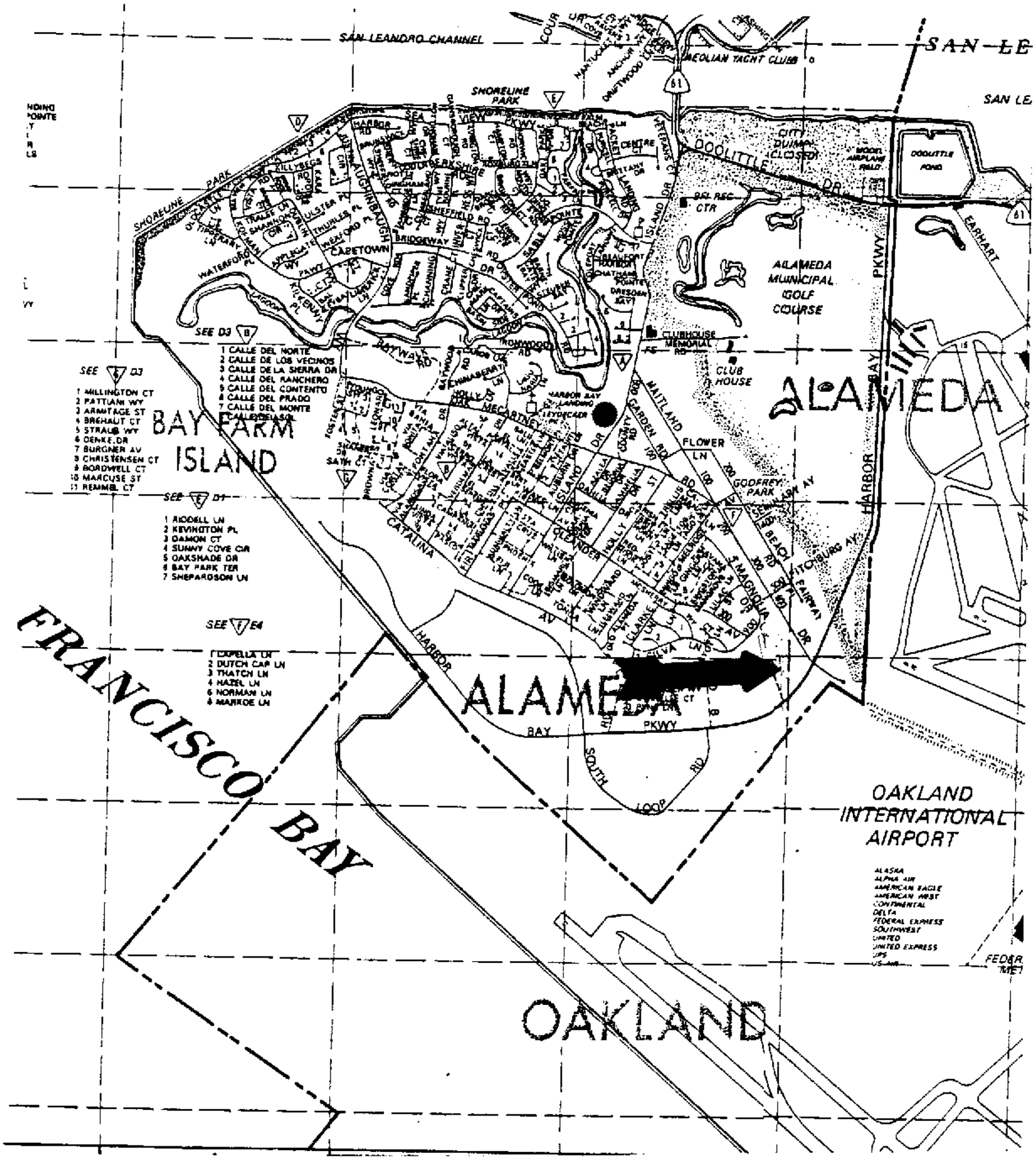
EPA. 1991a. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternative and Actions), Review Draft. EPA/540/1-89/002C, Office of Emergency and Remedial Response, Directive 9285.7-01C, Washington, DC.

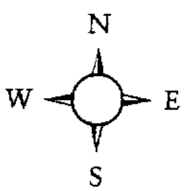
EPA. 1991b. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors". OSWER Directive 9285.6-03, Washington, DC.

EPA. 1992. Dermal Exposure Assessment: Principles and Applications, Interim Report. EPA/600/8-91/011B, Office of Research and Development, Washington, DC.

EPA. 1993. Heast Effects Assessment Summary Tables, Annual FY-1993. OERR 9200.6-303(93-1), Office of Emergency and Remedial Response, Office of Research and Development, Environmental Criteria and Assessment Office, Cincinnati, OH.

RISK ASSESSMENT OF THE PROPOSED DEVELOPMENT PLAN





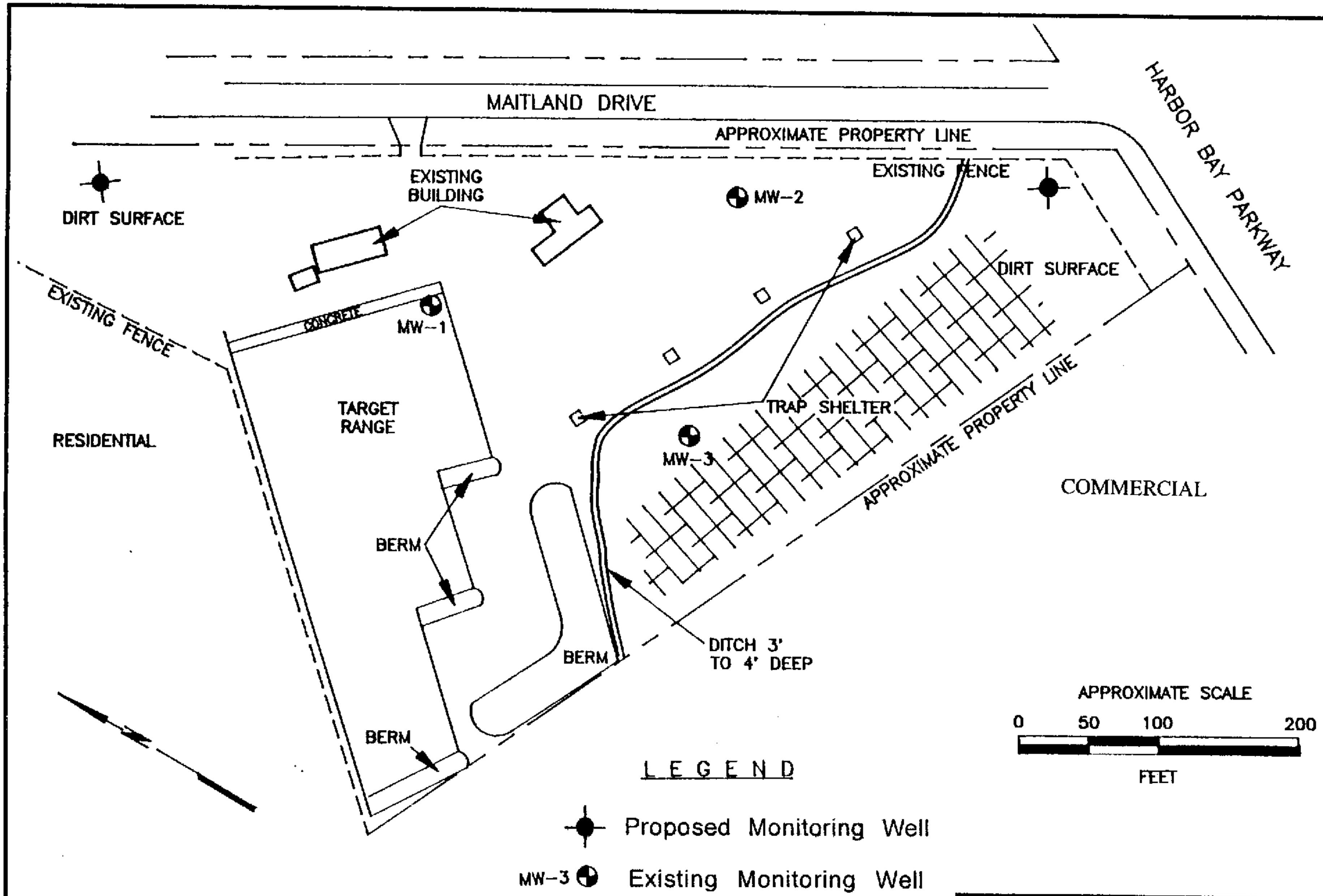
Source: Thomas Brothers

Scale: 1" = 2200'

Location Map
Former Gun Club
500 Maitland Drive, Alameda

1/27/1994	Drawn By: CS	Project: 6140-1	Figure 1

ACC Environmental Consultants • 1000 Atlantic Avenue, Suite 110 • Alameda, CA 94501 • (510) 522-8188 Fax: (510) 865-5731



January 27, 1994	Drawn By: MCK	Project No.: 6140-1	Figure 2	**Proposed Well Locations** Former Gun Club 500 Maitland Drive, Alameda

ACC Environmental Consultants • 1000 Atlantic Avenue, Suite 110 • Alameda, CA 94501 • (510) 522-8188 • Fax: (510) 865-5731

APPENDIX A

SOIL SAMPLING IN BOREHOLES AND DURING CONSTRUCTION OF MONITORING WELLS

U.S. Environmental Protection Agency standards serve as the foundation for all field sampling operations performed by ACC. EPA SW 846 is the primary publication from which procedures are derived. While some aspects of field and laboratory work may be delegated to the CAL EPA-Department of Toxic Substances Control (DTSC), the Bay Area Regional Water Quality Control Board, and the Health Services Agency - Department of Environmental Health establish the general and specific criteria for sampling.

SAMPLE INTERVALS

Undisturbed soil samples will be obtained for chemical analysis and geo-technical classification at five-foot intervals or at distinct lithologic changes, beginning at five feet below grade.

COLLECTION DEVICES

Samples will be collected using a 2-inch or 2.5-inch inside diameter Modified California Split Spoon Sampler containing three six-inch-long brass tubes or two three-inch-long tubes between two six-inch-long brass tubes. The sample collection device and tubes will be decontaminated before and after each use by steam cleaning or by an Alconox solution wash, tap water rinse and deionized water rinse. The sampler will be driven ahead of the auger using a 140-pound drop hammer. The average blow counts required to drive the sampler the last 18 inches will be recorded on the boring logs.

PRESERVATION AND HANDLING

After collection, sample tubes will be labeled, sealed at each end with Teflon sheeting and PVC end caps, placed in ziplock bags and stored in an ice filled cooler to be delivered under chain-of-custody to a State-certified laboratory by the next business day.

SOILS CLASSIFICATION

Soil exposed at the ends of each brass tube will be examined by a geologist for obvious signs of contamination and classified according to the Unified Soil Classification System. These observations will be recorded in the boring logs.

Selection of samples for laboratory analysis will be based primarily on headspace readings using a Photoionization device (PID) and position within the boring. In general, samples with headspace readings over 50 ppm or that have visual or olfactory indications of contamination will be submitted for analysis. One sample will also be selected from one or two sampling intervals below the apparent lower limit of contamination to obtain a "zero line" value. In addition, the sample closest to the depth of the storage tank invert will be submitted for analysis. If the water table is above the tank invert, the sample closest to the water table will be selected.

SAMPLE LABELING AND CHAIN OF CUSTODY

Samples selected for analysis will be labeled with self-adhesive, pre-printed labels indicating project name (or number), sample number, boring/well number, sample depth, date and time of sample collection, and required analyses. The same information will be recorded on the chain of custody.

APPENDIX B

WELL CONSTRUCTION

GENERAL PRACTICES

Each monitoring well will be designed to register the potentiometric surface, facilitate soil sampling, and permit water sampling. ACC's standard procedures for well installation and soil/water sampling meet or exceed guidelines set forth by the EPA, California State Regional Water Quality Control Board, and the Alameda County Health Care Services Agency. Drilling, construction, and completion of all exploratory borings and monitoring well will be in conformance with procedures in this appendix.

DRILLING PROCEDURES

Monitoring wells will be drilled with a hollow-stem, continuous-flight auger. All boring and logging will be supervised by a geologist with special attention given to the avoidance of cross contamination of underlying aquifers. The following procedures used by ACC geologist prevent pollution of clean aquifers underlying contaminated zones:

1. Drilling will cease if five feet of saturated impermeable material is encountered. It will be assumed that any significant saturated, impermeable layer, such as a clay layer, is an aquitard separating the shallow and deep aquifers and should not be penetrated.

2. Drilling will be terminated 20 feet below any perched or unconfined water table.

3. Drilling will be terminated at 45 feet below ground surface if groundwater is not encountered. This is above nearly all deep aquifers currently supplying groundwater in the Bay Area.

The drill rig operator and ACC geologist will discuss significant changes in material penetrated by the drill, changes in drilling conditions, hydraulic pressure, and drilling action. The ACC geologist will be present during the drilling of exploratory borings and will observe and record changes by time and depth, evaluate the relative moisture and content of the samples, and note water producing zones. This record will be used later to prepare a detailed lithologic log. Lithologic descriptions will include soil or rock type, color, grain size, texture, hardness, degree of induration, carbonate content, presence of fossils or other materials (gypsum, hydrocarbons), and other pertinent information. A copy of the logs will be retained in the field file at the project site.

Soil Cuttings

Soil cuttings generated during drilling will be stockpiled on and covered with plastic sheeting. Soil will be left on-site for subsequent disposal pending receipt of analytical results. Drums will be disposed of at an accepting facility.

SCREEN AND CASING

The monitoring well assembly will consist of new schedule-40 (minimum), flush-threaded, polyvinyl chloride (PVC) casing from the bottom of the boring to the ground surface. Casing will be shipped in protective wrappers.

From the base of the well to approximately five feet above the ground water surface, casing will consist of perforated casing (well screen); the remainder of the well will be solid PVC casing. Perforated casing (well screen) will be factory slotted. Screen sizes are intended to facilitate hydraulic connection between the monitoring well and the surrounding aquifer while retaining 70 to 90% of the filter pack material.

Upon completion of drilling, well casing will be assembled and lowered to the bottom of the boring. Since using glue to connect casing sections could cause false analytical interpretations of water quality, the casing will be connected with dry threads or slip joints. The bottom of the casing will be approximately flush with the bottom of the boring and will be capped with a threaded PVC cap or plug. Using the lithologic log for control, the ACC geologist will specify the exact depths of screened intervals so that the well screen is approximately opposite the water-bearing zone to be monitored.

Where possible, the casing will extend six inches above the ground surface. When monitoring wells are placed in traffic areas where the wells cannot extend above the surface, locking, pre-cast concrete or cast iron boxes and covers will be installed.

FILTER PACK

After the monitoring well assembly has been lowered to the specified depth, filter pack will be placed in the annular space between the well casing and borehole from the bottom of the well to approximately two feet above the top of the well screen. The depth to the top of the filter pack will be verified using the tremie pipe or a weighted steel tape. Filter pack will be at least 95% silica sand. Sand will be hard, durable, well-rounded, spherical grains that have been washed until free of dust and contamination.

American Society for Testing and Materials (ASTM) recommends the following guidelines for screen slot size and filter pack selection based on the anticipated underlying material:

Anticipated Soil Type	Recommended Well Screen Slot Size (inches)	Recommended Filter Pack Material (U.S. sieve sizes)
Sand & Gravel	0.030	20 to 4
Silt & Sand	0.020	30 to 8
Clay & Silt	0.010	50 to 16

Reference: Development Methods for Water Wells: An Anthology: NWWA Water Well Journal, June 1988.

GROUT SEAL

A layer of bentonite pellets approximately one foot thick will be placed above the filter pack and charged with water. The depth to the top of the bentonite pellets layer will be verified using the tremie pipe or a weighted steel tape. A cement-bentonite grout mixture will be tremied into the annular space from the bentonite seal to the top of the well. The grout material will be a mixture of Portland Type I/II cement (94 lb.) to five gallons of clean water or a sand-cement slurry with a minimum of 11 sacks of portland Type I/II cement per cubic yard. Only clean water from a municipal supply shall be used to prepare the grout. Well development will not begin until the grout has set for a minimum of 24 hours.

CAPPING WELLS

Following well construction, a steel or pre-cast concrete wall vault (or valve box) will be installed below ground surface. A metal tag containing well number and construction data will be permanently attached to the well vault. A steel well cover clearly marked "monitoring well" will be bolted to the vault. A suitable watertight, locking well cap will be fitted to the riser casing to prevent the entry of surface runoff or foreign matter.

WELL DEVELOPMENT

When well installation is complete, the well will be developed by surging, and/or bailing, and/or pumping to remove fines from the formation and filter pack. Well development generally restores natural hydraulic properties to the adjacent soils and improves hydraulic properties near the borehole so the water flows more freely in the well. At least three well volumes casing volumes will be removed from the wells. There are at least two common methods for determining that water in casing storage has been removed and water is flowing freely from the aquifer: (1) Monitor water level while pumping. When the pumping water level has "stabilized," it is likely that little or no water from casing storage is being pumped. (2) Monitor the temperature, pH and conductivity of the water while pumping. When these parameters "stabilize," it is probable that little or no water from casing storage is being pumped and that most of the water is coming from the aquifer. ACC will use the latter method. During development, pH, specific conductance, and temperature of the return water from the water pump will be measured. Well development will proceed until these field-measured water quality parameters have stabilized and the water is, in the judgement of the geologist, at its greatest possible clarity.

Temperature, pH and specific conductance meters will be calibrated per manufacturer's guidelines. Calibration shall be documented in the field log book or data sheets and will include a description of the calibration method, identification number of equipment, and/or reagents used in calibration.

Temperature will be measured with a mercury-filled, Centigrade-scaled, bimetallic-element thermometer, or electronic thermistor pH measurements will be made shortly after collection of the sample, preferably within a few minutes.

Conductivity will be measured by dipping the conductivity probe in the water source or sample. The probe must be immersed above the vent. The temperature of the sample will be used to calculate specific conductance from the conductivity measurement. Conductivity will be reported in units of micromhos per centimeter (mmho/cm) at 25°C.

WELL PURGING AND WATER SAMPLING

Purging and sampling will not begin for at least 24 hours following construction to allow grout to set. Purging and sampling will be in accordance with procedures in Appendix C, Water Sampling in Wells, and Boreholes.

DOCUMENTATION

A well construction diagram for each monitoring well will be completed by the geologist and submitted to the project manager when the work has been completed. In addition, the details of well installation, construction, development, and field measurements of water quality parameters will be summarized as daily entries in a field notebook or data sheets which will be submitted to the project manager when the work has been completed.

DRILLING EQUIPMENT DECONTAMINATION PROCEDURES

The sampler and liners will be decontaminated before and after each use by steam cleaning or washing in an Alconox solution, followed by tap water and deionized water rinses. Only clean water from a municipal supply will be used for decontamination of drilling equipment. Sampler and liners will be sealed in plastic bags or other sealed containers to prevent contact with solvents, dust or other contamination.

All rinsate used in the decontamination process will be stored on site in steel DOT approved drums. Drums will be labeled as to contents, suspected contaminants, date container was filled, expected removal date, company name, contact and phone number. These drums will be sealed and left on-site for subsequent disposal pending receipt of analytical results.

Drums of water will be disposed of at an accepting facility.

ENVIRONMENTAL CONSULTANTS

APPENDIX C

WATER SAMPLING IN WELLS AND BOREHOLES

GENERAL CONSIDERATIONS

In general, the composition of water within the well casing and in close proximity to the well is not representative of groundwater quality. This may be due to contamination by drilling fluids or equipment or disparities between the oxidation-reduction (redox) potential in the well and the redox potential in the aquifer. To obtain a representative sample of groundwater, the well should be pumped or bailed until the well is thoroughly flushed of standing water and contains fresh water from the aquifer. One common procedure is to pump or bail the well until a minimum of three boring volumes (or alternatively, 10 well volumes) have been removed.

At the least, pumping should continue until water in casing storage has been removed. There are at least two common methods for determining that water in casing storage has been removed and water is flowing freely from the aquifer: (1) Monitor water level while pumping. When the pumping water level has "stabilized," it is likely that little or no water from casing storage is being pumped. (2) Monitor the temperature, pH and conductivity of the water while pumping. When these parameters "stabilize," it is probable that little or no water from casing storage is being pumped and that most of the water is coming from the aquifer. ACC utilizes the latter method.

PURGING

During each round of sampling, static water level will be measured prior to purging using an electronic sounder. All water-level measurements will be recorded to the nearest 0.01 foot with respect to mean sea level.

A minimum of three bore volumes will be purged from the well prior to sampling. Bore and well volumes will be calculated using the table in this Appendix. To ensure that water in the well has been exchanged, pumping or bailing shall commence at the top and work downward. The well will be allowed to return to 80% of the original water level before sampling.

Temperature, pH and specific conductance will be measured for each boring volume pumped. Purging will continue until these field-measured water quality parameters have stabilized and the water is, in the judgment of the geologist, representative of water in the aquifer. Data obtained from field water quality measurements will be recorded in the field log book or data sheets. To ensure cross contamination does not occur, a separate allotment of groundwater collected from the purge water outlet stream will be used for field measurements; samples intended for laboratory analysis will not be used.

Temperature, pH and specific conductance meters will be calibrated per manufactures guidelines. Calibration will be documented in the field log book or data sheets and will include a description of the calibration method, identification number of equipment, and/or reagents used in calibration.

VOLUME OF WATER IN CASING OR HOLE

Diameter of Casing or Hole (Inches)	Gallons per foot of depth	Cubic Feet per foot of Depth	Liters per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.500	0.509×10^{-3}
1.5	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
2.5	0.255	0.341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
3.5	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
4.5	0.826	0.1104	10.26	10.26×10^{-3}
5	1.020	0.1364	12.67	12.67×10^{-3}
5.5	1.234	0.1650	15.33	15.33×10^{-3}
6	1.469	0.1963	18.24	18.24×10^{-3}
7	2.000	0.2673	24.84	24.84×10^{-3}
8	2.611	0.3491	32.43	32.43×10^{-3}
9	3.305	0.4418	41.04	41.04×10^{-3}
10	4.080	0.5454	50.67	50.67×10^{-3}
11	4.937	0.6600	61.31	61.31×10^{-3}
12	5.875	0.7854	72.96	72.96×10^{-3}
14	8.000	1.069	99.35	99.35×10^{-3}
16	10.44	1.396	129.65	129.65×10^{-3}
18	13.22	1.767	164.18	164.18×10^{-3}
20	16.32	2.182	202.68	202.68×10^{-3}
22	19.75	2.640	245.28	245.28×10^{-3}
24	23.50	3.142	291.85	291.85×10^{-3}
26	27.58	3.687	342.52	342.52×10^{-3}
28	32.00	4.276	397.41	397.41×10^{-3}
30	36.72	4.909	456.02	456.02×10^{-3}
32	41.78	5.585	518.87	518.87×10^{-3}
34	47.16	6.305	585.68	585.68×10^{-3}
36	52.88	7.069	656.72	656.72×10^{-3}

Notes:

- 1 Gallon = 3.785 Liters
- 1 Meter = 3.281 Feet
- 1 Gallon Water Weighs 8.33 lbs. = 3.785 Kilograms
- 1 Liter Water Weighs 1 Kilogram = 2.205 lbs.

Temperature will be measured with a mercury-filled, Centigrade-scaled, bimetallic-element thermometer, or electronic thermistor. Acidity/alkalinity (pH) will be measured by dipping the pH probe in the water source or sample; pH will be measured soon after collection of the sample, preferably within a few minutes.

Conductivity will be measured by dipping the conductivity probe in the water source or sample. The temperature of the sample will be used to calculate specific conductance from the conductivity measurement. Measurements shall be reported in units of micromhos per centimeter at 25°C.

SAMPLE COLLECTION

Wells and borings will be sampled using a new, clean, disposable Teflon bailer attached to new, clean string. Sample vials and bottles will be filled to overflowing and sealed so that no air is trapped in the vial or bottle. Once filled, samples shall be inverted and tapped to test for air bubbles. Samples will be contained in vials and bottles approved by the US EPA and the Regional Water Quality Control Board. Some analyses may require separate sample containers in accordance with EPA methods described in 40 CFR Part 136 and SW-846.

Water samples intended for volatile hydrocarbon analysis (EPA Method 602) will be contained in 40 ml VOA vials and will contain a small amount of preservative (HCl) in the vial. Samples intended for analysis by EPA Method 601 and EPA 624 GCMS procedures will not be preserved. Water samples intended for low level diesel analysis will be stored in amber glass 1-liter bottles to reduce degradation by sunlight. Antimicrobial preservative (HCl) may be added to the sample if a prolonged holding time is expected prior to analysis.

Sample containers will be labeled with self-adhesive, pre-printed tags. Labels will contain the following information in waterproof ink:

- Project number (or name)
- Sample number (or name)
- Sample location (Well number, etc.)
- Date and time samples were collected
- Treatment (preservative added, filtered, etc.)
- Name of sample collector

All samples will stored in ice filled coolers to be delivered to an EPA/CAL accredited laboratory for analysis.

All purged water will be stored on site in steel, DOT-approved drums. Drums will be labeled as to contents, suspected contaminants, date container filled, expected removal date, company name, contact and phone number. The drums will be left on-site for subsequent disposal pending receipt of analytical results. Drums of water will be disposed of at an accepting facility.

DOCUMENTATION

Sampling information will be recorded in ink in a bound notebook with consecutively numbered pages. Pages will not be removed for any reason. Alternatively, specially formatted field data sheets may be used to record the information collected during water quality sampling. Errata may be marked out with a single line and initialed by the person making the change. The log book and data sheets will be placed in the project file when sampling is completed.

FIELD EQUIPMENT DECONTAMINATION PROCEDURES

Bailers and string will be properly decontaminated and disposed of off-site. All other sampling equipment, such as buckets and stands, will be decontaminated after each use by washing in an Alconox solution, followed by tap water and deionized water rinses. Equipment will be sealed in plastic bags or sealed containers to prevent contact with solvents, dusts, or other types of contamination.

All rinsate used in the decontamination process will be stored on site in steel DOT-approved drums. Drums will be labeled as to contents, suspected contaminants, date container filled, expected removal date, company name, contact and phone number. These drums will be sealed and left on-site for subsequent disposal pending receipt of analytical results. Rinsate will be disposed of at an accepting facility.

APPENDIX D

SITE SPECIFIC
HEALTH AND SAFETY PLAN

ACC

SITE SAFETY PLAN

A. GENERAL INFORMATION

Project Title: **Former Island Gun Club**

Project No.: **6140-1**

Project Manager: **Misty Kaltreider**

Location: **Former Island Gun Club, 500 Maitland Drive, Alameda, CA**

Prepared by/date: **Misty Kaltreider**

Approved by/date: ______________________________

Scope of Work/Objective(s): **Soil Borings, installation of monitoring wells**

Proposed Date of Field Activities: ______________________

Documentation/Summary:

Overall Chemical Hazard:	Serious [ ]		Moderate [ ]	
	Low [X]		Unknown [ ]	
Overall Physical Hazard:	Serious [ ]		Moderate [X]	
	Low [ ]		Unknown [ ]	

- -

B. SITE/WASTE CHARACTERISTICS

Waste Types(s):

Liquid [X] Solid [X] Sludge [ ] Gas/Vapor [X]

Characteristics:

Flammable/ Ignitible [ ]	Volatile [X]	Corrosive [ ]	Acutely Toxic [X]
Explosive [ ]	Reactive [ ]	Carcinogen [X]	Radio-active [ ]

Other: ______________________________

Physical Hazards:

Overhead [ ]	Confined Space [ ]	Below Grade [ ]	Trip/ Fall [X]

Puncture [ ] Burn [ ] Cut [X] Splash [X] Noise [X]

Other: **Hazards with Drilling**

Site History/Description and Unusual Features:
Drilling and Sampling within areas of elevated levels of copper, lead and PNAs

Locations of Chemicals/Waste: **In soil and water**

Estimated Volume of Chemicals/Waste: **Unknown**

Site Currently in Operation: Yes [X] No [ ]

C. HAZARD EVALUATION

List and Evaluate Hazards By Task (ie. sampling/ drilling)

Physical Hazard Evaluation	Anticipated Level of Protection
Task 1. **Drilling**	D
Task 2. **Sampling**	D
Task 3. **Installing Monitoring Well**	D
Task 4. **Groundwater Sampling**	D

Modifications: ______________________________

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold/Desc.
Lead	**0.10 ppm**	**inhalation**	**abdom. pain, anemia**	**A heavy soft**
copper	**0.05 ppm**	**dermal,**	**nephropathy, eye**	**grey metal**
PNAs	**varies**	**ingestion**	**irrit, hypotension**	

D. SITE SAFETY AND WORK PLAN

Site Control: Attach map of the site.

Perimeter identified? [Y] Site secured? [Y] Work areas identified? [Y]

Zone(s) of contamination identified? [N]

Decontamination procedures and solutions:

Tri-sodium phosphate and water, triple rinsed

Special Site Equipment: (Sanitary facilities, lighting, etc)

None anticipated

Site Entry Procedures and Special Considerations

Underground Services Alert (USA) notified to avoid underground utilities

Work Limitations (time of day, weather conditions, etc.)

None anticipated

General Spill Control, if applicable: **N/A**

Investigation-Derived Material Disposal (expendables, cuttings, etc.)

stockpile cuttings, drum rinsate water in covered, labeled 55-gallon DOT certified drums.

Sample Handling Procedures:

Soil samples collected in brass tubes, teflon tape and plastic end caps taped to each end. All samples will be placed in ice-filled coolers until pick-up by laboratory.

E. EMERGENCY INFORMATION

Ambulance **911**

Hospital Emergency Room **(510) 523-4357**

Directions to Hospital (attach map) **Alameda Hospital, 2070 Clinton Avenue**

Poison Control Center **911**

Police **911**

Fire Department **911**

Laboratory **ChromaLab Analytical**

UPS/Fed. Express **N/A**

Client Contact **Mr. Aidan Barry (510) 769-5125**

Site Contact **Mr. Aidan Barry (510) 769-5125**

SITE RESOURCES

Water Supply Source **On-site**

Telephone **On-site**

Cellular Phone, if available ---

Other ---

EQUIPMENT CHECKLIST

Protective Gear	Quantity
Respirator	[1]
Cartridges **(organic)**	[2]
Protective Suit type: **Tyvek**	[1]
Gloves (pr) type: **Nitrile**	[1]
Steel Toed Boots	[1]
Hard Hat	[1]
Safety Glasses	[1]
Ear Plugs	[1]

Instrumentation	Quantity
O2/Explosimeter	[ ]
PID (HNu)	[1]
Draeger Pump (tubes)	[ ]
Heat Stress Monitor	[ ]
Personal Sampling Pumps	[ ]

First Aid Equipment	Quantity
First Aid Kit	[X]
Portable eye wash	[ ]
Blood pressure monitor	[ ]
Fire extinguisher	[ ]

Miscellaneous	Quantity
Surveyor's tape	[1]
Fiberglass tape	[ ]
Rope/string (100')	[3]
Surveying Flags	[ ]
Camera/film	[1]
Banner tape (active site)	[X]
Coolers	[1]
Teflon tape (roll)	[1]
Bottle labels (set)	[1]
Baggies (set)	[1]
Chain of custody forms	[1]
Bubble wrap	[ ]
Paper towels (roll)	[1]
Buckets	[3]

Sampling Equipment	Quantity
Liter bottles	[6]
Half gallon bottles	[ ]
VOA bottles	[6]
String	[ ]
Hand bailers	[3]
Spoons	[ ]
Personal sampling pump supplies	[ ]
Shovel	[ ]
Custody seals	[ ]
Federal Express forms	[ ]
Trash bags	[1]
Detergent/TSP (box)	[1]
Brushes	[2]

SITE SAFETY REVIEW

General Information

Date ____________ Time ____________ Project No. **6140-1**

Site **Former Gun Club Property**

Location **500 Maitland Drive, Alameda, CA**

Client Contact **Mr. Aidan Barry (510) 769-5125**

Objectives **Soil Borings, installing monitoring wells**

Types of Chemicals Anticipated **Lead, Copper, PNAs**

Topics Discussed

Physical Hazards **Typical Hazards assciated with drilling**

Chemical Hazards **Lead, Copper, PNAs**

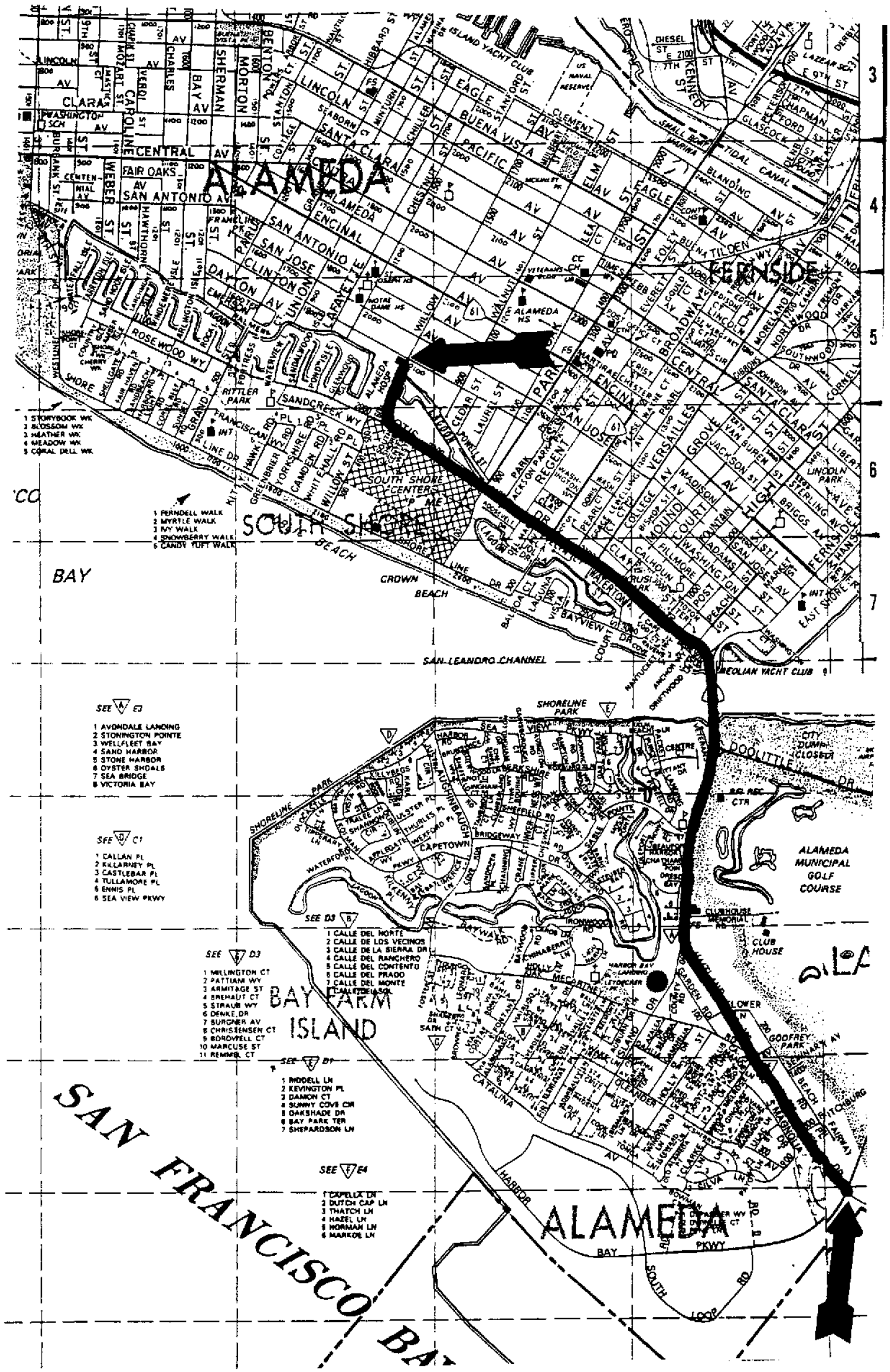
Personal Protection **Level D, modified as required**

Decontamination **Equipment to be decontaminated after each boring.**
Rinsate water will be drumed

Special Site Considerations **None anticipated**

ATTENDEES

Name Printed	Signature
-------------------------------	-------------------------------
-------------------------------	-------------------------------
-------------------------------	-------------------------------
-------------------------------	-------------------------------
-------------------------------	-------------------------------



Hospital Location Map