Draft
Environmental Impact Report

Proposed
U.S. Environmental Protection Agency, Region IX Laboratory at the University of California's Richmond Field Station

Appendices

University of California, Berkeley
Planning, Design and Construction Department
Physical and Environmental Planning Group
Berkeley, California

State Clearinghouse No. 90030459

July 1991

EPA REGION IX LABORATORY
ENVIRONMENTAL IMPACT REPORT
VOLUME II: APPENDICES
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APPENDIX A

NOTICE OF PREPARATION AND INITIAL STUDY CHECKLIST

UNIVERSITY OF CALIFORNIA, BERKELEY

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CAMPUS PLANNING OFFICE
A & E BUILDING

BERKELEY, CALIFORNIA 94720

June 7, 1990

To All Responsible and Trustee Agencies

CERTIFIED MAIL

NOTICE OF PREPARATION–DRAFT ENVIRONMENTAL IMPACT REPORT (EIR)

Project Title: U.S. Environmental Protection Agency, Region 9, Laboratory at the Richmond Field Station
Project Location: Richmond Field Station, Richmond, University of California, Berkeley
County: ContraCosta

Project Description: The University of California, Berkeley, Campus Planning Office, will be the Lead Agency and will prepare an environmental impact report (EIR) for the U.S. Environmental Protection Agency (EPA), Region 9, laboratory at the University's Richmond Field Station. The EPA has prepared a draft environmental assessment for the laboratory according to the National Environmental Policy Act (NEPA), the regulations of the Council on Environmental Quality (40 CFR Part 1500 et seq.), and the EPA NEPA regulations (40 CFR Part 6). The EPA's environmental assessment is not yet available for public review.

In compliance with the State and University of California guidelines for implementation of the California Environmental Quality Act, this Notice of Preparation is hereby sent to inform you that the University of California, Berkeley, is preparing a Draft Environmental Impact Report (EIR) on the above-named project.

As Lead Agency, we need to know the views of your agency as to the scope and content of the environmental information which is germane to you agency's statutory responsibilities in connection with the proposed project. (Potential environmental effects are identified in the attached material or Initial Study.)

Due to the time limits mandated by State law, your response must be sent at the earliest possible date, but not later than 30 days after receipt of this Notice. Please designate a contact person in your agency and send your response to the address below.

Leroy Bean
Assistant Vice Chancellor

University of California, Berkeley
Campus Planning Office
300 A & E Building
Berkeley, CA 94720
(415) 643-8677

Attachment
DS/ma
cc: State Clearinghouse
Senior Vice President-Administration
General Counsel

:notofpre.Ric

INTRODUCTION

The University of California, Berkeley, is the lead agency in the preparation of a draft EIR for the development of an EPA regional laboratory at the University's Richmond Field Station. The facility would provide laboratory support for all of EPA, Region 9's environmental programs.

The draft EIR will be prepared to assess the impacts of the proposed laboratory, pursuant to the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 et seq.), the State CEQA Guidelines (14 California Code of Regulations, Section 15000 et seq.), and the University of California *Procedural Handbook and Model Approach for Implementing the California Environmental Quality Act.*

The draft EIR is a public document used to analyze the environmental effects of the project. CEQA (Section 15126) requires that several elements be a part of this document including the following components:

- summary of the report,
- project description,
- environmental setting,
- significant environmental effects of the proposed project,
- significant environmental effects that cannot be avoided if the proposal is implemented,
- the relationship between local short-term uses of the environment and the maintenance and enhancement of the long-term productivity,
- significant irreversible environmental changes which would be involved in the proposed action if it is implemented,
- cumulative impacts of the proposed action,
- growth-inducing impacts of the proposed action,
- alternatives to the proposed action, and
- mitigation measures proposed to minimize the significant effects.

The draft EIR will include all of these elements.

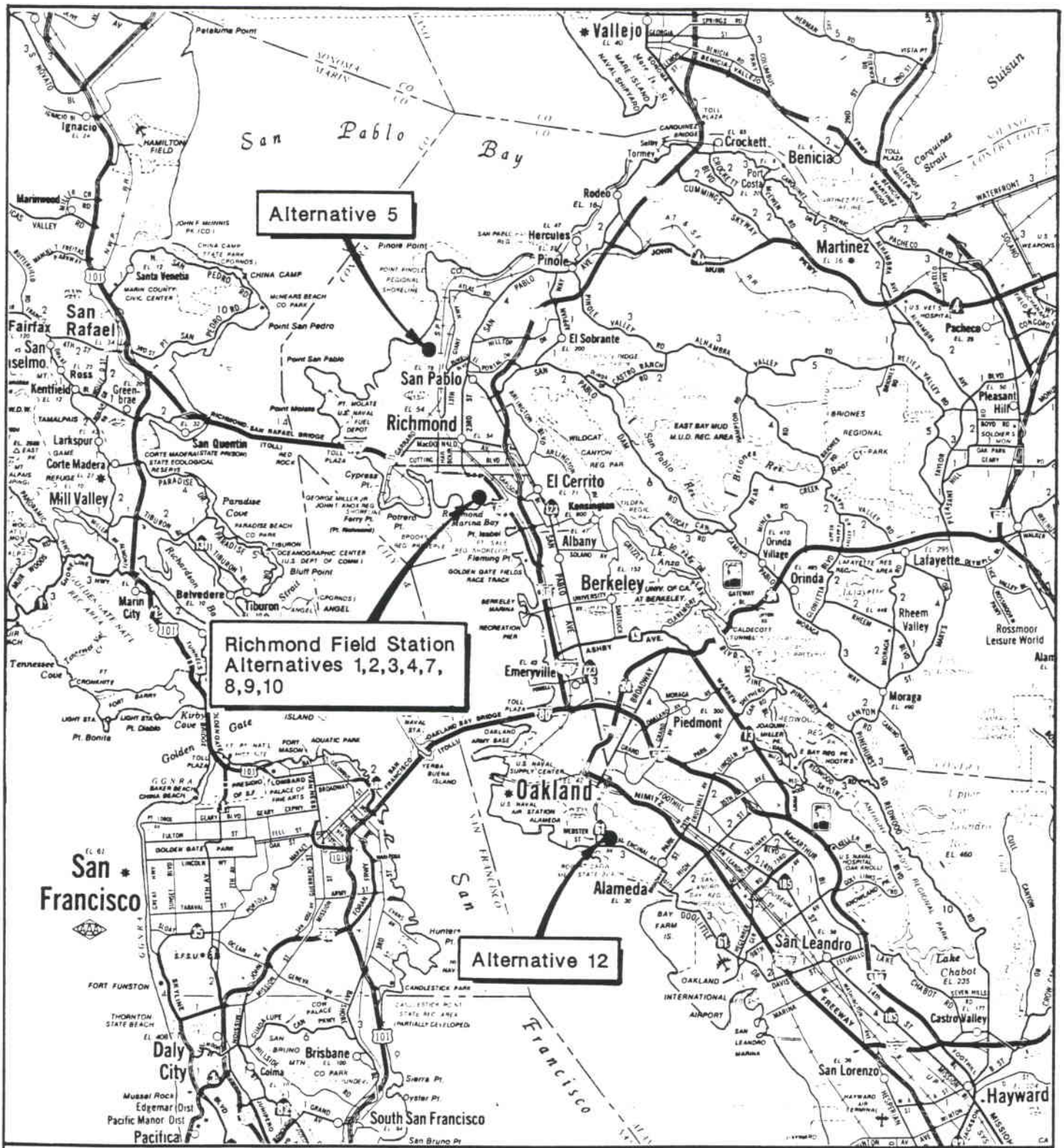

FIGURE 5. ALTERNATIVE PROJECT SITE LOCATIONS

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NOTICE OF PREPARATION
INITIAL STUDY CHECKLIST

UNIVERSITY OF CALIFORNIA

NOTICE OF PREPARATION

DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE U. S. ENVIRONMENTAL PROTECTION AGENCY, REGION 9, LABORATORY AT THE UNIVERSITY OF CALIFORNIA AT BERKELEY RICHMOND FIELD STATION

June 7, 1990

Prepared by:

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916/444-5638
Contact Person: Ron Bass, Project Manager

This notice is prepared in compliance with the California Environmental Quality Act

INTRODUCTION

The University of California, Berkeley, is the lead agency in the preparation of a draft EIR for the development of an EPA regional laboratory at the University's Richmond Field Station. The facility would provide laboratory support for all of EPA, Region 9's environmental programs.

The draft EIR will be prepared to assess the impacts of the proposed laboratory, pursuant to the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 et seq.), the State CEQA Guidelines (14 California Code of Regulations, Section 15000 et seq.), and the University of California *Procedural Handbook and Model Approach for Implementing the California Environmental Quality Act.*

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- alternatives to the proposed action, and
- mitigation measures proposed to minimize the significant effects.

The draft EIR will include all of these elements.

PROJECT DESCRIPTION AND BACKGROUND

Location and Project Site Description

The proposed project site is located within the University's Richmond Field Station in the City of Richmond in southwestern Contra Costa County (Figures 1 and 2). The field station is located on the north shore of the San Francisco Bay, approximately 8.5 miles northeast of San Francisco, California, and 5 miles northwest of the main Berkeley campus. The field station is bordered by Regatta Boulevard (previously South 32nd Street) to the west; Regatta Boulevard (formerly Seaver Avenue) and Meade Street to the north; and South 46th Street to the east. The project site is located at the northeast intersection of Avocet Way and Heron Drive.

The project site encompasses 3.17 acres. Disturbed grasslands cover approximately 2.0 acres of the project site. The remainder of the site (approximately 1.2 acres) is either paved or developed with research and storage facilities. Buildings 126, 128, 129, 131, and 200 are within the project site boundaries (Figure 2).

Project Description

Improvements to the site would include construction of the laboratory, a hazardous materials storage structure, a boiler building, waste treatment and holding tanks, secured parking for EPA vehicles, and 38 parking spaces for 25 staff and visitors. The EPA laboratory would consist of a single-story building with 45,855 gross square feet. The main building would be 22 feet high with mechanical equipment adding 9 feet to the height for a total of 31 feet. The north side of the site would be reserved to accommodate a future 25-percent expansion of laboratory operations (approximately 10,000 gross square feet) and future parking. At buildout, the laboratory would house 33 employees and encompass 55,000 gross square feet of area (Figure 3).

Purpose and Need

The new building would consolidate the EPA, Region 9, laboratory operations, field staging facility, and the management staff into one centrally located facility. EPA, Region 9, currently operates a laboratory in Las Vegas Nevada which is distant from the laboratory's management staff in the Region 9 headquarters in San Francisco and the field staging facility in Alameda, California. Most importantly, the new laboratory would increase

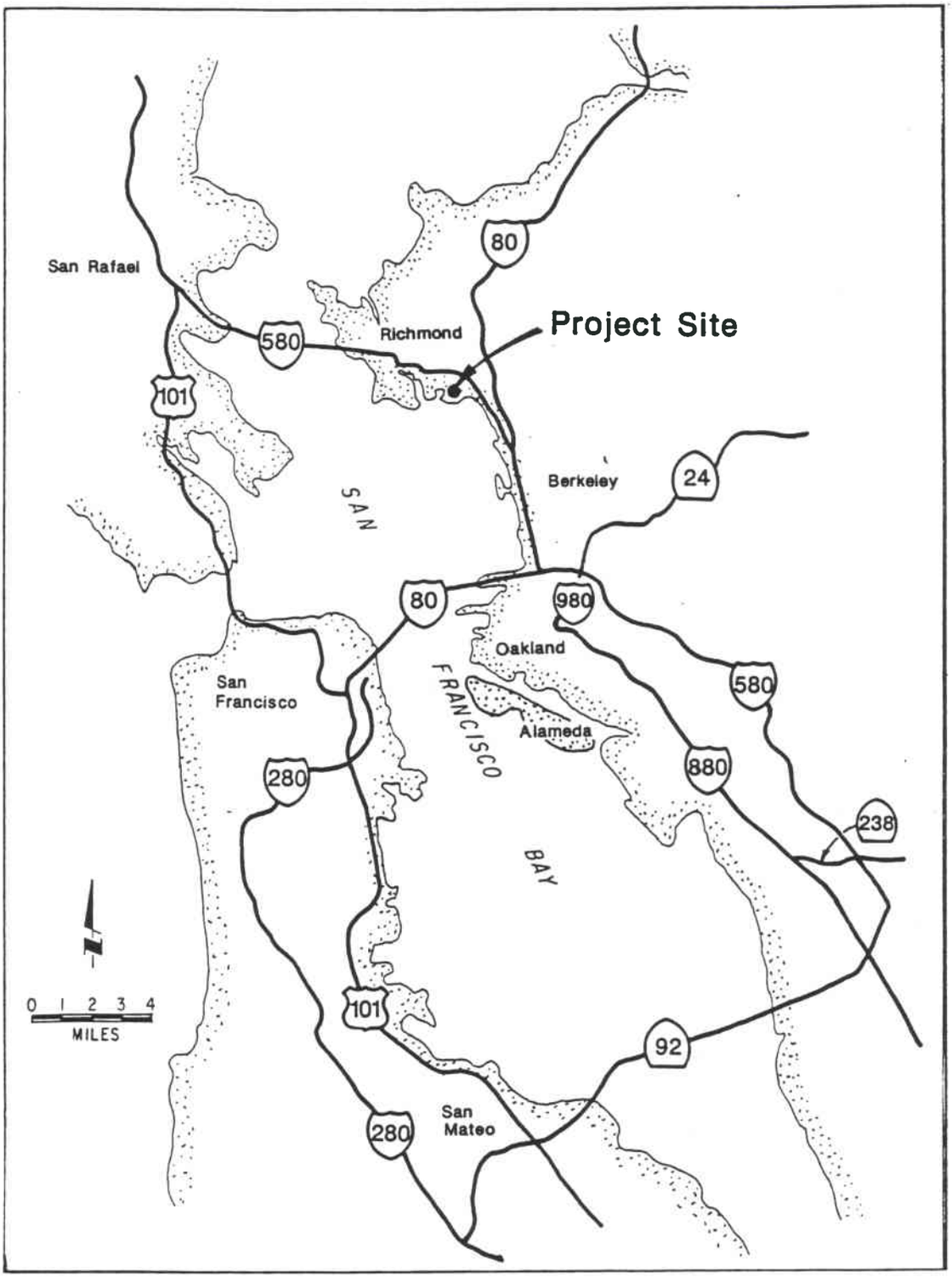


FIGURE 1. REGIONAL LOCATION OF THE UNIVERSITY OF CALIFORNIA RICHMOND FIELD STATION

shifted to the west toward South 32nd Street and Regatta Boulevard (Figure 4). Like Alternative 3, it would accommodate tentative schematic plans to redevelop the Richmond Field Station. In addition, it would provide greater visual access to the shoreline.

Alternative 5. North Richmond Alternative

The North Richmond Alternative will examine an alternative site that is not owned by the University or the EPA but is potentially available for development as a laboratory. This site was suggested by a planner for the City of Richmond who is familiar with the laboratory project. The site is located in north Richmond on Goodrick Avenue, south of the Point Pinole Regional Shoreline (Figure 5). The site is approximately 5 acres and is zoned for industrial uses.

Alternative 6. No-Project Alternative

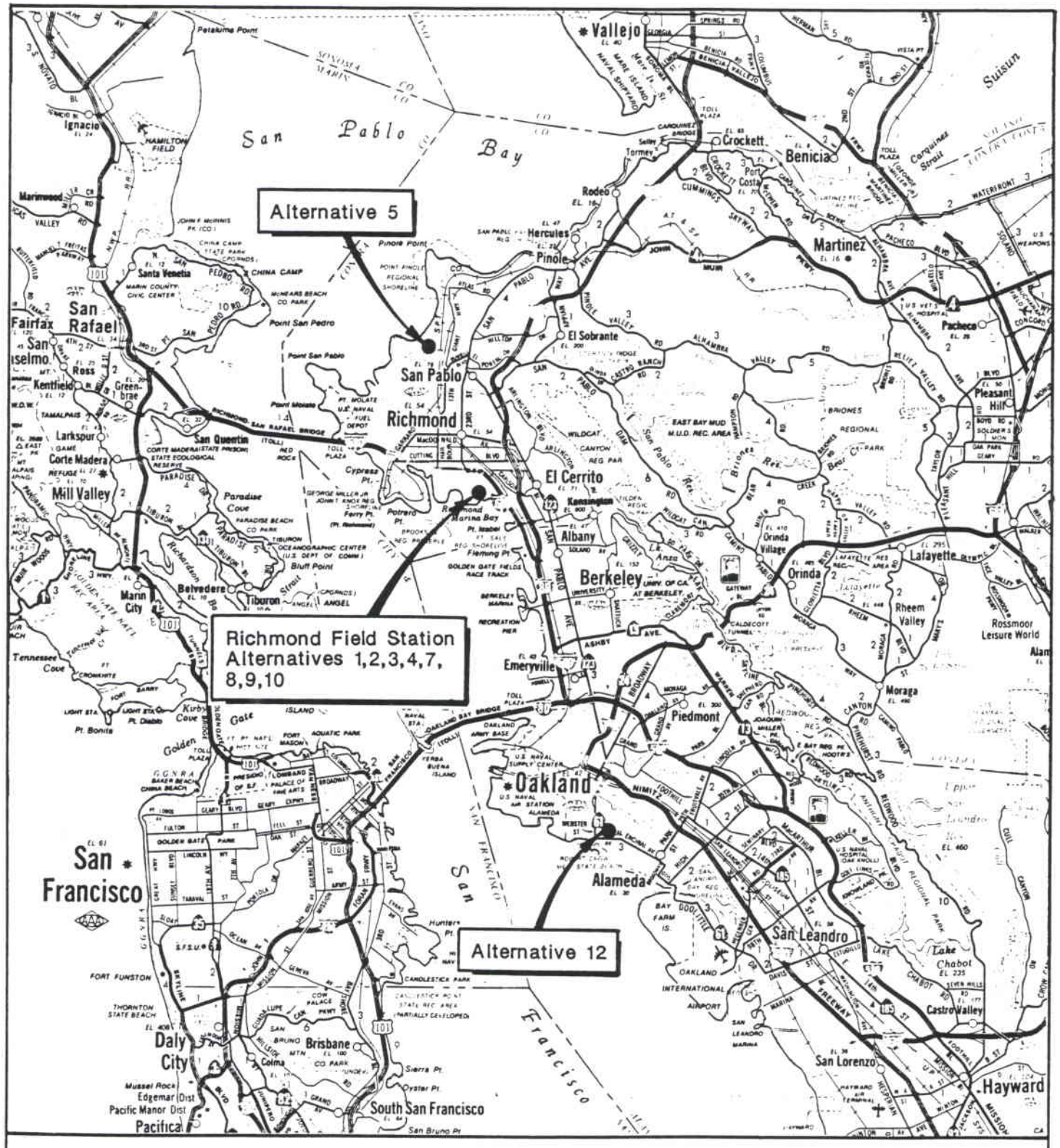
This alternative consists of continued use of the existing Las Vegas laboratory facilities. No laboratory would be constructed in the Bay Area, although the EPA would continue to have a field staging area in the Bay Area.

Alternative 7. Lark Drive Alternative

The Lark Drive Alternative is an offsite alternative, located on the Richmond Field Station adjacent to Regatta Boulevard and Lark Drive (Figure 4). This site was chosen because it is close to public utilities on Regatta Boulevard and because it has convenient access to Regatta Boulevard. The site encompasses 4.3 acres. The Lark Drive Alternative was evaluated by the EPA in their environmental assessment.

Alternative 8. North Starling Way Alternative

This offsite alternative was evaluated by the EPA as a potential project site. The 4.2-acre North Starling Way Alternative is located at the north end of Starling Way, approximately 800 feet north of the Lark Drive Alternative (Figure 4). The site is L-shaped to accommodate the potential expansion of the Northern Regional Library Facility, which is adjacent to the site. The North Starling Way Alternative would likely be accessed by the southward extension of 34th Street from Regatta Boulevard.



Note: Alternative 6 is the No-Project Alternative.
Alternative 11 is located in Las Vegas, Nevada.

0 1 2 3 4
MILES

FIGURE 5. ALTERNATIVE PROJECT SITE LOCATIONS

Alternative 9. Two-Story Laboratory Alternative

This onsite alternative would include development of a two-story laboratory on a smaller project site (approximately 2 acres) within the existing project site (Figure 4). This alternative would conserve land on the shoreline. However, it would obstruct views of the shoreline.

Alternative 10. Scaled-Down Laboratory Alternative

The scaled-down laboratory alternative is also located on the proposed project site (Figure 4). The facility would be reduced by 30 percent to a 2-acre site (approximately) with roughly 30,000 gross square feet of laboratory, storage, and office space.

Alternative 11. Expansion of the Las Vegas Laboratory Alternative

This offsite alternative considers the expansion of the existing Las Vegas Laboratory to accommodate additional uses proposed for the laboratory. The laboratory is leased from the University of Nevada, Las Vegas and is located on the University's main campus. The building houses other laboratories, which are leased by the EPA's Office of Research and Development environmental monitoring and systems laboratory.

Alternative 12. Expansion of the Alameda Field Staging Area Alternative

This offsite alternative assesses the potential to expand the EPA's field staging area in Alameda, California, to accommodate the entire laboratory. The field staging area is located at 620 Central Avenue (Figure 5). It is in a federal complex of approximately ten buildings operated by the General Services Administration. The buildings are occupied by various federal agencies, the largest tenant being the U. S. Department of Agriculture's meat and poultry laboratory. The EPA is leasing approximately 1,000 square feet of the complex.

MAJOR ISSUES TO BE ADDRESSED

The initial study checklist (see attachment) identifies a number of potential environmental impacts. Those issues that the University anticipates may or will have adverse environmental impacts unless mitigated (as indicated by checks in the "yes" and "maybe" columns of the initial study checklist form) will be addressed in the draft EIR in the following manner.

Land Use and Policy Issues

The draft EIR will encompass a detailed analysis of land use changes, including relocation of existing uses. The site is occupied by several buildings used for research and storage, plus related landscaping and utility infrastructure. The document will describe proposed or planned land use changes (other than the project) in the site vicinity and describe land use changes likely to occur if the proposed project is implemented (i.e., the growth-inducing potential).

This chapter will describe the relationship of the proposed project to overall planning for the Richmond Field Station. This section will also involve analysis of the City of Richmond's applicable land use designations in the zoning ordinance and general plan elements, the Richmond coastline plan, the Richmond Shoreline Conservation and Development Strategy, and the South Richmond Shoreline Special Area Plan. This analysis will include the draft Knox Freeway/Cutting Boulevard Corridor Specific Plan currently under review by the City of Richmond. The analysis will identify the degree of compatibility with applicable plans of regional agencies, such as the Association of Bay Area Government's Regional Plan, the Bay Conservation and Development Commission's San Francisco Bay Plan, and the Bay Area Air Quality Management District's Air Quality and Urban Development Guidelines. CEQA (Section 15126 [g]) requires that the growth-inducing impacts of a project be assessed in an EIR. The presence of the EPA laboratory could attract other light industrial or research and development uses to the field station. The project's potential effects on pertinent University plans, including the potential for encouraging development of similar projects at the Richmond Field Station, will be discussed in the draft EIR.

Population, Employment, and Housing

The EIR will assess whether the 33 future laboratory employees are new hires or transferred EPA staff. Pertinent demographic data will be furnished. The employment prospects for local workers will also be addressed.

Public Utilities and Services

The report will address the provision of necessary public services to the project site and vicinity, based on the most recent information available from service providers and information provided by the project proponent. This chapter will include analyses of water, wastewater treatment and disposal, solid and hazardous waste disposal, electricity, natural gas, law enforcement, fire protection, and emergency services.

Consumption of water, electricity, natural gas, and generation of waste will be estimated. The report will describe existing fire and police protection systems serving the site, including station locations, response times, and available equipment and personnel. It will also analyze requirements for special safety equipment and provide recommendations to facilitate emergency response systems, such as augmentation of equipment and personnel needs if necessary. Building performance for fire and risk protection will also be reviewed.

Hazardous Substances

Past uses of the Richmond Field Station have exposed portions the property to hazardous materials contamination. Between 1850 and 1950, the eastern portion of the field station was used for the production of explosives and munitions. Mercury fulminate was used in this process and mercury has been found in soil samples taken at the field station. The mercury contamination, which appears to be localized, occurred before the University acquired the property in 1950. Jonas & Associates, a firm that specializes in identification of environmental contamination, is working with the University to determine the extent of the contamination.

The draft EIR will summarize the results of Jonas & Associates' investigation. The history of hazardous materials use at the field station and in the vicinity of the field station will also be presented in the document. The EPA's laboratory operation will be assessed for consistency with Richmond's hazardous substances zoning requirements and with state and federal requirements for hazardous materials use. Business plan and materials inventory requirements will be reviewed.

The draft EIR will address the potential for accidental releases of hazardous materials, failure of pollution control equipment, and transportation accidents. Mitigation measures, such as safety features will be incorporated into the design of the project and into the operations and management plans for the laboratory, as necessary. Air toxics emissions, including any potential for hazardous emissions from laboratory exhaust hoods and stacks, will be analyzed.

Traffic and Circulation

Contributions to average daily traffic and peak-hour traffic at key intersections will be calculated using employment and delivery projections and existing traffic data available from the California Department of Transportation and the City of Richmond when such data are up to date. New data will be generated as needed.

The potential for use of public transit and shuttle buses from campus, as well as pedestrian and bicycle access, will be addressed. The University of California, Berkeley New Directions in Transportation Program also will be discussed. This chapter will also analyze traffic safety impacts resulting from construction and ongoing operations.

Air Quality

The "Air Quality" chapter will focus on regional air quality issues. The potential release of hazardous materials into the atmosphere will be addressed in the "Hazardous Substances" chapter. Cumulative air quality impacts will be addressed in the "Cumulative Impacts" chapter, and construction impacts in the immediate vicinity of the site will be addressed in this chapter.

Noise

The project is not expected to generate significant amounts of noise. The change in noise levels in the vicinity of the site as a result of the project will be qualitatively analyzed. Sensitive receptors (if any exist) will be identified and existing noise levels will be characterized. No noise modeling is anticipated. Construction-related noise impacts will be addressed in this chapter.

Geology, Soils, and Seismicity

This chapter will include a general description of geological and soil characteristics of the area, using information from the U. S. Geological Survey and the U. S. Soil Conservation Service. Soil, seismic, and geological constraints will also be addressed. The report will consider nearby earthquake faults and fault traces and the potential impacts of a major seismic event, including any potential for liquefaction. Impacts of development, such as erosion, geologic hazards, and disturbance due to construction activities, will be assessed, and mitigation measures will be identified, as applicable.

Hydrology and Water Quality

This chapter will identify project site drainage, describe the City of Richmond canal west of the site, and provide flood information. Impact assessment tasks will include assessment of runoff rates generated by project development (based on soil type and

Emergency Management Agency flood zones and elevations will be described. Mitigation measures will be recommended, as necessary.

Biotic Resources

The botanical resources of the site have been surveyed and information on these resources will be presented in the draft EIR. Vegetation (including eucalyptus trees) will be described and its value as wildlife habitat explained. Wildlife (including Monarch butterflies) using the habitats found elsewhere at the field station also will be described. The removal of eucalyptus trees and the increased undergrounding of the drainage swale extending through the site will be evaluated for impacts on biotic resources.

The report will examine the potential for disturbance of native grassland or wetland indicator species. Native grasslands and wetlands will be mapped for general background information. A records search of the California Natural Diversity Data Base will be conducted for special-status species that may occur in the vicinity of the project site. Local biological experts will be consulted, as appropriate.

Visual Quality

The "Visual Quality" chapter will address the regional aesthetic setting for the project site and the local aesthetic aspects of the site, including onsite views of the surrounding area and offsite views of the site. Special attention will be given to views of the San Francisco Bay shoreline from potential view corridors. Other issues requiring attention are setbacks from nearby buildings that will remain in place (such as Building 275) and views from new residential units being developed in Marina Bay along the shoreline to the west.

Applicable field station or University policies concerning visual access to the shoreline will be examined for consistency with the proposed project.

Cultural Resources

Using a study prepared by Holman & Associates (1989), the draft EIR will assess the presence of cultural resources in the vicinity of the project site, as well as impacts on these resources. The buildings proposed for removal as part of the project will be assessed for cultural significance.

Summary of Construction-Related Impacts

Construction-related impacts summarized in this chapter will include equipment noise, traffic from construction vehicles, dust generation, and soil compaction. Fuel consumption and the use of nonrenewable resources will also be discussed.

Cumulative Impacts

Cumulative impacts on land use, traffic, air quality, biological resources, and aesthetic resources will be addressed in the cumulative impacts chapter. The cumulative analysis will include possible future projects at the Richmond Field Station and in the surrounding south shoreline area of Richmond.

The cumulative traffic impact analysis will evaluate the laboratory's contribution to Knox Freeway and Regatta Boulevard in the vicinity of the project. The laboratory's contribution to demand for public transit at the Richmond Field Station will also be addressed. The cumulative aesthetic impact assessment will address the gradual blocking of bay views. The incremental loss of significant biotic resources and the additional deterioration of air quality will also be examined in this chapter.

APPENDIX I

Environmental Checklist Form

I. **Background**

1. Name of Proponent: University of California at Berkeley

2. Address and Phone Number of Proponent: Campus Planning Office
300 A & E Building, Berkeley, CA 94720
415/643-8677.

3. Date Checklist Submitted: May 11, 1990

4. Agency Requiring Checklist: University of California, Berkeley

5. Name of Proposal, if Applicable: U. S. EPA Region 9 Laboratory

II. **Environmental Impacts**

Explanations of all "yes" and "maybe" answers pre provided following each question.

	Yes	Maybe	No
1. **Earth.** Will the proposal result in:			
a. Unstable earth conditions or in changes in geologic substructures?			X
b. Disruptions, displacements, compaction, or overcovering of the soil?	X		
Explanation: The project would result in the compaction and overcovering of approximately 2.0 acres of permeable soil. Most of the 3.17-acre project site would be covered. A portion of the site (approximately 1 acre) is currently covered and would continue to be covered following project implementation.			
c. Change in topography or ground surface relief features?		X	

		Yes	Maybe	No
	Explanation: Absorption rates, drainage patterns, and the rate and amount of surface runoff would be altered by the project. An increase in impermeable surfaces would increase runoff. Construction would disrupt the existing storm drainage system which consists of several open drainage ditches and some culverted drainages. However, the site plan includes a drainage system consisting of 14 catch basins and four drainage inlets.			
c.	Alterations to the course or flow of flood waters?	__	X	__
	Explanation: Implementation of the project could alter the course and flow of flood waters. Portions of the Richmond Field Station were inundated with several inches of ponding surface runoff for a short period in 1982. This brief period of flooding was caused by a poor surface drainage system, ground saturation, and a 50-year storm event.			
d.	Change in the amount of surface water in any water body?	__	__	X
e.	Discharge into surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen, or turbidity?	__	X	__
	Explanation: Urban runoff from the laboratory's parking lots, structures, and landscaped areas could affect water quality along the San Francisco Bay shoreline. Urban runoff would be directed into catch basins and forwarded to the bay.			
f.	Alteration of the direction or rate of flow of groundwaters?	__	__	X
g.	Change in the quantity of groundwaters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?	__	__	X

		Yes	Maybe	No
h.	Substantial reduction in the amount of water otherwise available for public water supplies?			X
i.	Exposure of people or property to water-related hazards such as flooding or tidal waves?		X	
	Explanation: Implementation of the project could expose the U. S. Environmental Protection Agency (EPA) laboratory and staff to flooding (see explanation to item 3c). Also, an exceptionally large earthquake could provoke a tsunami that could extend to the project site.			
4.	**Plant Life.** Will the proposal result in:			
a.	Change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, and aquatic plants)?	X		
	Explanation: Approximately 2.0 acres of disturbed grassland and less than 30 eucalyptus trees would be replaced by urban uses. The grassland includes a small amount of native bunchgrasses and a small patch of saltgrass in a low-lying area.			
b.	Reduction of the numbers of any unique, rare, or endangered species of plants?			X
c.	Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species?			X
d.	Reduction in acreage of any agricultural crop?			X
5.	**Animal Life.** Will the proposal result in:			
a.	Change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms or insects)?	X		

	Yes	Maybe	No
Explanation: Snakes and ground-dwelling mammals may be eliminated during project construction. Some mammals and snakes may use landscaped areas once project construction is completed.			
b. Reduction of the numbers of any unique, rare, or endangered species of animals?	___	X	___
Explanation: The project could potentially affect the saltmarsh yellowthroat (a federal candidate species proposed for listing as threatened or endangered) that may use the tidal saltmarsh and grassland south of the project site. Project implementation would eliminate foraging habitat for the northern harrier, American kestrel, and the black-shouldered kite. Also, removal of roughly 20-30 eucalyptus trees could affect monarch butterflies that congregate in the eucalyptus grove approximately 1,500 feet north of the project site.			
c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?	___	___	X
d. Deterioration to existing fish or wildlife habitat?	X	___	___
Explanation: Please refer to the explanation for item 4.a.			
6. **Noise.** Will the proposal result in:			
a. Increases in existing noise levels?	___	X	___
Explanation: Construction activities could expose adjacent nonsensitive land uses to noise levels of 60-80 dBA (A-weighted decibel scale). Noise from additional automobile trips, operation of landscape maintenance equipment, and operation of the ventilation system and the boiler could slightly increase existing noise levels.			
b. Exposure of people to severe noise levels?	___	___	X

		Yes	Maybe	No
7.	**Light and Glare.** Will the proposal produce new light or glare?		X	
	Explanation: The building exterior would be lit at night which would increase light and glare in the area.			
8.	**Land Use.** Will the proposal result in a substantial alteration of the present or planned land use of an area?		X	
	Explanation: The proposed project would replace existing storage, research, and open space land uses with a laboratory, auxiliary structures, new infrastructure, and paved parking.			
9.	**Natural Resources.** Will the proposal result in an increase in the rate of use of any natural resources?			X
10.	**Risk of Upset.** Will the proposal involve: a risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals, or radiation) in the event of an accident or upset conditions?	X		
	Explanation: Operation of the laboratory could result in the release of hazardous substances in the event of an accident or upset conditions.			
	b. Possible interference with an emergency response plan or an emergency evacuation plan?			X
11.	**Population.** Will the proposal alter the location, distribution, density, or growth rate of the human population of an area?			X
12.	**Housing.** Will the proposal affect existing housing, or create a demand for additional housing?		X	
	Explanation: Project implementation would require staff relocation from the EPA's Las Vegas, Nevada laboratory. These staff members and their families would require housing. The maximum number of employees at the facility would be 33; however, some of these employees currently			

	Yes	Maybe	No
replacement to provide adequate water pressure to serve the laboratory in the event of a fire. The existing storm drainage system on the project site would require relocation. The existing electrical distribution system on the project site would require relocation. Project implementation may require rerouting of an existing gas line on the project site.			
17. **Human Health.** Will the proposal result in:			
a. Creation of any health hazard or potential health hazard (excluding mental health)?		X	
The use of hazardous materials at the EPA laboratory could potentially create a health hazard to laboratory staff and visitors.			
b. Exposure of people to potential health hazards?		X	
Explanation: Project implementation could potentially expose laboratory staff and visitors to mercury contamination in the soil adjacent to and east of the project site. The University is currently determining the lateral and vertical extent of the soil contamination and is evaluating whether removal and/or remedial action is necessary.			
18. **Aesthetics.** Will the proposal result in the obstruction of any scenic vista or view open to the public, or will the proposal result in the creation of an aesthetically offensive site open to public view?		X	
Explanation: Placement of the EPA laboratory may impede some long-distance views of the San Francisco Bay.			
19. **Recreation.** Will the proposal result in an impact upon the quality or quantity of existing recreational opportunities?			X

		Yes	Maybe	No
20.	**Cultural Resources.**			
a.	Will the proposal result in the alteration of or the destruction of a prehistoric or historic archeological site?		X	
	Explanation: No cultural resources were uncovered on the project site during a cultural resource investigation in 1989. However, the project could affect unknown cultural resources on the project site.			
b.	Will the proposal result in adverse physical or aesthetic effects to a prehistoric or historic building, structure, or object?		X	
	Explanation: Please refer to the explanation for item 20a.			
c.	Does the proposal have the potential to cause a physical change which would affect unique ethnic cultural values?			X
d.	Will the proposal restrict existing religious or sacred uses within the potential impact area?			X
21.	**Mandatory Findings of Significance.**			
a.	Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?		X	
b.	Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period			

	Yes	Maybe	No
of time, while long-term impacts will endure well into the future.)		X	
c. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.)		X	
d. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?		X	

III. **Discussion of Environmental Evaluation** (See each discussion item above for narrative description of environmental impacts.)

IV. **Determination** (To be completed by the Lead Agency.)

On the basis of this initial evaluation:

I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared. [ ]

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described on an attached sheet have been added to the project. A NEGATIVE DECLARATION WILL BE PREPARED. [ ]

I find the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required. [X]

June 7, 1990
Date

Dale Sanders
Signature

For UNIVERSITY OF CALIFORNIA, BERKELEY

APPENDIX B

COMMON AND SCIENTIFIC NAMES OF WILDLIFE SPECIES POTENTIALLY OCCURRING ON THE PROPOSED LABORATORY SITE OR MENTIONED IN THE TEXT

Appendix B. Common and Scientific Names of Plant Species Occurring at the Richmond Field Station or Are Mentioned in the Text

Common Name	Scientific Name
Aster	*Aster* sp.
Bird's foot lotus	*Lotus corniculatus*
Big squirreltail grass	*Sitanion jubatum*
Blue gum	*Eucalyptus globulus*
Bristle ox-tongue	*Picris echioides*
California blue-eyed grass	*Sisyrinchium bellum*
California poppy	*Eschscholzia californica*
Chinese caps	*Euphorbia crenulata*
Coast madia	*Madia sativa*
Common hareleaf	*Lagophylla ramosisima*
Cottoneaster	*Cottoneaster* sp.
Coyote bush	*Baccharis pilularis* var. *consanguinea*
Curly dock	*Rumex crispus*
Cut-leaved geranium	*Geranium dissectum*
Dallis grass	*Paspalum dilatatum*
English plantain	*Plantago lanceolata*
False dandelion	*Hypochoeris radicata*
Fuller's teasel	*Dipsacus fullonum*
Hairgrass	*Deschampsia* sp.
Harding grass	*Phalaris tuberosa* var. *stenoptera*
Hare barley	*Hordeum leporinum*
Himalaya berry	*Rubus procerus*
Iris	*Iris* sp.
Italian thistle	*Carduus pycnocephalus*
Meadow barley	*Hordeum brachyontherum*
Mediterranean barley	*Hordeum geniculatum*
Monkey flower	*Mimulus* sp.
Narrow leaf mule ears	*Wyethia angustifolia*
Yelloe nut sedge	*Cyperus eragrostis*
Pampas grass	*Cotadaria jubata*
Pine tree	*Pinus* sp.
Poison-oak	*Toxicodendron diversiloba*
Prickly lettuce	*Lactuca seriola*
Purple needlegrass	*Stipa pulchra*
Rattail fescue	*Vulpia myuros*
Red stem filaree	*Erodium cicutarium*

Appendix B. Continued

Common Name	Scientific Name
Rip-gut brome	*Bromus diandrus*
Ryegrass	*Lolium perenne*
Sand spurry	*Spergularia marina*
Scarlet pimpernel	*Anagallis arvensis*
Shamrock	*Trifolium dubium*
Sheep sorrel	*Rumex acetosella*
Short pod mustard	*Brassica geniculata*
Slender oats	*Avena barbata*
Soft chess brome	*Bromus mollis*
Spreading rush	*Juncus effusus*
Spring vetch	*Vicia sativa*
Sweet fennel	*Foeniculum vulgare*
Toyon	*Heteromeles arbutifolia*
Umbrella mallow	*Malva neglecta*
Western blue flax	*Linum perenne*
Western morning glory	*Calystegia occidentalis*
Wild radish	*Raphanus sativa*
Yellow ice plant	*Carpobrotus edule*

APPENDIX C

COMMON AND SCIENTIFIC NAMES OF PLANT SPECIES POTENTIALLY OCCURRING ON THE PROPOSED LABORATORY SITE OR MENTIONED IN THE TEXT

Appendix C. Common and Scientific Names of Wildlife Species That May Occur at the Richmond Field Station or Are Mentioned in the Text

Common Name	Scientific Name
Reptiles	
Gopher snake	*Pituophis melanoleucus*
Common garter snake	*Thamnophis sirtalis*
Birds	
Great blue heron	*Ardea herodias*
Great egret	*Casmerodias albus*
Mallard	*Anas platyrhynchos*
Black-shouldered kite	*Elanus caeruleus*
Northern harrier	*Circus cyaneus*
Sharp-shinned hawk	*Accipiter striatus*
Cooper's hawk	*Accipiter cooperii*
Red-tailed hawk	*Buteo jamaicensis*
American kestrel	*Falco sparverius*
Ring-necked pheasant	*Phasianus colchicus*
California quail	*Callipepla californica*
California black rail	*Laterallus jamaicensis coturniculus*
Virgina rail	*Rallus limicola*
Sora	*Porzana carolina*
California clapper rail	*Rallus longirostris obsoletus*
Killdeer	*Charadrius vociferus*
Willet	*Catoptrophorus semipalmatus*
Western sandpiper	*Calidris mauri*
Short-billed dowitcher	*Limnodromus griseus*
Rock dove	*Columba livia*
Mourning dove	*Zenaida macroura*
Great horned owl	*Bubo virginianus*
Burrowing owl	*Athene cunicularia*
Anna's hummingbird	*Calypte anna*
Allen's hummingbird	*Selasphorus sasin*
Northern flicker	*Colaptes auratus*
Pacific slope flycatcher	*Empidonax difficilis*
Black phoebe	*Sayornis nigricans*
Say's phoebe	*Sayornis saya*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Cliff swallow	*Hirundo pyrrhonota*

University of California
Office of the President
May 1988

UNIVERSITY POLICY ON SEISMIC SAFETY

Basic Policy

It is University policy to the maximum extent feasible by present earthquake engineering practice to acquire, build, maintain, and rehabilitate buildings and other facilities which provide an acceptable level of earthquake safety, as defined in this Policy, for students, employees, and the public who occupy those buildings and other facilities at all locations where University operations and activities occur. Feasibility is to be determined by weighing the practicability and cost of protective measures against the gravity and probability of injury resulting from a seismic occurrence.

Responsibility

The President is responsible for overall administration of this Policy and shall provide for (1) interpretation or clarification of the Policy as may be required, (2) development of seismic safety criteria, standards, and guidelines supplementary to the Policy, (3) evaluation of seismic safety programs and review of specific proposals for the abatement of seismic hazards, and (4) determination of Universitywide priorities among seismic safety projects and other projects proposed for inclusion in the Capital Improvement Program.

The President shall assign specific duties and authority to individuals within the Office of the President who may engage professional consultants or other specialists to advise and assist them in matters involving seismic safety.

The Chancellors, Senior Vice President—Administration, Vice President—Agricultural and Natural Resources, Director—Lawrence Berkeley Laboratory, Director—Lawrence Livermore Laboratory, and Director—Los Alamos Scientific Laboratory are the officials responsible for taking all reasonable steps to assure protection of persons under their respective jurisdictions against the effects of earthquakes which could result in the loss of life or injury to persons. Each responsible official shall assign specific duties and authority to individuals under his or her jurisdiction for the purpose of discharging this responsibility.

Program for Abatement of Seismic Hazards

Each responsible official shall develop a program for abatement of seismic hazards in existing buildings and other facilities within their respective jurisdictions and shall establish priorities for seismic safety projects in accordance with this Policy. Each responsible official shall coordinate proposed seismic correctional work with (1) proposed fire protection work (see University Policy--Fire Protection, issued September 22, 1971), (2) other proposed work involving environmental health and safety considerations, and (3) reasonable and prudent rehabilitation for functional and programmatic improvements.

The program for abatement of seismic hazards shall include identification and temporary and permanent correction of potential earthquake falling, sliding, or rupturing hazards such as, but not limited to, interior and exterior building elements, utilities, equipment, fixtures, furnishings, and other contents which could be dislodged, fall, overturn, slide, or rupture during seismic disturbances. Temporary measures to reduce the risks of injury pending permanent corrective action shall be considered and implemented if feasible.

The Consulting Structural Engineer

Each responsible official shall secure the services of one or more consulting structural engineers experienced in field investigations and analyses of damage in earthquakes. The consulting structural engineer shall be required to examine existing buildings and other facilities as directed by the responsible official and to submit to the responsible official reports on the adequacy of the resistance of such campus buildings and other facilities to seismic forces based on (1) conformance to the current seismic provisions of Title 24, existing California Administrative Code (CAC), the most recent edition of the Uniform Building Code (UBC), or local seismic requirements (e.g., city or county building regulations) whichever requirements are more stringent, and (2) the consulting structural engineer's professional evaluation of their anticipated seismic performance expressed in terms of Good, Fair, Poor, or Very Poor, as defined in Appendix A, with respect to degree of risk of injury to persons but not necessarily in conformance with the above specific seismic provisions. For buildings and other facilities which are reported as Poor or Very Poor by the consulting structural engineer, the responsible official shall immediately consider alternatives to undiminished continued use and occupancy of the buildings and other facilities including total or partial evacuation, temporary emergency measures, reductions in use, reconstruction, or combinations of these alternatives and shall then take appropriate action.

The consulting structural engineer shall be required to include in all reports recommendations regarding priorities for abatement of seismic hazards and estimates of costs for correcting seismic deficiencies in accordance with this policy.

Standards for Seismic Rehabilitation Projects

When evaluation by the consulting structural engineer of existing buildings or other facilities discloses conditions which do not afford an acceptable level of safety, proposed correctional work shall be incorporated in the program developed by the responsible official for abatement of seismic hazards and integrated in the University's proposed Capital Improvement Program. Seismic rehabilitation projects shall provide, as a minimum, an acceptable level of earthquake safety based on the sole consideration of the protection of life and prevention of personal injury, insofar as predictable, at a level of safety equivalent to that which would be established by compliance with the current seismic provisions of Title 24, CAC, the most recent edition of the UBC, or local seismic requirements, whichever requirements are more stringent, disregarding insofar as possible potential building damage not jeopardizing life, which would be expected from one earthquake of the intensity of at least IX on the Modified Mercalli Intensity Scale (modified by Charles F. Richter in 1958 as shown in Appendix B), except that an intensity of VIII can be utilized for buildings on the Davis and San Diego campuses. The intent of seismic rehabilitation shall be to reconstruct buildings and other structures so that they would have a Good seismic performance rating, as defined in Appendix A based on the present state of the practice of earthquake engineering.

When funds for seismic rehabilitation are limited, the program developed by the responsible official may include a phased rehabilitation program for selected buildings. The first phase would have the goal of reducing the greatest life safety hazards of the structure, such as reducing the potential of partial building collapse and/or reducing falling hazards at building entrances and along adjacent walkways. Later phases, to be performed when funds are available, would complete the seismic rehabilitation program of the structure. The consulting structural engineer shall assist the responsible official in establishing the scope of work in each phase of a phased rehabilitation program.

Preliminary plans for all seismic rehabilitation projects shall be reviewed by the consulting structural engineer, who shall verify the scope of the rehabilitation work and shall prepare any recommendations regarding any special criteria which should be considered in the project design. Upon completion of plans and specifications, the consulting structural engineer shall review the plans and structural calculations for completeness, general accuracy, appropriateness of details, and for compliance with any special criteria. The design structural engineer shall incorporate comments into the plans prior to bidding.

New Buildings and Other Facilities: Hospitals

The design and construction of new buildings and other facilities on University premises shall, as a minimum, comply with the current seismic provisions of Title 24, CAC, the most recent edition of the UBC, or local seismic requirements, whichever requirements are more stringent. In addition, provisions shall be made for adequate anchorage for seismic resistance of nonstructural building elements, including but not limited to glass, fixtures, furnishings and other contents, equipment, material storage facilities, and utilities (gas, high-temperature water, steam, fire-protection water, etc.) with respect to potential hazards to persons in the event of seismic disturbances.

New University buildings shall not be constructed on the trace of an active geological fault.

Preliminary plans for new major capital improvement projects, except pre-engineered buildings, wood framed buildings of less than 3,000 square feet, and buildings not intended for human occupancy, other than hospitals proposed for construction, shall be examined by the consulting structural engineer, who shall prepare recommendations regarding any special criteria that, in that engineer's opinion, should be recognized in providing adequate resistance to seismic forces to minimize the risk of injury to persons and damage to property. Upon completion of the final plans, the consulting structural engineer shall review the plans and structural calculations for completeness, general accuracy, structural details, and for compliance with any special criteria previously established. Should seismic design standards be revised during the period between completion of final plans and the date of advertisement for bids, the consulting structural engineer shall review again the plans and structural calculations before advertising for bids. The design structural engineer shall incorporate all comments into the plans prior to bidding.

Prior to the release of funds for structures other than hospitals or for seismic rehabilitation projects, a letter or report from the campus consulting structural engineer shall be submitted stating that the construction plans are in general conformance with the University Policy on Seismic Safety.

The design and construction of new facilities or alterations for hospitals, as defined in Section 15001 of the California Health and Safety Code, on University premises or under University operation shall comply with the seismic Administrative Regulations of Title 22, CAC, Division 7, Chapter 7 and the Design and Construction Standards of Title 24, CAC, particularly with Division T-22 of Part 6, Title 24, CAC.

A. TITLE AND PURPOSE.

This Section shall be known as the Special Industrial District. This district is established in order to provide land use and development controls for the area beyond those contained in the existing M-1, M-2 and M-3 regulations. The primary objectives of these zoning regulations shall be as follows:

1. Implementation of the Special Industry Land Use Category of the Richmond General Plan;

2. Promotion and accommodation of a wide range of appropriate land uses as suggested by the Shoreline Conservation and Development Strategy. This objective shall include policies to allow for the continued operation of existing viable land uses in the district with minimum disruption;

3. Provision for a review process which affords the City the opportunity to review development proposals that have a potential for significant impacts without imposing unnecessarily time consuming or bureaucratic procedures on the landowners and users.

4. Protection of the public welfare through the regulation of activities involving nuisance characteristics and/or the use of hazardous materials.

5. Protection of visual quality of the district especially as perceived from major collector streets, non-motorized circulation corridors, public open spaces, adjacent residential uses, and the shoreline.

6. Provision of clear and definitive development standards and standards of operation.

B. DEFINITIONS.

1. Bulk Plant. Refer to Section 15.04.145 D.

2. Bulk Storage and/or Distribution. Refer to Section 15.04.145 D.

3. Commercial Packaged. Refer to Section 15.04.145 D.

4. Hazardous Materials. Refer to Section 15.04.145 D.

5. Household Packaged. Refer to Section 15.04.145 D.

6. Lab Amounts. Refer to Section 15.04.145 D.

7. Minor Streets. For purposes of this Section, Minor Streets shall include all streets except those designated as Collector Streets.

8. Collector Streets. For purposes of this Section, Collector Streets shall be determined per the standards of the Public Works Department or as designated by the City Council.

(The following streets or portions of streets as shown on the Zoning Map have been designated as Collector Streets for purposes of the M-S District: Marina Bay Parkway, South 27th Street, Regatta Boulevard, South 34th Street, Meeker Avenue, South 37th Street, Meade Street, South 51st Street, Rydin Road, and Central Avenue. Ord. 46-88 N.S. 12/12/88. The preceding material has been provided for informational purposes only and is not part of the M-S District text.)

C. USE.

Under the provisions set forth in this Section and Section 15.04.193, the following uses may be permitted within the Heavy Industrial (HI) or Light Industrial/Research and Development (LI/R&D) areas of the district by right or with special review (conditional use permit approval) by the City, dependent upon use and quantities of hazardous substances (refer to Section 15.04.145 D.) Following each entry on the list will be a coded designation indicating how and where those uses are permitted; where applicable, exceptions are noted under each listing. The code is as follows: P = permitted, N = not permitted, CUP = permitted subject to approval of a conditional use permit.

** Use	HI	LI/R & D
1. Food and Kindred Products Manufacturing EXCEPTION: Slaughtering, rendering, glue and size processing not permitted in HI or LI/R&D.	P	CUP
2. Textile Mill Products Manufacturing	P	CUP
3. Apparel and other Finished Products from Fabric, Leather and Similar Materials Manufacturing EXCEPTION: Small scale custom mfg. of fabric products permitted in LI areas.	P	CUP
4. Lumber and Wood Products Manufacturing EXCEPTION: Not including furniture manufacturing & repair (See Item 5).	CUP	N
5. Furniture and Fixture Manufacturing EXCEPTION: Small scale custom mfg. permitted in LI/R&D.	P	CUP
6. Paper and Allied Products Manufacturing	CUP	N
7. Printing, Publishing, and Allied Industries	P	P

** Uses involving chemicals may also be subject to Section 15.04.145 D., Hazardous Materials; in which case, the more restrictive requirements shall apply.

8.	Petroleum Related Industries Manufacturing	CUP	N
9.	Rubber Products Manufacturing	CUP	N
10.	Chemicals and Allied Products Manufacturing Including medicinal/pharmaceuticals. EXCEPTION: Uses involving hazardous materials are subject to the permitting requirements of Table 1 in Section 15.04.145 D, Hazardous Materials.	P	CUP

**	Use	HI	LI/R & D
11.	Research and Development Activities EXCEPTION: Conditional Use Permit shall be required in HI and LI/R&D for activities involving or relating to the following:	P	P

a. The use of viruses or infectious materials.
b. The manipulation of genetic material of living organisms including, but not limited to, recombinant DNA molecules and organisms (as defined in the National Institute of Health Guidelines); cell fusion; and novel bioprocessing techniques.
c. Uses classified by the National Institute of Health as large-scale (greater than 10 liters of culture) research or production.
d. Uses where the laboratory requirements are at a Biosafety Level Two or above as defined by the National Institute of Health and the Center for Disease Control.

(Approval criteria and use of professional assistance, for this type of CUP, would be per Section 15.04.145 D.5.c.).

12.	Stone, Clay, and Glass Product Manufacturing EXCEPTIONS: Cement, lime, and plaster manufacturing and stone milling shall require a Conditional Use Permit in HI and LI/R&D; Small scale custom mfg. permitted in LI/R&D.	P	CUP
13.	Primary Metal Industries EXCEPTIONS: Ore reduction, refining, smelting, and extruding not permitted in HI or LI/R&D; plating, casting and foundry activities require a Conditional Use Permit in HI; fabricating, alloying, and finishing permitted in HI.	P	N
14.	Fabricated Metal Products Manufacturing EXCEPTIONS: Motor vehicle, heavy equipment, structural steel, iron and pipe manufacturing and shipbuilding shall require a Conditional Use Permit in HI and LI/R&D; Small scale custom mfg. permitted in LI.	P	CUP

** Uses involving chemicals may also be subject to Section 15.04.145 D., Hazardous Materials; in which case, the more restrictive requirements shall apply.

** Use	HI	LI/R & D
15. Electrical and Electronic Equipment Mfg. See "Professional ...Equipment" etc. below; EXCEPTIONS: Assembly of electronic components with no mfg. permitted in L.I.; Uses involving hazardous materials are subject to the permitting requirements of Table 1 in Section 15.04.145 D., Hazardous Materials.	P	CUP
16. Professional, Scientific, and Precision Equipment Manufacturing	P	P
17. Warehousing, Distribution, and Storage Activities Including self-service storage facilities (mini-warehouses).	P	CUP
18. Welding, Painting, Enameling and Lacquering Activities Including machine shops.	P	N
19. Recycling Activities Including collecting, sorting, storage, or bailing of rags, paper, iron, cast-off or salvage material, subject to approval of a Conditional Use Permit and to the limitations listed for Light Processing Facilities in Section 15.04.140. EXCEPTION: Reverse vending machines, mobile recycling units, and collection facilities shall be permitted per the limitations specified in Section 15.04.100.	CUP	CUP
20. Contractor Yards, Transit System Yards, Motor Vehicle Storage, and Motor Vehicle or Equipment Service Yards	CUP	N
21. Motion Picture, Video, Audio Recording Studios and Production Facilities	P	CUP
22. Industrial Product Sales	P	P
23. Utility Substations and Public Service Structures and uses	P	P

24. Other uses as determined by the Planning Director to be essentially the same as or very similar to those listed above, shall be permitted as are those uses to which they are determined to be most similar.

** Uses involving chemicals may also be subject to Section 15.04.145 D., Hazardous Materials; in which case, the more restrictive requirements shall apply.

25. ON-SITE ACCESSORY USES.

a. Those uses that are clearly incidental and accessory to those uses listed above, may be allowed if they are sited within the property boundaries of the primary use. Including but not limited to the following:

1. Administrative offices.
2. Food service facilities.
3. Recreation amenities including private landscaped open space.
4. Parking lots.
5. Outdoor storage and activity areas meeting the required conditions of the district.

b. The following accessory uses may be permitted if approved by the Commission according to the procedure set forth in Section 15.04.190.

1. Motor vehicle, rail or water terminal for freight or passengers.
2. Radio, telephone, or television transmitters and dish-type receivers requiring licensing by the Federal Communications Commission.
3. Schools or instructional facilities, including day care facilities.
4. Any accessory uses determined by the Planning Director to exhibit nuisance characteristics including but not limited to the emission of noise, smoke, vapor, odor, dust, light, glare, or excessive vibration (refer to Standards of Operation, Section 15.04.145 C.).

26. SUPPORT USES AS PRIMARY USES.

The following uses may be permitted if approved by the Commission according to the procedure set forth in Section 15.04.190.

a. Administrative services including information processing and management and records storage.
b. Commercial facilities (e.g. retail, general offices, lodging).
c. Industrial services.
d. Institutional, educational and recreational facilities.
e. Parking lots.

D. USE OF HAZARDOUS MATERIALS.

1. Standards: The permitted on-site quantities and uses of hazardous materials for an activity are listed in Table 1.

2. Definition of Hazardous Materials and Hazardous Materials Quantities.

a. Hazardous Materials. Hazardous materials classifications and definitions are from Appendix VI-A of the Uniform Fire Code, 1988 edition. This reference to the 1988 Uniform Fire Code is for the purposes of definition only. These terms are also further defined in Titles 29 and 49, Code of Federal Regulations (Fed-OSHA; Transportation). Hazardous Materials belonging to more than one category are subject to the regulations of the more stringent category.

b. Bulk Plant. Hazardous materials at the bulk plant level are primarily manufactured, synthesized, processed, blended, or packaged. Materials are stored in large fixed containers. Bulk plant quantities are larger than the amount transported in or out in any single shipment.

c. Bulk Storage and/or Distribution. Hazardous materials at the bulk storage or distribution level are primarily collected, repackaged, blended or stored on-site; may be used or sold on-site. The materials are generally transported to the site in an unpackaged form and are then transferred to the activity's storage container by hose, pipeline, conveyor belt, etc. On-site usage of rail car, tanker truck, or similar vehicle for storage is considered at this quantity level.

d. Commercial Packaged. Hazardous materials at the commercial package level are stored in discrete containers which are handled individually, palletized or unitized for purposes of transportation. Packaged materials are used or sold on site. Packages may include cylinders, drums, boxes, glass jars,etc.

e. Lab Amounts. Hazardous materials at the lab amount level are primarily those amounts which are less than Commercial Packaged amounts, are generally recognized by the industry as that which is required for normal laboratory research and development activities, and which, if an incident were to occur, would not have impacts beyond the immediate premises.

f. Household Packaged. Hazardous materials at the household packaged level are packaged and distributed in a form intended or suitable for sale through retail sales outlets for consumption by individuals for purposes of personal care or household use.

3. Permitted, Conditionally Permitted and Not Permitted Uses of Hazardous Materials.

TABLE 1

	HI Bulk Mfg Plant	HI Bulk Stor &Dist	HI Comm Pkg Amts	HI Lab Amts	LI/R&D Bulk Mfg Plant	LI/R&D Bulk Stor &Dist	LI/R&D Comm Pkg Amts	LI/R&D Lab Amt
EXPLOSIVES AND BLASTING AGENTS High explosives Peroxides capable of detonation Low explosives Blasting Agents	NO	CUP	CUP	P	NO	NO	NO	P
TOXIC MATERIALS Class A & B poisons	CUP	CUP	CUP	P	NO	CUP	CUP	P
HIGHLY UNSTABLE MATERIALS Organic peroxides Class I-II Oxidizers Class 4 Phyrophoric materials Unstable materials Class 4-3 Water-reactive materials Class 3	CUP	CUP	CUP	P	NO	CUP	CUP	P
RADIOACTIVE MATERIALS In amounts licensed by State	NO	CUP	P	P	NO	NO	CUP	P
MODERATELY HAZARDOUS MATERIALS Corrosives Flammable gases Flammable liquids Flammable solids Organic peroxides Class III Oxidizers Class 3-2 Water-reactive materials Class 2	CUP	CUP(a)	P	P	CUP	CUP(a)	P	P
MATERIALS WITH LIMITED HAZARDS Combustible liquids Irritants Oxidizers Class 1 Organic peroxides Class IV-V Sensitizers Unstable materials Class 2-1 Water-reactive materials Class 1	P(b)	P	P	P	CUP(a)	P	P	P

Permissibility: P = Permitted, CUP = CUP required, NO = Not permitted

Notes:
(a) If stored underground, then permitted outright.
(b) If one-half mile or closer to a residentially zoned or developed parcel, school, college or hospital, then a CUP is required.
(c) If conflicts arise between Table 1 and Section 15.04.145 C.1 through 26, the more restrictive regulations shall apply.

See next page for qualifiers and exceptions.

4. Qualifiers and Exceptions

a. In addition to these regulations, all storage or use of hazardous substances must be approved by the Fire Chief and be in conformance with all applicable fire and building codes.

b. Unless otherwise stated in Table 1, packaged quantities of hazardous substances for on-site use or sale are permitted in the zones.

c. Household Packaged hazardous substances are exempt from these provisions; however, the provisions of Section 15.04.193 may apply.

d. An existing use would be subject to Table 1 requirements if the quantity of material used increases to a higher quantity level or the category of chemicals used changes to a higher (more hazardous) category (e.g. a change from a Moderately Hazardous Material to a Toxic Material).

5. Conditional Use Permit Review for Hazardous Substances Use. Required CUP for hazardous substance use shall be processed as follows:

a. Procedures: Same as outlined in Section 15.04.190 of the Richmond Municipal Code.

b. Evaluation Factors: Factors to be evaluated in reviewing requests shall include, but are not limited to:

1. The amount of, and level of hazard presented by the substance;
2. Safety measures being proposed;
3. The potential for odors and toxic fumes;
4. The number of people and amount of land and structures which would be at risk if there were a major accident;
5. Location of the site in relation to identified areas of special environmental concern such as water courses, water wells, underground aquifers, or fish and wildlife habitats;
6. Location of the site in relation to designated routes for the transport of hazardous substances; and
7. Any other public welfare concerns identified by the staff.

c. Approval Criteria: The request may be approved if it is found:

1. The activity will not create an unreasonable risk to the public health and safety or to the surrounding properties and activities; and

2. The activity is consistent with the character and economic function of the surrounding area; and

3. The proposed activity will not result in a significant impact on environmentally sensitive areas; and

4. The request has been approved by the Fire Department.

Professional Assistance For City Determinations: Whenever the approval or satisfaction of the Planning Commission may be required in this Section, the Planning Director may, at such applicant's sole cost and expense, retain a suitably qualified independent engineer, or chemist, or other appropriate professional consultant regarding the adequacy of the application to achieve the purposes of this Section. The consultant's proposal shall not exceed 40 hours and/or a fee of $4,500, which amount may be changed pursuant to Council resolution to reflect future inflation. The Planning Commission shall be entitled to rely on such evaluation and/or opinion of such engineer, chemist or professional consultant in making the relevant determinations provided for this Section. Processing of such an application and selection of a consultant shall follow the procedures specified in Section 15.04.193 F.5.

E. STANDARDS OF OPERATION.

1. Regulatory Agencies. All uses shall comply with the regulations of the Bay Area Air Quality Management District, the Regional Water Quality Control Board, the San Francisco Bay Conservation and Development Commission, the State and County health departments, and any other regulatory agencies which exist or may be established to ensure environmental quality in the San Francisco Bay Region. Any conflicts between the regulations established by this Section and those of another agency shall be resolved to the mutual satisfaction of the agencies.

2. Emissions. No use shall be permitted which creates emissions that endanger human health, can cause damage to animals, vegetation or other property or which can cause soiling at any point beyond the boundaries of the site.

3. Odors. No continuous, frequent or repetitive odors are permitted which are perceptible on or beyond adjacent property lines. An odor detected no more than 15 minutes in any one day shall not be deemed to be continuous, frequent or repetitive for this regulation.

4. Noise. The City's noise regulations are stated in Section 9.22.040 of the Richmond Municipal Code. In addition, no continuous, frequent or repetitive noises are permitted which are detectable on or beyond adjacent property lines and which exceed 65 dBA. A noise of no more than five minutes in any one day shall not be deemed continuous, frequent or repetitive for this regulation. Areas of significant potential noise generation, e.g. loading docks, truck

parking areas, garbage and trash collection and exterior activity areas, etc., shall be so designed that adjacent properties, especially those of a residential character, will not be adversely affected by sound.

5. Vibrations. No continuous, frequent or repetitive vibrations shall be produced which are discernable on or beyond adjacent property lines to a person of normal sensitivities and which exceed 0.002g peak. Vibrations from temporary construction and vehicles which leave the site (such as trucks, trains, airplanes and helicopters) are excluded. Vibrations of no more than five minutes in any one day shall not be deemed continuous, frequent or repetitive.

6. Glare. Lights, reflective surfaces or any other sources of illumination including high temperature processing, such as welding or metallurgical refining, shall be located or shielded so as to prevent any glare or direct illumination on any public street or other property.

7. Design Standards. All projects shall be subject to site and development review per Section 15.04.205 of the Richmond Zoning Ordinance. Particular emphasis shall be placed on the design of building elevations and walls, both structural and screening, facing street frontages. Further, all mechanical equipment, switching boxes, transformers, etc. shall be screened from off-site view and all other utilities undergrounded.

8. Sidewalks and Street Trees. Sidewalks, curbs and gutters shall be provided on all public streets. Street trees shall be provided in accordance with the regulations of the Public Works Department.

9. Fences. The location of all fences shall be subject to the minimum setback standards contained herein.

10. Maintenance. Each person, company or corporation utilizing a lot shall at all times maintain such lot in good order. This shall include repairs and maintenance of all structures, fences, signs, walks, driveways, lawns, landscaping, painting, etc. as may be necessary to preserve a high quality as established by the M-S District .

F. AUTOMOBILE PARKING AND LOADING AREAS.

1. Parking Space Requirements.

Industrial Product Sales; Industrial Service: Manufacturing & Production; Vehicle Service	1 space/750 sq. ft. of gross floor area.
Warehouse and Distribution	1 space/750 sq. ft. of gross floor area. for the first 5,000 sq. ft. and 1 space per 2,000 sq. ft. for all additional square footage.

Office Activities; Personal Services; Retail Product Sales & Service; Research and Laboratory Activities	1 space/350 sq. ft. of gross floor area plus 1 space per 2.000 sq. ft. of exterior display or exterior storage area.

General Notes: If lot size is 5,000 sq. ft. or less, then no more than 6 spaces are required, and if lot size is from 5,001 to 10,000 sq. ft., then no more than 10 spaces are required. If the facility falls within more than one category, then the standards are applied proportionately to the use allocation of the facility.

Gross floor area shall be used in computing required parking spaces and all fractions shall be rounded up to the next whole number. In addition, to the above required parking, adequate off-street parking shall be provided for all vehicles, including but not limited to fleet vehicles, used either in conjunction with the activity or serviced by the activity. Parking space reductions may be permitted if a rideshare, transit incentive program, or other transportation system management program is provided and approved by the Planning Commission.

2. Parking Lot Placement and Development Standards

a. Parking space dimensions shall be per the standards established by the Department of Public Works.

b. Surface parking lots shall be paved and set back as follows:

	Setbacks	
	HI	LI/R&D
Minor Streets	5'	15'
Collector Streets	25'	25'

c. Parking lots containing 12 or more auto spaces shall contain a minimum of one tree per four parking spaces.

d. Setback areas for parking lots shall include, low hedges, shrub masses, berms, screen walls or fences of an appropriate height, or other devices to provide visual screening.

e. Truck parking. Truck parking lots in the HI and LI/R&D areas shall meet the setback, landscaping, and screening requirements for exterior storage in HI (see Section 15.04.145 H.)

3. Parking Lots Not Meeting the Landscape Requirements Specified in Sections 15.04.145 F.2.c. & d.

a. Deficient border landscaping. Parking lot expansions over 20 percent of the existing parking area shall require all landscaping and screening requirements for the entire parking lot

i. Other required trees. Deciduous trees at the time of planting shall be fully branched, have a minimum caliper of 1-1/2 inches, and a minimum height of eight feet. Evergreen trees at the time of planting shall be fully branched and a minimum of six feet in height.

2. Landscape Plans:

Landscape plans, including irrigation plans, must be submitted for the required landscaped or screened areas, and shall be subject to the City's Landscape Design and Development Guidelines. They shall be drawn to scale. Planting schedules shall indicate and show species by common and botanical names, size and placement of plants. Materials, size and placement of screens shall be shown.

3. Maintenance:

Required landscaping shall be continuously maintained in a healthy and attractive manner. An automatic irrigation system is required to establish and maintain plants. Vegetation shall be pruned back from pedestrian areas and vehicle travel areas.

APPENDIX F

LETTERS IN RESPONSE TO NOTICE OF PREPARATION

UNIVERSITY OF CALIFORNIA, NORTHERN REGIONAL LIBRARY FACILITY

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BUILDING 400
RICHMOND FIELD STATION
SO. 47TH & HOFFMAN BLVD.
RICHMOND, CA 94804
(415) 232-7767

June 22, 1990

Dale Sanders
Campus Planning Office
300 Architects and Engineers Building
University of California
Berkeley Campus

Dear Mr. Sanders:

Thank you for giving me an opportunity to review the NOTICE OF PREPARATION - DRAFT ENVIRONMENTAL IMPACT REPORT (EIR), covering the proposed U.S.Environmental Protection Agency, Region 9, Laboratory at the Richmond Field Station. In Appendix 1, the Environmental Checklist Form, I am particularly concerned with Section 5: Animal Life.

In addition to the saltmarsh yellowthroat mentioned in the explanation for part b., the Richmond Field Station is home to another species of concern: Melospiza melodia samuelis. According to Dr. L. Richard Mewaldt, San Jose, CA, it is one of three species of song sparrows associated with salt marshes, all of which are suffering population declines. Proposals to both the state and federal government giving M. m. samuelis 'endangered' or 'threatened' status, apparently are under consideration. At the Richmond Field Station I have observed three nesting pairs of this song sparrow, one of which is seen regularly in the fields along the southern edge of the property.

Besides those raptors mentioned in the explanation for part b., be advised that there are resident, nesting pairs of red-tailed hawks and great horned owls. Project implementation on this site will eliminate habitat for snakes and small rodents which constitute the primary diet of these birds.

Please find attached a list of birds I have observed using the grasslands and brush in the southern portion of the Richmond Field Station. Essentially all of these birds will be affected by the elimination of hunting, foraging, or nesting territory. My experience of several years observing birds at the Richmond Field Station leads me to suggest that of the possible RFS locations, a building on Alternative Site 8 would have the least adverse effect on the avian communities.

I would very much appreciate your continuing to keep me advised on the status of this project.

Sincerely,

Kay Loughman

Katharine H. Loughman

cc: R. Cooper, SEEHRL

BIRDS RECORDED IN THE GRASSLANDS AT THE UC RICHMOND FIELD STATION
Based on documented observations, January 1987-June 1990

SPECIES

Great Blue Heron
Mallard (n)
Killdeer (na)
Turkey Vulture
Black Shouldered Kite (n)
Northern Harrier
Cooper's Hawk
Sharp-shinned Hawk
Red-tailed Hawk (n)
American Kestrel (na)
California Quail
Ring-necked Pheasant
Rock Dove
Mourning Dove (n)
Great-horned Owl (n)
Anna's Hummingbird (na)
Allen's Hummingbird (na)
Northern Flicker
Black Phoebe (na)
Says Phoebe
Pacific Slope Flycatcher
Northern Rough-winged Swallow
Barn Swallow (na)
Cliff Swallow
American Crow (n)
Common Bushtit (n)
Western Bluebird
Hermit Thrush
American Robin (n)
Loggerhead Shrike
Northern Mockingbird (n)
American Pipit
European Starling (n)
Yellow-rumped Warbler
Common/Saltmarsh Yellowthroat
California Towhee (n)
Savannah Sparrow
Song Sparrow (M.m.samuelis) (n)
Golden-crowned Sparrow
White-crowned Sparrow
Lincoln's Sparrow
Red-winged Blackbird (n)
Brewer's Blackbird
Brown-headed Cowbird
Western Meadowlark
House Finch (n)
American Goldfinch (na)
Lesser Goldfinch (na)
House Sparrow (na)

Legend: n = nests seen at RFS ; na = nests assumed, but not yet located
Nests are not necessarily located in grasslands.

Prepared by Kay Loughman, NRLF, 400 RFS, June 22, 1990

Community
Development
Department
County Administration Building
651 Pine Street
4th Floor, North Wing
Martinez, California 94553-0095

Phone: 646-2035

Contra
Costa
County

Harvey E. Bragdon
Director of Community Developmer

June 20, 1990

Mr. Leroy Bear
Assistant Vice Chancellor
University of California, Berkeley
Campus Planning Office
300 A & E Building
Berkeley, CA 94720

Dear Mr. Bear:

Thank you for the opportunity to comment on the NOP for the EPA Laboratory at the Richmond Field Station. The NOP is very thorough and I have no comments to make on it. I would, however, like to receive a copy of the Draft EIR.

Sincerely yours

James W. Cutler
Assistant Director, Comprehensive Planning

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JUN 25 1990
CPO

JC/rw
cjc9/bear.ltr

Contra Costa County
FLOOD CONTROL
& Water Conservation District

J. Michael Walford
ex officio Chief Engineer

Milton F. Kubicek, Deputy Director
255 Glacier Drive, Martinez, CA 94553-4897
Telephone: (415) 646-4470
FAX: (415) 646-1147

June 22, 1990

Mr. Leroy Bean
University of California, Berkeley
Campus Planning Office
300 A & E Building
Berkeley, California 94720

Dear Mr. Bean:

We have reviewed the Notice of Preparation - Draft Environmental Impact report for the U.S. Environmental Protection Agency Laboratory located at the Richmond Field Station and submit the following comments.

The development does not involve a major channel or secondary channel, nor does it lie within a Drainage Area or other entity under the jurisdiction of the District. There is no need for you to send us copies of the improvement plans or final map. We have not reviewed the plans for minor in-tract drainage.

We appreciate the opportunity to review plans which involve drainage matters and welcome continued coordination.

If you have any questions, please call Craig Kupras at (415) 646-4470, extension 277.

Very truly yours,

Robert D. Agnew
Senior Civil Engineer
Flood Control Engineering

RDA:CK:dmw
Bean.t6
MISC645/145

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JUN 27 1990
CPO

Contra
Costa
County

Public Works Department
255 Glacier Drive
Martinez, California 94553-4897
FAX: (415) 646-1147

J. Michael Walford
Public Works Director

Milton F. Kubicek
Deputy Director

Maurice E. Mitchell
Deputy Director

June 26, 1990

Leroy Bean
Assistant Vice Chancellor
University of California, Berkeley
Campus Planning Office
300 A & E Building
Berkeley, CA 94720

Dear Mr. Bean:

Thank you for giving us the opportunity to comment on the Notice of Preparation of the Draft Environmental Impact Report for the U.S. Environmental Protection Agency, Region 9, Laboratory at the University of California at Berkeley Richmond Field Station.

We do not have any comments to make at this time.

Please send a copy of the Draft Environmental Impact Report to Steve Wright, Associate Civil Engineer, CCC Public Works Department.

Very truly yours,

Thomas L. Dudziak
Associate Civil Engineer
Road Engineering Division

TLD:JAR:kd
C:BeanUCB.t6

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region, HCB
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

June 29, 1990 F/SWR13:MGT

Leroy Bean
University of California, Berkeley
Campus Planning Office
300 A & E Building
Berkeley, CA 94720

Dear Mr. Bean:

Thank you for giving the National Marine Fisheries Service the opportunity to review the Notice of Preparation (NOP)-Draft Environmantal Impact Report (DEIR) for the U.S. Environmental Protection Agency, Region 9, Laboratory at the Richmond Field Station.

The National Marine Fisheries Service is responsible for preserving and enhancing marine, estuarine, and anadromous fish resources and the habitats that support these resources. The NOP-DEIR should fully address any impacts to these resources, ways to reduce those impacts, and mitgation for unavoidable impacts.

Of particular concern is water quality associated with construction, leakage from underground storage tanks into the bay, and run-off from parking lots, etc. Contingency plans for the failure of underground storage tanks and mitgation for impacts associated with these failures should be fully described. Regarding the Hazardous Materials section on page 9 of the NOP-DEIR describing hazardous materials already on-site, a full discussion of procedures to reduce the impacts of these materials should be made.

If you have questions concerning these comments or wish to discuss the project further, please contact Michael Thabault of my staff at: National Marine Fisheries Service, 777 Sonoma Avenue, Room 325, Santa Rosa , California 95404; telephone (707) 578-7513.

Sincerely,

James R. Bybee
Environmental Coordinator
Northern Area

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JUL 02 1990
CPO

MARINA BAY NEIGHBORHOOD COUNCIL

July 1, 1990

RECEIVED
JUL 05 1990
CPO

Mr. Leroy Bean
Assistant Vice Chancellor
University of California, Berkeley
Campus Planning Office
300 A & E Building
Berkeley, California 94720

Regarding: U.S. Environmental Protection Agency, Region 9
Laboratory at the Richmond Field Station
Richmond, California 94804

Dear Mr. Bean,

I am in receipt of above referenced Notice of Preparation-Draft Environmental Impact Report dated June 7, 1990. This report has raised a number of questions within the Marina Bay community. On behalf of Marina Bay Neighborhood Council, I respectfully request clarification of the following issues:

1. When will the Environmental Protection Agency's environmental assessment be available for public review?

2. When will the University of California's draft environmental impact report be available for public review?

3. What is the projected time line for the project through completion?

4. What is the connection between the University of California (as lead agency) and the Environmental Protection Agency?

5. Has consideration been given to the Comprehensive General Plan Update Issues and Opportunities drafted by the City of Richmond dated January, 1990? This report states that "The South Richmond Special Area Plan was developed at the time the City was proposing to develop a major container port; therefore, industrial uses are dominant in the Plan. The Plan has been amended twice to accommodate changes in the planned marina-residential-commercial development located around Marina Bay. Due to the development of the Marina Bay area and changes in the plans for the Port, the Special Area Plan is in many ways inconsistent with the recently completed Shoreline Conservation and Development Strategy." It would appear that the basic policy regarding the existing and future use of the entire field station is being called into question.

6. As the current site location is approximately 3 miles from the Hayward fault and is also in close proximity (less than 500 feet) to the residential community of Marina Bay; has sufficient analysis been given to the "worst case scenario" due to the release of hazardous materials resulting from fire and/or major earthquake? Has a disaster preparedness plan been formulated including the evacuation of nearby residents?

7. The destruction of trees, wildlife habitat and wetlands appears to be inconsistent with the conservation efforts being made by the City of Richmond, the Richmond Shoreline Conservation and Development Strategy, and the South Richmond Shoreline Special Area Plan. What consideration is being given to these recommendations and guidelines?

8. The plan makes note of the need for services of the fire department and possibly the police department. How does the University and/or the EPA plan to reimburse the City of Richmond for these services?

9. Has public access to the shoreline been given consideration and is this plan in compliance with the guidelines established by the Bay Area Conservation and Development Commission?

10. Alternate Site 5, located on Goodrick Avenue in North Richmond is in a sparsely populated, industrial area. Why is that site not being given priority status?

We will appreciate your earliest response to our questions.

Please add our organization to the distribution list regarding all future development of the Richmond Field Station. Thank you for your assistance.

Respectfully,

Virginia G. Finlay, President
Marina Bay Neighborhood Council

Mailing Address: 1201 Melville Square, #109
Richmond, CA 94804

cc: Allen Jensen, President, Marina Bay Homeowner's Association
Dwight Detter, President, The Beaches Homeowner's Associaton

CITIZENS FOR RICHMOND SHORELINE PARKS

An Affiliate of Citizens for the Eastshore State Park

P.O. Box 6087
Albany, CA 94706
July 9, 1990

RECEIVED
JUL 11 1990
CPO

Leroy Bean
Assistant Vice Chancellor
Campus Planning Office
300 A & E Building
Berkeley, CA 94720

Dear Chancellor Bean:

Thank you for the opportunity to review the scope and content of the environmental impact report on the Richmond Field Station Project.

Citizens for Richmond Shoreline Parks is a member of the coalition of environmental organizations organized as Citizens for the Eastshore State Park (CESP). CESP is working to establish public parklands on the eastern shore of San Francisco Bay from the Oakland Bay Bridge into Richmond.

An important consideration in a detailed analysis of land use changes is that some portion of the project should be dedicated to public use and access. Given the proximity of the site to areas of public use, and the presence of wetland areas, consideration should be given to a possible use of some areas as demonstration laboratories for studies of natural habitat and hydrology of marshlands. Public access to the shoreline could be made available through the use of South 45th Street.

On page 11 in the second paragraph, ABAG's Bay Trail Plan has not been listed. A portion of the trail skirts the project site and could be impacted by the proposed project as well as augmented with public use of Richmond Field Station lands. The East Bay Regional Park District should be listed as one of the agencies with plans that could be impacted.

Comments on the Environmental Checklist:

#2, page 19 - Obviously, the creation of emissions of hazardous materials and objectionable odors into the ambient air will require monitoring of onsite hazardous wastes and odorous substances. Provision for this should be included.

#7, page 23 - Light and glare could be a hazard to cars on the John Knox Freeway, to boats approaching Marina Bay as well as to the homes located in the Marina Bay development.

#10, page 23 - Item b is inconsistent with the first paragraph of the item. The item needs clarification.

#14, page 24 - Would the project tie into the city or the county Hazardous Waste Emergency Response Team? Whose responsibility would it be to respond?

We appreciate your consideration of these concerns.

Sincerely,

Jay Vincent

Jay Vincent
Acting Chair
Citizens for Richmond
Shoreline Parks

Stana Hearne

Stana Hearne
Executive Director
Citizens for the
Eastshore State Park

Contra Costa County
Health Services Department
ENVIRONMENTAL HEALTH DIVISION
OCCUPATIONAL HEALTH / HAZARDOUS MATERIALS

July 20, 1990

University of California, Berkeley
Campus Planning Office
300 A & E Building
Berkeley, Ca. 94720

Attn: Dale Sanders

Dear Mr. Sanders:

I am writing in response to your Notice of Preparation for a draft Environmental Impact Report for the U.S. Environmental Protection Agency, Region 9, Laboratory at the University of California at Berkeley Richmond field station. It appears that the scope of this report adequately encompasses the regulatory concerns of our agency with the possible exception of the following:

- our agency, along with Richmond Fire, will be responsible for emergency response at this facility should the need arise;
- our agency will be responsible for obtaining a Business Plan from EPA and performing inspections under AB 2185.

As per our discussion this afternoon, I am the contact for the Hazardous Materials Division of County Environmental Health. I would appreciate receiving the initial and any subsequent draft EIR's and a final EIR. Please contact me if you have any questions regarding this letter or our interest in the project.

Sincerely,

Eric Jonsson
Hazardous Materials Specialist

4333 Pacheco Boulevard • Martinez, California 94553 • (415) 646-2286

STATE OF CALIFORNIA

GEORGE DEUKMEJIAN, Governor

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION
THIRTY VAN NESS AVENUE, SUITE 2011
SAN FRANCISCO, CA 94102-6080
PHONE: (415) 557-3686

July 25, 1990

Dale Sanders
University of California, Berkeley
Campus Planning Office
300 A&E building
Berkeley, California 94720

SUBJECT: Notice of Draft EIR for U.S. EPA, Region 9 Laboratory;
BCDC File No. MC.MC.7415.18

Dear Mr. Sanders:

Thank you for the opportunity to comment on the draft EIR for the EPA Region 9 laboratory. The project includes construction of a single-story laboratory, a hazardous materials storage structure, a boiler building, waste treatment and holding tanks, and parking. The draft EIR lists twelve alternative locations for the project.

The Commission has Bay jurisdiction over areas subject to tidal action and shoreline band jurisdiction over areas 100 feet inland from the line of highest tidal action, 5.8 in your area. Site plans of the project should show the line of highest tidal action and the 100-foot shoreline band. Based on the information submitted, all of the project alternatives appear to be outside the Commission's jurisdiction. If any work is within the Commission's jurisdiction it will require a BCDC permit.

Please contact me if you have any questions with regard to this letter.

Very truly yours,

Caitlin Smith

CAITLIN SMITH
Permit Analyst

cc: Resources Agency, Attn: Ken Fellows
Office of Planning and Research

CS/qjg

STATE OF CALIFORNIA—OFFICE OF THE GOVERNOR GEORGE DEUKMEJIAN, Governor

OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET
SACRAMENTO, CA 95814

DATE: June 11, 1990

TO: Reviewing Agencies

RE: University of California, Berkeley's NOP for
U.S. EPA, Region 9 Laboratory
SCH# 90030459

Attached for your comment is the university of California, Berkeley's Notice of Preparation of a draft Environmental Impact Report (EIR) for U.S. EPA, Region 9 Laboratory.

Responsible agencies must transmit their concerns and comments on the scope and content of the EIR, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of this notice. We encourage commenting agencies to respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Dale Sanders
University of California, Berkeley
Campus Planning Office
300 A&E Building
Berkleey, CA 94720

with a copy to the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the review process, call Nancy Mitchell at (916) 445-0613.

Sincerely,

David C. Nunenkamp
Deputy Director, Permit Assistance

Attachments

cc: Dale Sanders

Office of the
PLANNING DIRECTOR

City of Richmond

August 18, 1989

Ms. Neila Imlay
Jones & Stokes
1725 - 23rd Street, Ste.100
Sacramento, CA 95816

Dear Ms. Imlay:

Thank-you for the opportunity to comment on the proposed EPA Building at the UC Richmond Field Station. We appreciate having this opportunity early in the environmental assessment stage.

From our telephone conversation, it is my understanding that the proposal is for a 30,000 square feet, single story, single tenant building. There will be approximately 40 employees. The facility will have 40 parking spaces plus bicycle and motorcycle parking and space for a mobile laboratory and a trailer. The former wind tunnel building will be removed and the proposed building will be located in approximately the same location on the west side of the Field Station. Access to the site will be from Regatta Boulevard near the southeast corner of the Price Club. In the near term, the access would lead only to the EPA building and not to the rest of the Field Station.

The building will be a research facility for EPA for the testing of soil, air and water samples including samples from hazardous waste sites. Hence, there may be various types of materials in the building including hazardous materials and hazardous wastes.

Due to the general nature of the project description, the following "general" comments are offered for your information:

1. How will hazardous materials/wastes be handled, s red, disposed and transported? Detailed information should be provided, the response that all federal, state, and local regulations will be followed is not acceptable.

2. What is the maximum quantity of materials that may be on-site at any one time?

3. Is there or will there be an emergency action plan in case of accidental releases of hazardous materials/wastes?

4. What type of traffic will be generated by the facility? What impact will this traffic have at the projects road off of Regatta Boulevard?

5. The facility plans should be submitted to our Development Review Organization for review and approval. They will be concerned with the design of the building and the associated landscaping plans.

2600 Barrett Ave. P. O. Box 4046 Richmond California 94804 telephone: 415 620-6706

6. Although there is concern from the residential areas to the east and north relative to large structures being built on the shoreline, a one-story building for this site does not seem appropriate for an infill project. Due to the elevation of the site, two to three stories could easily be accommodated without impacting views from the hillside residential areas.

7. As we have commented previously in response to UC's Concept Plan for the Field Station, the City would like to see Regatta Boulevard extended through the site to the Regatta Interchange at I-580.

8. The City is aware that there may be valuable grassland and/or wetland habitat on the western portion of the UC Field Station site; will the proposed project impact these areas?

9. It is assumed that the project site is more than 100 feet from the shoreline; however, will the project affect the potential for future public access to the shoreline?

Without additional information, it is difficult to comment further on the proposed project. However, for your information, I have included a copy of the zoning regulations for the site from the MS, Special Industrial Zoning District, and copies of documents relating to the ICI Western Research Center Expansion Project. The documents are ICI's responses to questions raised by both City staff and residents about their expansion and will give you an idea of the types of issues the City is most concerned with relative to development in the area and the handling of hazardous materials/wastes.

When more information is available, we would like to meet to further discuss EPA's plans. Should you have any questions please call me at 620-6701.

Sincerely,

Nancy Kaufman

Nancy Kaufman
Principal Planner

Enclosures (3)

cc: Lawrence Moore, City Manager
Leonard Whorton, Assistant City Manager
Jim Farah, Planning Director
Patricia Shean, Economic Development Administrator

APPENDIX H

CRITICAL MOVEMENT ANALYSIS FOR THE INTERSECTION OF MEADE STREET, MEEKER AVENUE, AND THE SOUTHERN EXTENSION OF 37TH STREER

APPENDIX I. AIR TOXICS HOT SPOTS

BACKGROUND

The Bay Area Air Quality Management District (BAAQMD) requires a health risk assessment for all facilities that would emit one or more of the substances identified in the hot spots regulation (AB 2588) as being either carcinogenic or likely to cause acute or chronic health risks. A health risk assessment includes a comprehensive analysis of the dispersion of hazardous substances in the environment, the potential for human exposure, and a quantitative assessment of both individual and populationwide health risks associated with those levels of exposure (Hill pers. comm.).

The hot spots guidelines state that a screening risk assessment may be used in place of a refined risk analysis if approved by BAAQMD (AB 2588). A screening analysis requires less information than an in-depth risk assessment and is therefore easier to perform. A screening risk assessment must be reviewed by BAAQMD and by the Department of Health Services to ensure that the screening procedures do not underestimate health risks. Based on the level of risk estimated in a screening assessment, BAAQMD may require a more refined assessment of risk.

RISK ASSESSMENT

Procedures

The following screening risk assessment was performed for the proposed U. S. Environmental Protection Agency (EPA) laboratory at the University of California field station in Richmond, using the techniques recommended by the California Air Pollution Control Officers Association (CAPCOA 1990 and Interagency Working Group 1987), California Air Resources Board (1989c), and BAAQMD (Hill, Tomich pers. comms.). The

Appendix I. Air Toxics Hot Spots

Results

The maximum predicted concentrations for 1-hour (PTPLU results) and annual (PTPLU results multiplied by 0.10) averages are shown in Tables I-1 and I-2. Table I-2 also shows the excess lifetime cancer risks that would result from the EPA laboratory's emissions of methylene chloride. The excess lifetime cancer risk to the most exposed individual exceeds one in one million for methylene chloride. However, the emission rate used in PTPLU modeling was treated differently. An emission rate of 1 gram per second was modeled, and the results were scaled by each substance's actual emission rate.

Table I-1 also compares the acute and chronic health risks from EPA laboratory emissions. For each substance, the maximum predicted concentration is within acceptable exposure levels. In other words, the maximum predicted concentrations do not exceed the levels at which either acute or chronic noncancer effects would be expected in sensitive individuals.

In addition, a hazard index was used to estimate the total noncancer risks from human exposure to chronically and acutely hazardous substances. The hazard index for each substance is calculated by dividing the maximum estimated exposure of the substance by the acceptable exposure level. This ratio is summed for all substances and a sum exceeding one indicates that a potential health hazard exists.

The hazard index was calculated for both acutely and chronically hazardous substances. The results show that no potential acute or chronic health hazards would result from the EPA laboratory. Based on this screening risk assessment, a formal health risk assessment may be required because the excess cancer lifetime risk of 1.86E - 6 exceeds the allowable level of 1.00E - 6.

A second series of PTPLU runs was made to investigate possible mitigation measures for the EPA laboratory's methylene chloride emissions. These runs examined possible changes in stack height and gas exit velocity to reduce maximum predicted concentrations to levels

EPA Laboratory Risk Assessment

Source conditions:

emission rate = 1.00 g/sec
physical stack height = 10.00 m
stack gas temperature = 295.00 deg. k
stack gas velocity = 7.07 m/sec
stack diameter = 0.30 m
volume flow rate = 0.500 m^3/sec
buoyancy flux = 0.048 m^4/sec^3

Meteorological conditions:

ambient temperature = 55.00 deg. F = 285.93 deg. K
anemometer height = 10.00 m
mixing height = 5,000.00 ft. = 1524.00 m
wind profile exponents = A: 0.07, b: 0.07, C: 0.10, D: 0.15, E: 0.35, F: 0.53

Receptor data:

receptor elevation above ground level = 5.00 ft. = 1.52 m

Options used:

stack downwash
buoyancy induced dispersion
rural dispersion coefficients (Pasquill-Gifford)

Results using extrapolated winds:

Table I-2. Analysis of Concentration as a Function of Stability and Wind Speed (California Air Resources Board Modeling Section Version)

Stability	Wind Speed (m/sec)	Maximum Concentration (ug/m^3)	Distance of Maximum (km)	Effective Height (m)
A	0.50	4.9116E+002	0.114	22.7
A	0.80	4.7818E+002	0.088	18.0
A	1.00	4.5787E+002	0.080	16.4
A	1.50	4.0004E+002	0.070	14.2
A	2.00	3.4903E+002	0.064	13.2
A	2.50	3.0769E+002	0.061	12.5
A	3.00	2.7435E+002	0.059	12.1
B	0.50	5.1549E+002	0.150	22.7
B	0.80	5.1127E+002	0.118	18.0
B	1.00	4.9083E+002	0.107	16.4
B	1.50	4.3030E+002	0.092	14.2
B	2.00	3.7621E+002	0.085	13.2
B	2.50	3.3208E+002	0.081	12.5
B	3.00	2.9638E+002	0.078	12.1
B	4.00	2.4308E+002	0.074	11.6
B	5.00	2.0754E+002	0.071	11.2
C	2.00	4.0862E+002	0.124	13.2
C	2.50	3.6128E+002	0.117	12.5
C	3.00	3.2281E+002	0.113	12.1
C	4.00	2.6515E+002	0.107	11.6
C	5.00	2.2663E+002	0.103	11.2
C	7.00	1.8139E+002	0.097	10.6
C	10.00	1.3893E+002	0.092	10.2
C	12.00	1.2004E+002	0.090	10.0
C	15.00	9.9641E+001	0.088	9.8

Stability	Wind Speed (m/sec)	Maximum Concentration (ug/m^3)	Distance of Maximum (km)	Effective Height (m)
D	0.50	4.8232E+002	0.386	22.7
D	0.80	4.9499E+002	0.300	18.0
D	1.00	4.7864E+002	0.270	16.4
D	1.50	4.2425E+002	0.231	14.2
D	2.00	3.7326E+002	0.211	13.2
D	2.50	3.3082E+002	0.200	12.5
D	3.00	2.9610E+002	0.192	12.1
D	4.00	2.4377E+002	0.182	11.6
D	5.00	2.0871E+002	0.175	11.2
D	7.00	1.6755E+002	0.163	10.6
D	10.00	1.2863E+002	0.155	10.2
D	12.00	1.1125E+002	0.152	10.0
D	15.00	9.2436E+001	0.148	9.8
D	20.00	7.2057E+001	0.145	9.6
E	2.00	1.6699E+002	0.456	18.5
E	2.50	1.4374E+002	0.437	17.9
E	3.00	1.2689E+002	0.422	17.4
E	4.00	1.0382E+002	0.402	16.7
E	5.00	8.9178E+001	0.388	16.2
F	2.00	1.8205E+002	0.700	17.1
F	2.50	1.5550E+002	0.693	16.5
F	3.00	1.3632E+002	0.673	16.2
F	4.00	1.1035E+002	0.644	15.6
F	5.00	9.4083E+001	0.621	15.1

that would lower health risks below the individual excess cancer significance level of one in one million. The results showed that either stack heights would have to be raised from 10 to 20 meters or stack gas exit velocity would have to be increased from 7.07 to 14 meters per second. Under either of these scenarios, the significance level drops to less than one in one million, as shown in Tables I-3 and I-4.

California Air Resources Board 1989c

CAPCOA 1990

Hill, Steve

Interagency Working Group 1987

Johnson, James

Table I-3. EPA Lab Screening Risk Assessment Results Assuming Stack Height of 20 Feet

Substance	Maximum Emission Rate Grams/Second	Average Emission Rate Grams/Second	1-Hour Maximum Predicted Concentration Grams/Second	Acute AEL's ug/m^3	Annual Average Predicted Conc. Grams/Second	Chronic AEL's ug/m^3	Unit Risk Factor	Individual Excess Cancer Risk	Chronic Risk Hazard Index	Acute Risk Hazard Index
Hydrochloric acid	2.36E-03	1.63E-03	5.84E-01	3.00E+03	4.02E-02	7.00E+00	N/A	N/A	5.75E-03	1.95E-04
Methanol	3.47E-03	8.20E-03	8.56E-01	N/A	2.02E-01	6.20E+02	N/A	N/A	3.26E-04	N/A
Methylene chloride	3.59E-02	3.60E-02	8.87E+00	3.50E+03	8.88E-01	3.00E+03	1.00E-06	8.88E-07	2.96E-04	2.53E-03
PTPLU maximum 1-hour concentration		2.47E+02							6.37E-03	2.72E-03

ESTIMATED DAILY ENERGY CONSUMPTION
ENVIRONMENTAL PROTECTION AGENCY LABORATORY
RICHMOND, CALIFORNIA

EQUIPMENT NUMBER	QTY	ELECTRICAL LOAD 480V/3PH HP	ELECTRICAL LOAD 480V/3PH KW	ELECTRICAL LOAD 120V/1PH HP	ELECTRICAL LOAD 120V/1PH KW	NAT. GAS MBH
1	1	15.00	9.759			
2	1	7.50	7.460			
3	2	15.00	19.517			
4	1	20.00	8.575			
5a	1	2.00	1.381			
5b	1			0.5	0.400	
6a	2	3.00	2.763			
6b	2			0.5	0.799	
7a	2	3.00	2.763			
7b	2			0.5	0.799	
8a	3	3.00	4.144			
8b	3			0.5	1.199	
9a			1.000			
9b	1			0.25	0.219	
10	4			0.33	0.754	
11	1			0.25	0.146	
12	1			0.25	0.146	
13	1			0.25	0.146	
14	4			0.25	0.583	
15	1			0.25	0.146	
16	1	1.50	0.691			
17	1			0.50	0.301	
18	1	1.00		0.25	0.146	
19	1		280.000			
20	1					90000.00
21	2	7.50	6.582			
22	2	1.00	0.944			
23	8	1.8amp	6.912			
24	4			2amps	0.96	
25	1	5.00	2.274			
26	2	2.00	1.865			
27	2	10.00	13.165			
28	1	1.00	0.708			
29	1	1.00	0.472			
30	1	1.00	0.472			
31	1	1.00	0.472			
32	10	2.00	9.325			
33	1			0.33	0.188	
34	1	1.00	0.472			
35	1	1.00	0.472			
36	1			1.00	0.472	
37	1			1.00	0.472	

38	1			1.00	0.472		
39	1			1.00	0.472		
40	1			1.00	0.472		
41	4			1.00	1.889		
42	1			1.00	0.472		
43	1			1.00	0.472		
44	1			1.00	0.472		
45	2			1.00	0.944		
46	1			1.00	0.472		
47	1			1.00	0.472		
48	2			1.00	0.944		
49	2			1.00	0.944		
50	2			1.00	0.944		
51	1			1.00	0.472		
52	1			1.00	0.472		
53	3			1.00	1.416		
54	1			1.00	0.472		
55	1			1.00	0.472		
56	1			1.00	0.472		
57a	1			14.1FL	1.692		
57b	1			21.4FL	2.532		
58a	1			14.1FL	1.692		
58b	1			21.4FL	2.532		
59a	1			14.1FL	1.692		
59b	1			21.4FL	2.532		
60a	1			14.1FL	1.692		
60b	1			21.4FL	2.532		
61a	1			14.1FL	1.692		
61b	1			21.4FL	2.532		
62a	1			14.1FL	1.692		
62b	1			21.4FL	2.532		
63a	1			14.1FL	1.692		
63b	1			21.4FL	2.532		
64	1	15.00	6.506				
65	1			1.00	0.472		
66	1			1.00	0.472		
67	1			0.33	0.187		
68	2	2.00	1.865				

EQUIPMENT NUMBER	QTY	ELECTRICAL LOAD 480V/3PH HP	KW	HP	KW	NAT. GAS MBH
TOTAL			390.561		51.793	90042.21

LIGHTING: 43245 SQ. FT. X .0015KW = 64.87 KW

LIGHT EQUIPMENT (i.e. computers): 43245 SQ. FT. X .0005KW = 21.63 KW

TOTAL KW: 528.8541
TOTAL MBH: 90042.21

Note: KW/day calculated as follows:
(HP/fan motor efficiency factor)*(.746)*(estimated duty factor)

Source: 1) fan motor efficiency standard:
American Society of Heating, Refrigerating, and Air-Conditioning Engineers, 1985

2) Lighting:
California Energy Commission, 1988

3) Light equipment:
Makela pers. comm.

APPENDIX L

EPA STATEMENT OF PROJECT REQUIREMENTS

SECTION 1

SITE REQUIREMENTS

SECTION 1

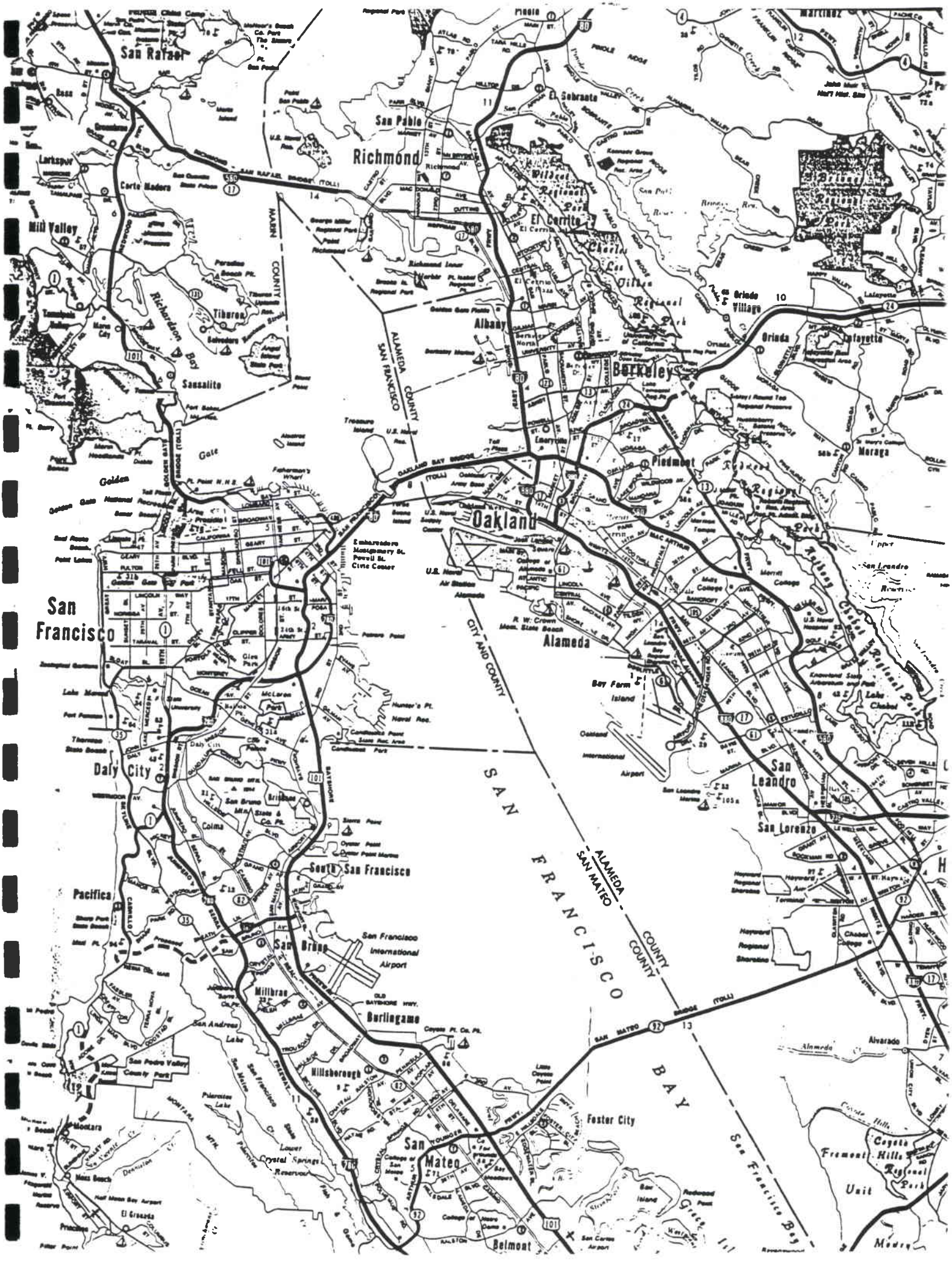
SITE REQUIREMENTS

1.1 SITE

1.1.1 This project shall provide a complete facility to serve the Environmental Protection Agency (EPA) Central Regional Laboratory. The building(s), related facilities, and all operating services described herein will be provided by the successful offeror (lessor). All monthly utility costs will be paid by the Government.

1.1.2 The facility will be within the city limits of either San Francisco, South San Francisco, Millbrae, San Mateo, Richmond, El Cerrito, San Bruno, Albany, Oakland, Alameda, Emeryville, Berkeley, San Leandro, San Lorenzo, or Hayward. The location of the areas to be considered is further described herein and on the attached map.

LOCATION: The entire area from and including the City of San Francisco to the San Mateo Bridge, with easy access to Highway 101, and the East Bay Area from and including the City of Richmond to the San Mateo Bridge with easy access to Highways 880, 80 and 580.


San Rafael
Larkspur
Corte Madera
Mill Valley
Richmond
San Pablo
El Sobrante
Pinole
Martinez
Wildcat Regional Park
El Cerrito
Tiburon
Belvedere
Sausalite
Richardson Bay
Marin County
Alameda County
San Francisco County
Albany
Berkeley
Emeryville
Piedmont
Oakland
Orinda
Lafayette
Moraga
Briones Regional Park
Golden Gate
Golden Gate National Recreation Area
San Francisco
Embarcadero
Montgomery St.
Powell St.
Civic Center
Alameda
U.S. Naval Air Station Alameda
Bay Farm Island
Oakland International Airport
San Leandro
San Lorenzo
Lake Chabot
Daly City
Colma
South San Francisco
Pacifica
San Bruno
San Francisco International Airport
Millbrae
Burlingame
San Mateo
Foster City
Belmont
San Carlos Airport
Alvarado
Coyote Hills Regional Park
Fremont
San Francisco Bay
Alameda - San Mateo County
San Mateo Bridge (Toll)
Oakland Bay Bridge (Toll)
Golden Gate Bridge (Toll)
San Rafael Bridge (Toll)

SECTION 2

GENERAL FACILITY REQUIREMENTS

2.1 Scope of Project

2.2 Handicapped Accessibility

2.3 Building Materials/Furnishings Selection and Installation

SECTION 2

GENERAL FACILITY REQUIREMENTS

2.1 SCOPE OF PROJECT

2.1.1 The facility will consist of approximately 30,000 (plus or minus 5%) Net Usable Square Feet (Defined in Section 9.2, page 78) of space plus appurtenant land with all features and performance (materials, equipment, appliances, installations, and methods of construction) as required by this Solicitation, but in no event less than requirements of codes, ordinances, regulatory agencies and local laws having legal jurisdiction. The more stringent requirements of any shall govern except where requirements herein are more stringent.

A partial listing of codes and regulatory standards as would apply to private enterprise-owned, operated, and occupied buildings used for the same class as that intended by the Government are as follows (and further contained in Section 7, Paragraph 7.10):

(1) Code for Life Safety From Fire in Buildings and Structures NFPA 101

(2) National Fire Protection Association Standards (e.g., NFPA-30 & 91, etc.)

(3) Fire Protection for Laboratories Using Chemicals - NFPA 45

(4) Uniform Building Code

(5) Uniform Plumbing Code

(6) National Electrical Code

(7) U.S. Department of Labor-Occupational Safety and Health Standards (OSHA)

(8) EPA Facilities Safety Manual - 4870-1

(9) ASHRAE 90-80 (or latest version) Energy Conservation in New Building Design

(10) 40 CFR, Part 262, 264, 265, and 281

(11) EPA Health and Safety Manual (Chapter 8)

(12) ASHRAE Standards/Data Books

(13) ANSI - American National Standard Institute

(14) Uniform Federal Accessbility Standards (1984) adopted by GSA in 41 CFR 101-19.6.

The latest edition of the codes/standards and all amendments thereto, applicable at the date this Solicitation is issued, are to be used. In the event of conflict, the Government will make the final decision on the interpretation of all codes.

In addition to the above, the facility shall conform with any and all other specifications which may be required or stated hereafter within specific sections of this Solicitation.

2.1.2 The solicited space is required in a single story building for single user occupancy by EPA.

2.1.3 The building and all systems shall be functional, incorporating state-of-the-art design, aesthetically comparable (design and finish materials) to structures surrounding it, and of permanent non-combustible construction. (Pre-engineered metal buildings <u>will</u> <u>not</u> receive consideration).

2.1.4 If the facility offered for lease consists of more than one building, the buildings shall be connected by an enclosed, lighted, heated, and air conditioned corridor(s).

2.1.5 The building offered for lease and all its construction features (materials, methods, and installation - including mechanical and electrical) shall provide concepts that will reflect reduced energy consumption. See Section 5.16 for Energy Conservation Design Features. All monthly utility costs will be paid by the Government. See Section 9.12.

2.1.6 Paved parking for 40 vehicles shall be provided <u>plus</u> a paved area of approximately 40 feet by 50 feet to accommodate three (3) mobile laboratories, a van and a laboratory trailer. Five (5) of the 40 spaces are for official vehicles and shall be in a secured area preferably in the rear of the facility. Additionally, parking for bicycles and motorcycles shall be provided.

2.1.7 An additional building of approximately 840 NUSF is also required. It will be located within the secured area mentioned above and will be used as a Hazardous Materials Storage Facility (HMSF). 2.1.4 does not apply to the HMSF.

2.2 <u>HANDICAPPED ACCESSIBILITY</u>

2.2.1 Design and layout of the facility must be accessible by the physically handicapped in accordance with the Uniform Federal Accessibility Standards (1984) adopted by GSA in 41 CFR 101-19.6.

2.3 BUILDING MATERIALS/FURNISHINGS SELECTION AND INSTALLATION

2.3.1 Materials employed in the construction of the building can have significant impacts on indoor air quality. Many chemicals are known emitters of toxic or irritating chemicals. Lessor shall evaluate and carefully select materials to avoid any unnecessary, costly, and troublesome contamination of indoor air.

2.3.2 Many newly manufactured building materials and furnishings emit a major portion of their lifetime chemical emissions during the first few hours, days, or weeks they are exposed to the environment. Air circulation at their surfaces is critical to the release of chemicals. Elevated temperature, humidity, and exposure to ultra-violet light can also accelerate off-gassing. To reduce the quantity of chemicals emitted into building air, the lessor shall expose materials and furnishings to environmental conditions prior to their loading into the building.

SECTION 3

GUIDANCE FOR FACILITY DESIGN & LAYOUT

3.1 General Space Provision
3.2 Space Identification
3.3 Specific Room Requirements
3.4 Guidance for Architectural Layout

SECTION 3

GENERAL GUIDANCE FOR FACILITY DESIGN AND LAYOUT

3.1 GENERAL PROVISIONS

3.1.1 Since this Solicitation must apply to appropriate existing buildings as well as any possible new construction, the EPA can only present the space requirements, identify the space and give general guidance in its actual layout. Space identification and size will be shown in this section as well as guidance for the actual architectural layout of the building. The Offeror must produce the final building layout in accordance with the guidance.

3.1.2 Due to the ever changing needs and missions of the Region IX Central Regional Laboratory, modular design for the entire facility is desirable. However, it is mandatory that the technical wing (Block C) be of modular design. This type of design will provide optimum flexibility and allow sufficient capability for future modifications of space arrangements. The space sizes shown in this Solicitation are based upon a modular laboratory design that uses 12 x 24 (288 square feet) as the basis for the single module and 20 x 24 (480 square feet), 30 x 24 (720 square feet), 40 x 24 (960 square feet), and 50 x 24 (1200 square feet) for a two, three, four, and five module set respectively. While these module dimensions are recommended, some variations in dimensions are acceptable if the spaces remain functional.

3.1.3 The related utilities and support services and heating ventilation, air conditioning, plumbing, and electrical systems shall allow expansion or contraction in the services provided. The utilities and support services location and size of lines, method of connection and valving shall be such as to minimize interruption of service, and to maximize accessibility of systems to the space they service, and to allow the maintenance personnel to easily access the system for service and repair of each module without disrupting services in other modules.

3.2 SPACE IDENTIFICATION

3.2.1 The facility will subdivide into the following blocks of space shown in net usable square feet (NUSF):

(a) Block A is administrative office space which shall house the Administrative Section which consists of 8 people. Block A is to be 1080 NUSF.

(b) Block B is administrative support space and is 3264 NUSF.

(c) Block C is laboratory space and is 13,488 NUSF.

(d) Block D is laboratory office space which shall house the scientists and technicians. The space consists of 3375 NUSF.

(e) Block E is laboratory support space and is 2040 NUSF.

(f) Block F is general storage, field storage, workshop, staging and field calibration space and is 5880 NUSF.

(g) Block G is the Hazardous Material Storage Facility (HMSF) and is 840 NUSF.

The total of all of these blocks of space is 29,967 NUSF which indicates the size of the facility exclusive of toilets, corridors, stairwells, mechanical and electrical rooms, etc.

3.2.2 BLOCK A - 1080 NUSF

3.2.2.1 Administrative office space for 8 people must be provided as follows:

1 Laboratory Chief	135 NUSF
1 Health/Safety, Env. Compliance Officer	135 " "
2 Administrative Officer & Tech.	270 " "
1 Receptionist/Secretary	135 " "
2 AARP	270 " "
1 SIS	135 " "
	1080 NUSF

3.2.3 BLOCK B - 3264 NUSF

3.2.3.1 The following administrative support space must be provided:

Smoking Room	150 NUSF
Library	400 " "
Conference Room	720 " "
Lunch room	288 " "
Computer Room	300 " "
Audio/Visual Equipment Storage Room	288 " "
Office Supply, Copy and Mail Room	480 " "
File Storage Room	288 " "
First Aid Room	150 " "
Lobby/Reception Area	200 " "
	3264 NUSF

3.2.4 BLOCK C - 13,488 NUSF

3.2.4.1 Laboratory space must be provided for the following sections as shown:

(a) Organic Chemistry Section

GC Laboratory	720 NUSF
VOA GC/MS Laboratory	720 " "
ABN GC/MS Laboratory 1	720 " "

ABN GC/MS Laboratory 2 (Special Studies)	720 " "
Organic Extraction Lab 1	720 " "
Organic Extraction Lab 2	480 " "
Low-level Sample Prep Room	288 " "
Partial Containment Lab	480 " "
	4848 NUSF

(b) Inorganic Chemistry Section

Inorganics Laboratory 1	480 NUSF
Inorganics Laboratory 2	480 " "
Extraction Laboratory	960 " "
Trace Metals Laboratory	720 " "
ICP Laboratory	480 " "
ICP/MS Laboratory	480 " "
X-Ray Fluorescence Laboratory	480 " "
Radiochemistry Laboratory	288 " "
Radiochemistry Counting Room	288 " "
	4656 NUSF

(c) Biology/Microbiology Section

Bioassay Lab w/ Environmental Rooms (25°C, 20°C, and 12°C)	1440 NUSF
Microbiology Laboratory	288 " "
Media Preparation Room	288 " "
Virology/Parasitology Lab	480 " "
Asbestos/Electron Microscopy	288 " "
General Biology Laboratory	480 " "
	3264 NUSF

(d) Air Monitoring & Field Calibration Section

Calibration & Testing Room	720 NUSF

3.2.5 BLOCK D - 3375 NUSF

3.2.5.1 Laboratory office space shall be provided for 25 laboratory personnel as follows:

(a) Chemistry

1 Chemist/Team Leader	135 NUSF
3 Analytical Chemists	405 " "
2 Chemists	270 " "
1 Laboratory Technician	135 " "
1 Electronics Engineer	135 " "
	1080 NUSF

(b) Biology

2 Aquatic Biologists	270 NUSF
1 Microbiologist	135 " "
1 Marine Biologist	135 " "
1 Life Scientist	135 " "
	675 NUSF

(c) Environmental Services Assistance Team (ESAT)

1 Chemist/Team Leader	135 NUSF
6 Analytical Chemists	810 " "
2 Chemists	270 " "
2 Laboratory Technicians	270 " "
1 Data Compiler	135 " "
	1620 NUSF

3.2.6 BLOCK E - 2040 NUSF

3.2.6.1 Laboratory Support Space must be provided as follows:

Glassware Preparation	720 NUSF
Uninterruptable Power Supply System & Main Power Distribution Room (UPS/MPD)	600 " "
Sample Receiving & Log-in Room (includes cold storage rooms)	720 " "
	2040 NUSF

3.2.7 BLOCK F - 5880 NUSF

3.2.7.1 General type storage for laboratory areas must be provided as follows:

General Storage	3600 NUSF
Loading Dock	600 " "
Workshop	480 " "
Field Equipment Storage, Clean-up and Calibration Rooms	1200 " "
	5880 NUSF

3.2.8 BLOCK G - 840 NUSF

3.2.8.1 A separate Hazardous Material Storage Facility (HMSF) shall be provided.

3.3 SPECIFIC ROOM REQUIREMENTS

3.3.1 The Room Data Sheets for specific rooms are shown in the Appendices A, B, C and D. These Room Data Sheets indicate specific room/laboratory requirements as well as preferred floor plans with regard to installed equipment. Any areas not detailed have no specific requirements and therefore the final layouts will be the responsibility of the Offeror with approval by the EPA for definitions of standard requirements, symbols, and abbreviations used in Room Data Sheets, refer to Appendix H.

3.3.2 In addition to other requirements called for in the various sections of the solicitation, a listing of typical standard requirements symbols and abbreviation indicated on the Room Data Sheets are further defined in Appendix H.

3.3.3 Architectural requirements specified as standard requirements in the Room Data Sheets call for chemical resistant vinyl tile floors, 1/8 inch thick, as manufactured by Flexco or approved equal with vinyl or rubber bases, and masonry or gypsum wall board insulated partitions extending from the floor to underneath the ceiling slab. Wall surfaces shall be painted with semi-gloss or glossy rubber based paint. Ceilings may be either plastered (gypsum wall board or concrete) or suspended acoustical tiles. Ceilings height in laboratory space (Block C) shall be 9 feet 6 inches. The above shall be in accordance with the required code and conform with other specifications in this Solicitation.

3.3.4 The List of Special Equipment provided on the Room Data Sheets is to assist the offeror in determining required electrical usage, HVAC thermal loads, plumbing, special gases, and other utility connections. All equipment will be furnished by the EPA. The exceptions are in the Sample Receiving and Log-in Room and the Bioassay Laboratory where the List of Special Equipment describes cold storage rooms which are to be furnished by the successful offeror.

3.4 GENERAL GUIDANCE FOR ARCHITECTURAL LAYOUT

3.4.1 The interior of the facility shall group Blocks A & B together and physically separate them with a (minimum) two hour fire wall from Blocks C, D, & E. In addition, the mechanical room, smoking room and Partial Containment Laboratory shall each be separated from adjacent spaces with appropriate or code required fire separation.

3.4.2 The basic concept will be to separate the administrative functions from the technical functions.

3.4.3 Block F shall be adjacent to the technical area and be physically separated with 2 hour rated fire separation.

3.4.4 The buffer zone distance required between any of the EPA buildings in this facility and other building, existing or potential, shall be 100 feet. Existing highways or streets can be part of the 100 foot buffer zone. The HMSF shall be at least 50 feet from the main facility. Both the main facility and the HMSF shall be at least 50 feet from the property line. The paved parking area for vehicles can be considered as part of the building buffer zone.

3.4.5 Within the technical area (Blocks C, D, & E) all laboratories within an individual section must be grouped together with doors from the laboratories swinging outward in the direction of egress. All laboratory office space must be in close proximity to its related laboratory and window exposure for offices shall be maximized.

3.4.6 Special attention must be given to grouping of fume hood exhaust fans in relationship to air handling unit(s) intakes so as to avoid cross contamination. The same applies to the cooling tower(s) (if applicable) and the emergency generator exhaust.

3.4.7 The rear of the facility shall be paved and enclosed with a security enclosure (chain-link fence) with card key operated rolling gate to protect government vehicles (2 vans, 3 mobil labs, 2 sedans), the HMSF, and other items that will require security.

3.4.8 Block E - Lab Support Space shall be grouped together to the rear of the facility and be adjacent to Block F and the technical space.

3.4.9 Refer to Appendix E EPA Facilities Safety Manual for more information.

APPENDIX M

RESEARCH CENTER PRELIMINARY MASTER PLAN

UNIVERSITY OF CALIFORNIA AT BERKELEY

RESEARCH CENTER

FEASIBILITY STUDY

MARKET STUDY, FINANCIAL ANALYSIS AND PRELIMINARY MASTER PLAN

PREPARED BY:

WALLACE ROBERTS & TODD

KPMG PEAT MARWICK

CHEMICAL SECURITIES, INC.

BECHTEL CIVIL, INC.

UNDER THE GUIDANCE OF:

THE FACULTY - ADMINISTRATION COMMITTEE ON RESEARCH CENTER DEVELOPMENT

MARCH 1990

M

APPENDIX N

ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED EPA, REGION IX LABORATORY AT THE UNIVERSITY OF CALIFORNIA'S RICHMOND FIELD STATION

ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED EPA REGION 9 LABORATORY AT THE UNIVERSITY OF CALIFORNIA'S RICHMOND FIELD STATION

U. S. Environmental Protection Agency
Region 9
215 Fremont Street
San Francisco, CA 94105

Technical Assistance by:

Jones & Stokes Associates, Inc.
2600 V Street, Suite 100
Sacramento, CA 95818-1914
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September 1990

N

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CHAPTER 1. Introduction

PURPOSE AND REQUIREMENTS OF THE ENVIRONMENTAL ASSESSMENT

This environmental assessment (EA) has been prepared for the U. S. Environmental Protection Agency (EPA) to assess impacts associated with the construction of an EPA regional laboratory at the University of California Richmond Field Station. The facility would provide laboratory support for all of Region 9's environmental programs. The facility would include a single-occupant office and laboratory building with approximately 30,000 net usable square feet (nusf), a hazardous materials storage building, and parking for 40 vehicles. A mobile laboratory and other support vehicles would be located at the site.

The purpose of this EA is to determine whether the construction of the EPA Region 9 laboratory at the field station is a major federal action that could significantly affect the environment, in which case a full environmental impact statement (EIS) would be prepared and distributed for public review and comment. If no such determination is made, a finding of no significant impact (FONSI) may be prepared. This EA has been prepared pursuant to the National Environmental Policy Act (NEPA), the regulations of the Council on Environmental Quality (40 CFR Part 1500 et seq.), and the EPA NEPA regulations (40 CFR Part 6).

The EA is a public document used to analyze the environmental effects of a proposed project, indicate possible ways to reduce or avoid the possible environmental damage, and to identify alternatives to the project. The EA discloses significant environmental impacts, growth-inducing impacts, effects found not to be significant, and significant cumulative impacts of all past, present, and reasonably anticipated future projects.

Prior to construction of the EPA laboratory, a project-specific environmental impact report (EIR) must be prepared by the University of California to assess the environmental impacts pursuant to the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 et seq.). Approval or rejection of the project EIR would be determined by the Regents of the University of California. CEQA requires that all state and local government agencies consider the environmental consequences of projects over which they have discretionary authority. Approval and construction of the EPA laboratory project constitutes a project under CEQA.

SCOPE OF THE ENVIRONMENTAL ASSESSMENT

The EA contains 10 chapters and one technical appendix. The EA addresses land use and policy issues, public utilities and services, hazardous materials, circulation, air quality, noise, biotic resources, geology and soils, and cultural resources.

LEVELS OF SIGNIFICANCE

The EA uses the following five definitions for levels of significance for impacts.

- A "less-than-significant" impact would result in no substantial adverse change in the environment and would not require mitigation, although mitigation measures may be applied as deemed suitable.

- A "potentially significant" impact may or may not result in a substantial adverse change in the environment. It is equivalent to a "significant" impact but is used to demonstrate uncertainty. The potentially significant designation is used in two circumstances: 1) when it is unknown if an impact will occur and 2) when an impact can have a variable affect that is unknown. A potentially significant impact must be mitigable to a less-than-significant level.

- A "significant" impact is one that would result in a substantial adverse effect on the environment and that must be mitigable to a less-than-significant level.

- A "significant and unavoidable" impact is one that would result in a substantial adverse effect on the environment and for which no mitigation is available to reduce the impact to a less-than-significant level.

- A "beneficial" impact is one that would result in a beneficial effect on the environment.

ACRONYMS AND ABBREVIATIONS

The following acronyms and abbreviations are used in this report.

AB	Assembly bill
AC	Alameda County
BAAQMB	Bay Area Air Quality Management District
CAA	Clean Air Act
Caltrans	California Department of Transportation
ARB	California Air Resources Board

CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CNEL	community noise equivalent level
CO	carbon monoxide
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel scale
DOT	U. S. Department of Transportation
EA	environmental assessment
EBMUD	East Bay Municipal Utility District
EIR	environmental impact report
EIS	environmental impact statement
EPA	U. S. Environmental Protection Agency
FONSI	finding of no significant impact
Kv	kilovolt
Ldn	day-night average sound level
Leq	equivalent noise levels
LI/R & D	light industry/research and development
MGD	million gallons per day
M-S	special industrial district
NEPA	National Environmental Policy Act
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NPDES	National Pollution Discharge Elimination System
nusf	net usable square feet
PCB	polychlorinated biphenyls
pers. comm.	personal communication
PG&E	Pacific Gas and Electric Company
psi	pounds per square inch
QAPP	quality assurance program plan
RAS	routine analytical service
RCRA	Resource Conservation and Recovery Act
RFD	City of Richmond Fire Department
RFS	University of California Richmond Field Station
RPD	City of Richmond Police Department
SAS	special analytical service
SCDS	Shoreline Conservation and Development Plan
SOW	statement of work
TSCA	Toxic Substances Control Act
TTLC	total threshold limit concentration
V/C	volume to capacity ratio

CHAPTER 2. Project Description and Background

PROJECT LOCATION AND SITE DESCRIPTION

Location

The proposed project site is located within the University of California Richmond Field Station in the City of Richmond in southern Contra Costa County (Figures 2-1 and 2-2). The field station is approximately 8.5 miles northeast of San Francisco and 4 miles northwest of the main Berkeley campus on the north shore of the San Francisco Bay. The field station is bordered by Regatta Boulevard (previously South 32nd Street) to the west; Regatta Boulevard, Seaver Avenue, and Meade Street to the north; and South 46th Street to the east. The project site is located at the northeast intersection of Avocet Way and Heron Drive.

Site Access

The University of California intends to use the field station's main gate at South 46th Street and Regatta Boulevard for access to the EPA laboratory. The facility's driveway would be located on Avocet Way. The university may consider providing multiple access points to the field station allowing users of the EPA laboratory to reach the site via Regatta Boulevard and Lark Drive (the westernmost stretch is also known as Griffin Avenue). These entrances are part of the field station's master plan.

Lark Drive currently deadends 120 feet east of Regatta Boulevard on the field station, but is proposed to be extended to Regatta Boulevard as a part of the field station's master plan. User access to the laboratory would be via Regatta Boulevard near the Price Club and Bio Rad Laboratories at a location identified by the university as "Gate 7."

Facility Description

The project site extends 490 feet along Heron Drive and 330 feet along Avocet Way (Figure 2-3). It encompasses 3.17 acres. Improvements to the site would include construction of the laboratory, a hazardous materials storage structure, a boiler building, waste treatment and holding tanks, secured parking for EPA vehicles, and 38 parking spaces

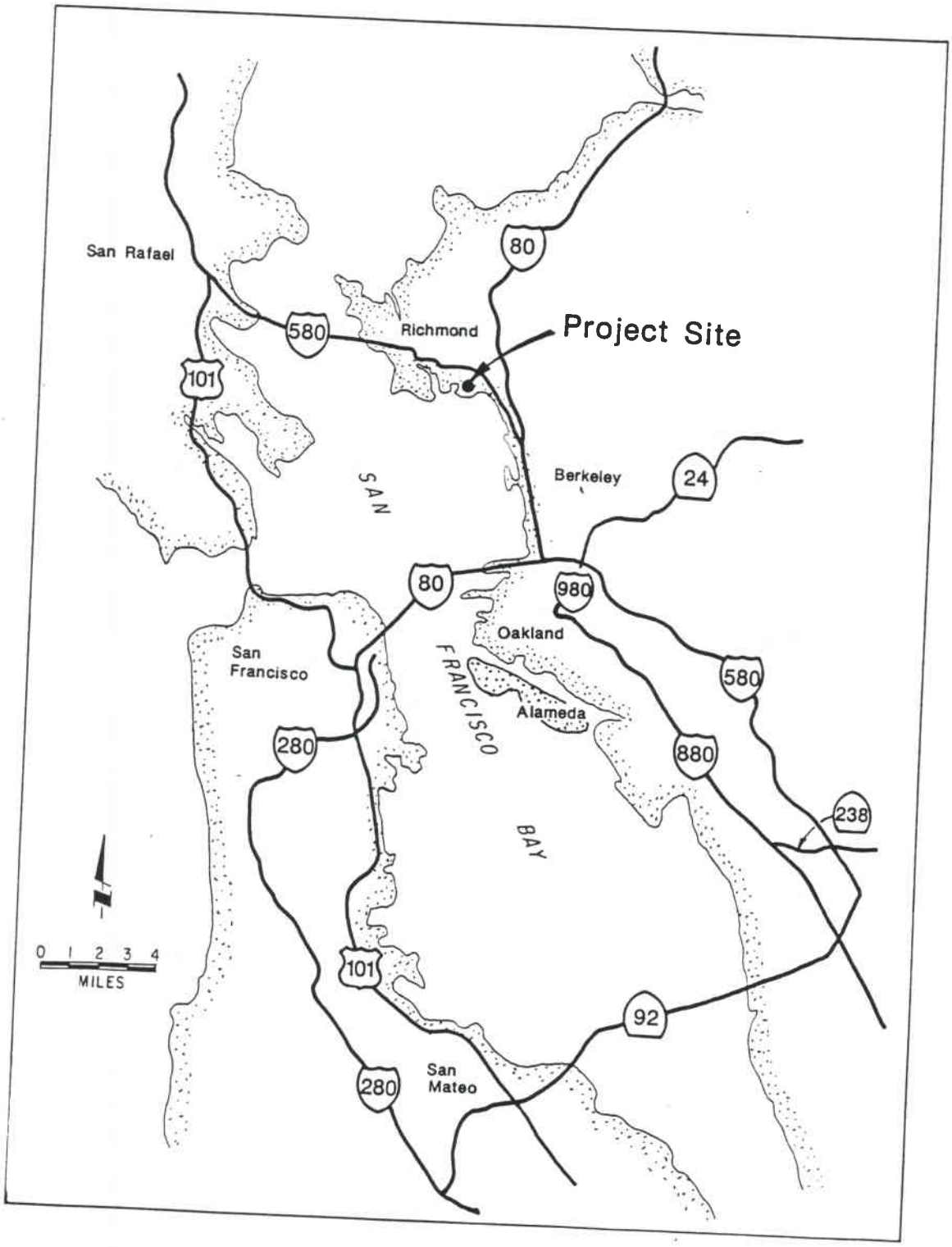


FIGURE 2-1. REGIONAL LOCATION OF THE UNIVERSITY OF CALIFORNIA RICHMOND FIELD STATION

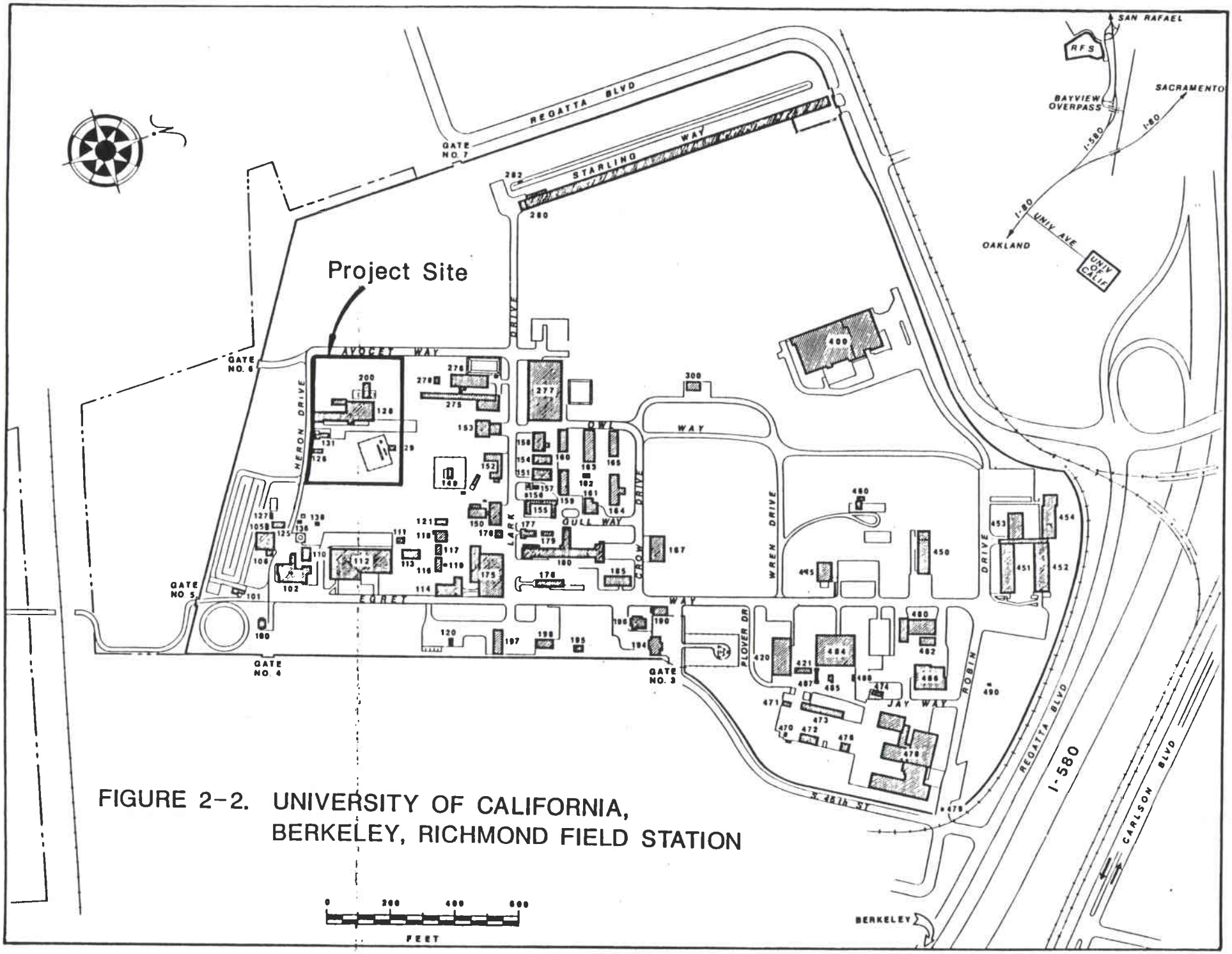


FIGURE 2-2. UNIVERSITY OF CALIFORNIA, BERKELEY, RICHMOND FIELD STATION

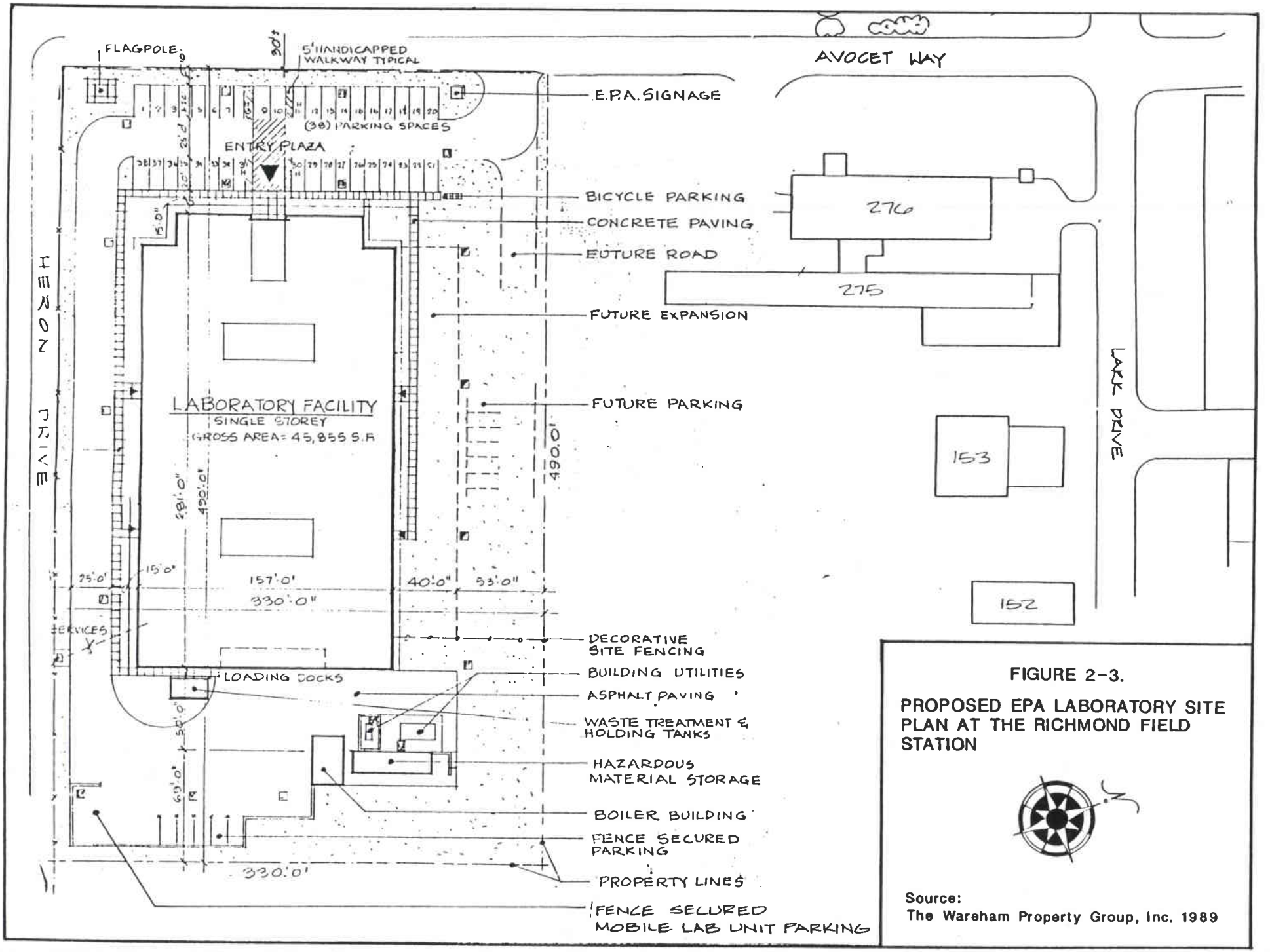


FIGURE 2-3.

PROPOSED EPA LABORATORY SITE PLAN AT THE RICHMOND FIELD STATION

Source:
The Wareham Property Group, Inc. 1989

for 25 staff and visitors. The EPA laboratory would consist of a single story building with 45,855 gross square feet. The east side of the site would be reserved to accommodate a future 25-percent expansion of laboratory operations and future parking.

U. S. ENVIRONMENTAL PROTECTION AGENCY DEVELOPMENT PROCESS

Consolidation of Regional Laboratory Operations

This project would provide a complete laboratory facility in one central location to serve the EPA's (Region 9) regional laboratory needs. The EPA, Region 9, presently operates a laboratory in Las Vegas, Nevada. The EPA also has a field staging area in Alameda, California. The EPA intends to consolidate these operations to create a more efficient and centralized operation. The field station is being considered as a site for the consolidation.

Bidding and Site Selection Process

The EPA's quest for a laboratory site began in 1989, when it released the program of requirements or specifications for the bidding process, construction requirements, space needs, and standards. The EPA held a preproposal workshop where the program of requirements was distributed and questions by prospective developers were responded to. Roughly 15 firms attended the prebid meeting, but only two groups submitted bids on the project.

The EPA provided the following site criteria and thereby narrowed the site selection process.

- The facility must be within the area from and including the City of San Francisco to the San Mateo Bridge, with easy access to Highway 101, and the East Bay Area from and including the City of Richmond to the San Mateo Bridge, with easy access to Interstate Highways 80, 880, and 580. Suitable cities include Albany, Alameda, Berkeley, El Cerrito, Emeryville, Hayward, Millbrae, Oakland, Richmond, San Bruno, San Francisco, San Leandro, San Lorenzo, San Mateo, or South San Francisco.

- The site shall be directly accessible to major transportation facilities.

- The site shall be in an area that is reasonably free from organic and inorganic chemical fumes to avoid contamination of the facility's chemical analysis

- analysis of extractable organics;
- preparation of fish samples for priority pollutant analysis;
- analysis of fluorides, sulfides, and cyanides;
- analysis of water, wastewater, and soil samples, including pH and conductivity testing; testing for the presence of chloride and phosphates; photometric measurements; and electrometric measurements;
- digestion of inorganic samples, such as mercury, on hot plates;
- radiochemical analysis of water, soil, and sewage samples;
- bioassay of fish, invertebrates, and plants;
- microbiological testing for pathogenic organisms such as salmonella, shigella, and giardia;
- bacteriology, parasitology, and virology testing using commercially prepared, dehydrated media;
- analysis of samples potentially containing asbestos using transmission electron microscopy and polarized light microscopy; and
- calibration of state and local ozone photometers.

CHAPTER 3. Land Use and Policy Issues

AFFECTED ENVIRONMENT

Regional Land Use

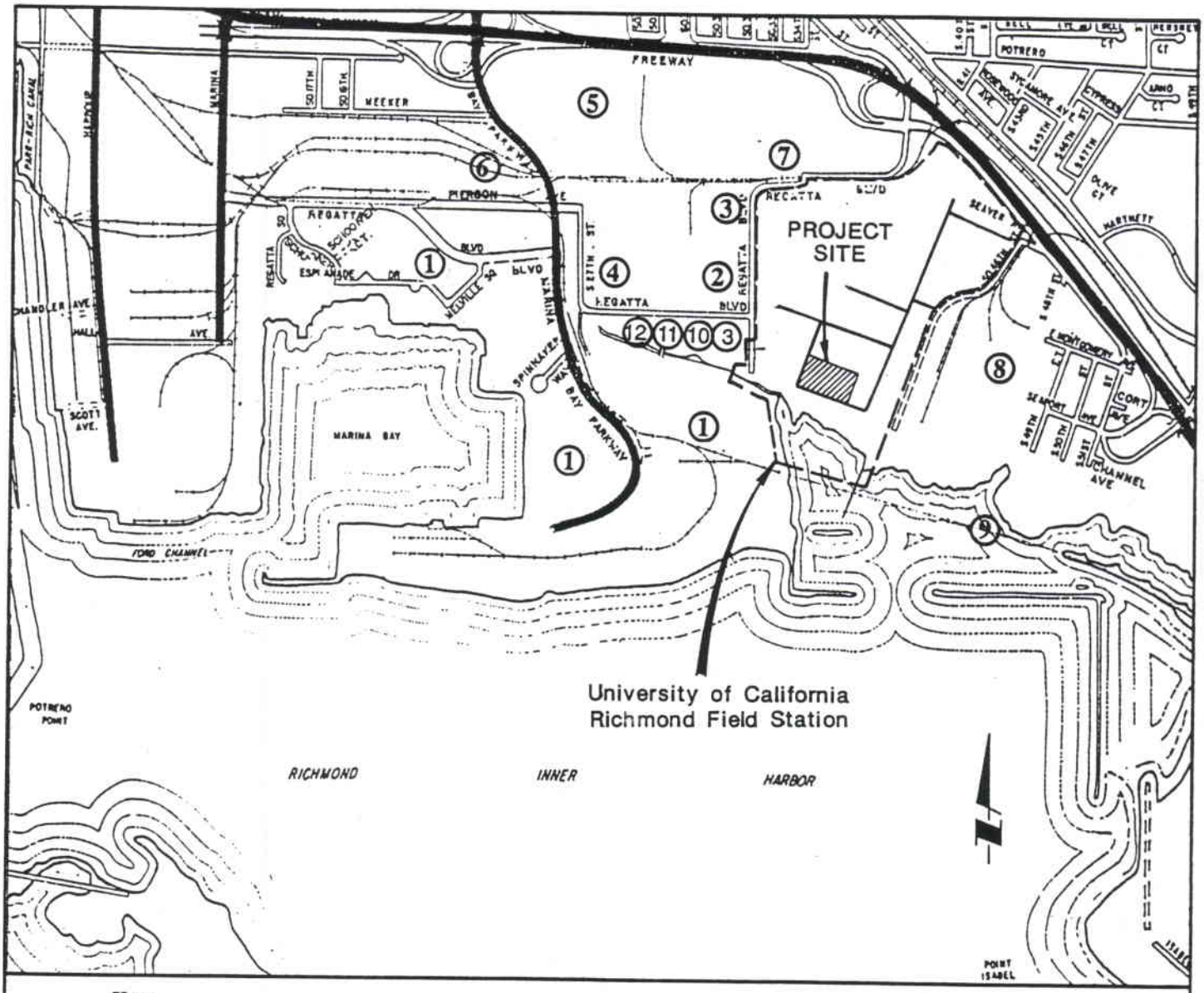
The University of California field station is located in the south part of the City of Richmond on the shore of the Richmond Inner Harbor in Contra Costa County. Richmond is bordered by El Cerrito and Albany to the southeast and east, El Sobrante and Pinole to the north and east, Point Richmond to the west, and the San Francisco Bay to the south (Figure 2-1).

Local Land Use

The project site is located in an area dominated by industrial land uses located south of Interstate Highway 580 (I-580; also known as the John T. Knox Freeway). The area was formerly developed with heavy industrial land uses but these have been replaced over the past several years by commercial, residential, and light industrial land uses. The recent extension of I-580 through this area has been a partial catalyst for the changes in land use.

Surrounding industrial, research and development, and warehousing land uses include Bio Rad Laboratories, Chemical Division, the Safeway distribution center, Imperial Chemicals Industry of America, Inc. (ICI; an agricultural chemical laboratory and manufacturing facility), and a California Department of Transportation (Caltrans) equipment storage yard (Figure 3-1). ICI is in the process of converting the old Stauffer chemical manufacturing facility (east of field station) to a laboratory and greenhouse with a small chemical manufacturing division. Safeway also has a regional bakery within the vicinity of the project site. Safeway is considering moving their distribution center to Tracy, California.

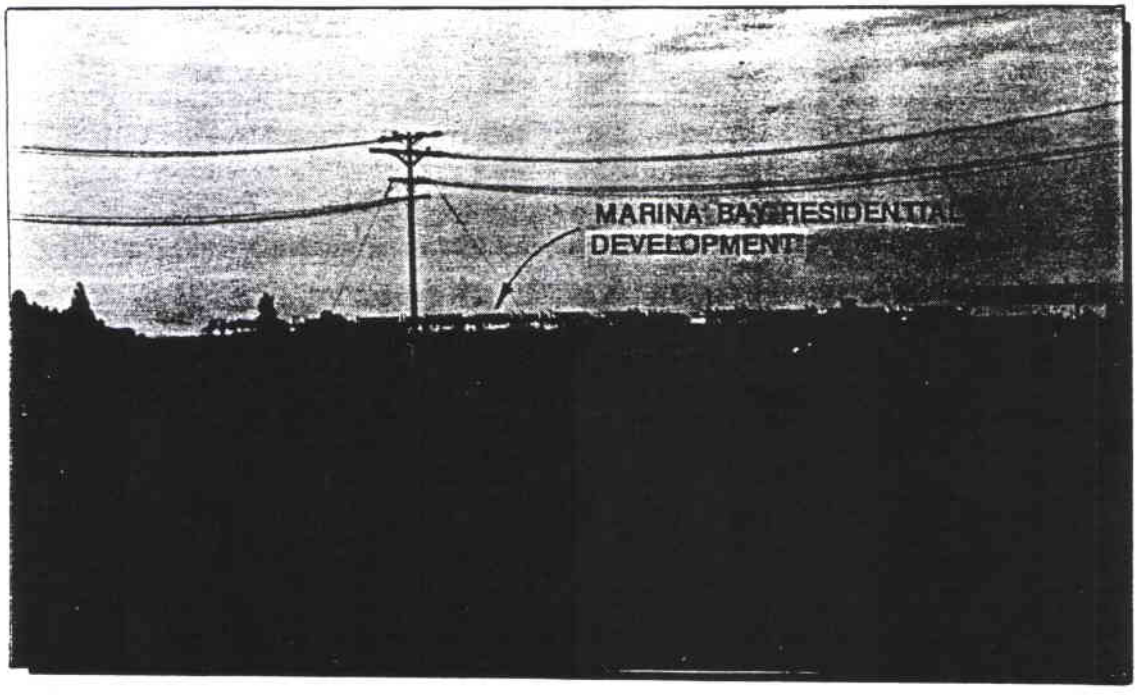
The Marina Bay project (consisting of shoreline residential, commercial, business, and marina development), located southwest of the site, is partially constructed (Figure 3-2). Marina Bay is located on the bay shoreline approximately 500 feet from the site. Upon completion, Marina Bay will include 1,200 rental units, townhouses, and single family residential units. A portion of Marina Bay farther west of the project site has been completed and is occupied.



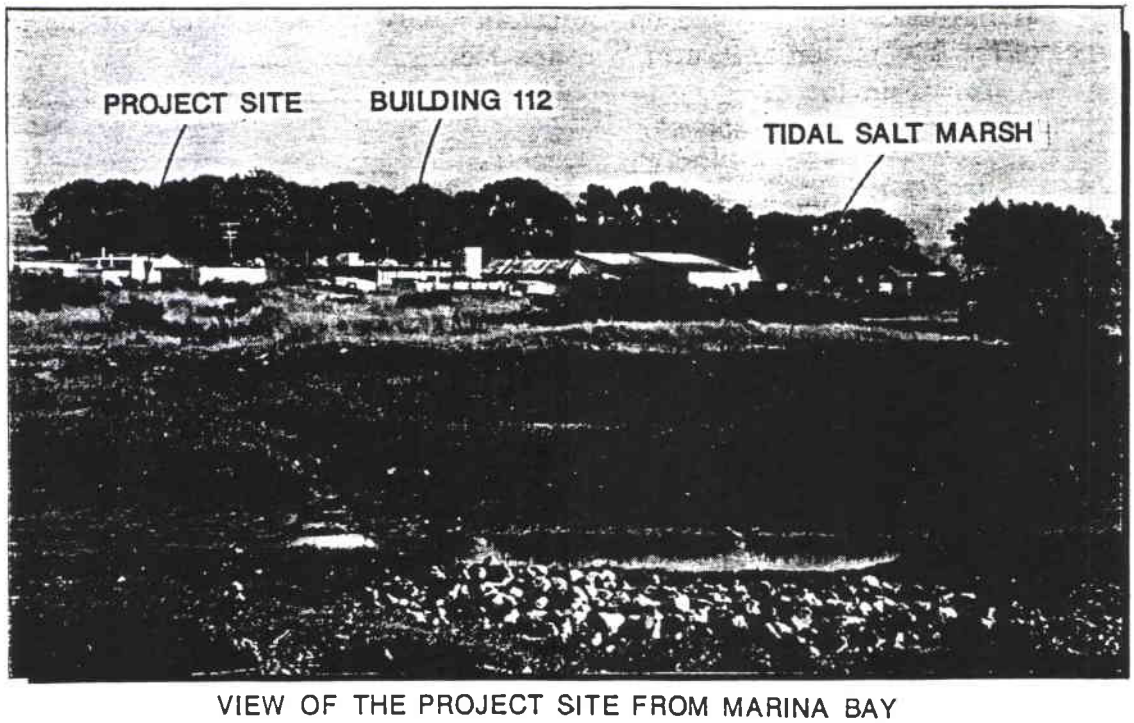
Key:

1. Marina Bay Mixed Use Development (Residential, Commercial, Office, and Recreational Land Uses)
2. Price Club (Off-price Retail)
3. BioRad Laboratories
4. Pacific Gas & Electric
5. Safeway Distribution Center
6. Railyard
7. Caltrans
8. ICI America (Chemical Laboratory and Manufacturing Facility)
9. Santa Fe Railroad
10. Sequoia Trucking
11. Technical Safety Services
12. Richmond Wholesale Services

FIGURE 3-1. LAND USES IN THE VICINITY OF THE PROJECT SITE RICHMOND, CALIFORNIA



VIEW OF MARINA BAY MIXED-USE DEVELOPMENT FROM THE PROJECT SITE



VIEW OF THE PROJECT SITE FROM MARINA BAY

FIGURE 3-2

Richmond Field Station Land Uses

The 150-acre field station was acquired by the University of California in 1950. Approximately 50 acres of field station are used for large-scale university research projects, including the Sanitary Engineering and Environmental Health Research Laboratory, the Forest Products Laboratory, and the Earthquake Engineering Research Center. The Northern Regional Library Facility for the University of California is also located at the field station and is currently being expanded to increase storage capacity. Other small individual research projects are also located at the field station (Figure 3-3).

A concrete-lined storm drainage channel (a portion of which is known as Meeker Ditch), owned by the City of Richmond, borders the west perimeter of the field station, parallel to Regatta Boulevard. Avocet Way and a vacant field border the west boundary, and Heron Drive and a second vacant field abut the south property boundary. The San Francisco Bay shoreline and an extensive tidal salt marsh lie 250-500 feet south of the site beyond a ruderal field (Figure 3-2). The remaining 100 acres of the field station can be characterized as undeveloped upland property and shoreline marsh.

Project Site Land Uses

The project site is located on the south side of the field station at the northeast corner of the intersection of Avocet Way and Heron Drive. Buildings 126, 128, 129, 131, and 200 are within the project site boundaries (Figures 2-3 and 3-4). The uses and occupants of these buildings include:

- 126 - storage for the Mechanical Engineering Department;
- 128 - vacant, previously used for solid waste recycling, research and development for Waste Energy Technology (a private company);
- 129 - vacant, previously used for water technology, an organized research unit (ORU);
- 131 - storage for the Engineering Department, Office of Research Services and Industry Liaison; and
- 200 - vacant; previously used by the Naval Architecture and Offshore Engineering Department (Kuykendall pers. comm.).

A sixth, unnumbered building is located between buildings 128 and 129. It is a dilapidated, corrugated metal storage shed that is no longer in use. A redwood tank is located next to the shed. A loading platform and a shipping container are located between buildings 126 and 138. Building 129 has a fenced yard. Most of these uses seem to be remnants of previous research projects.

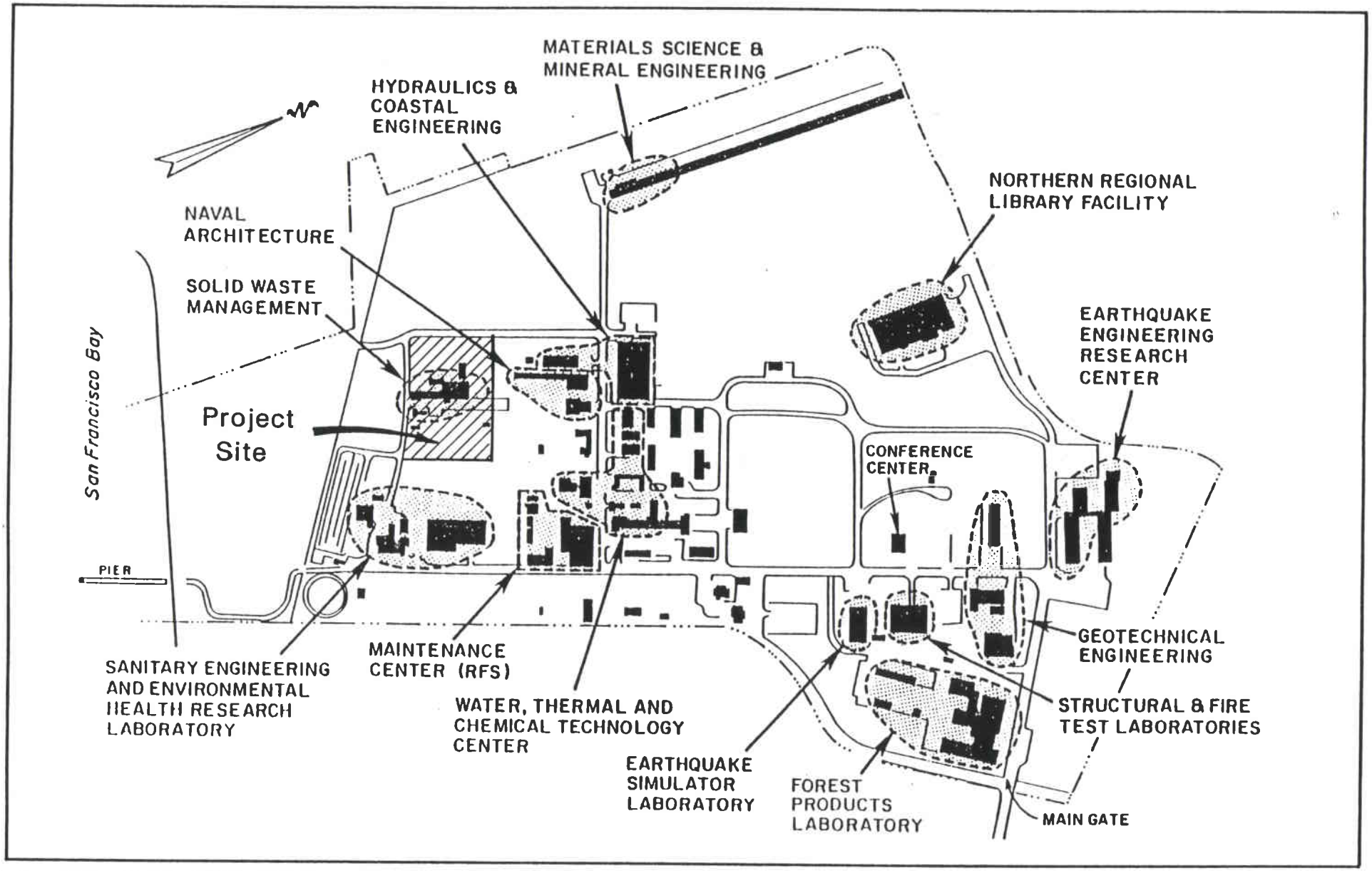


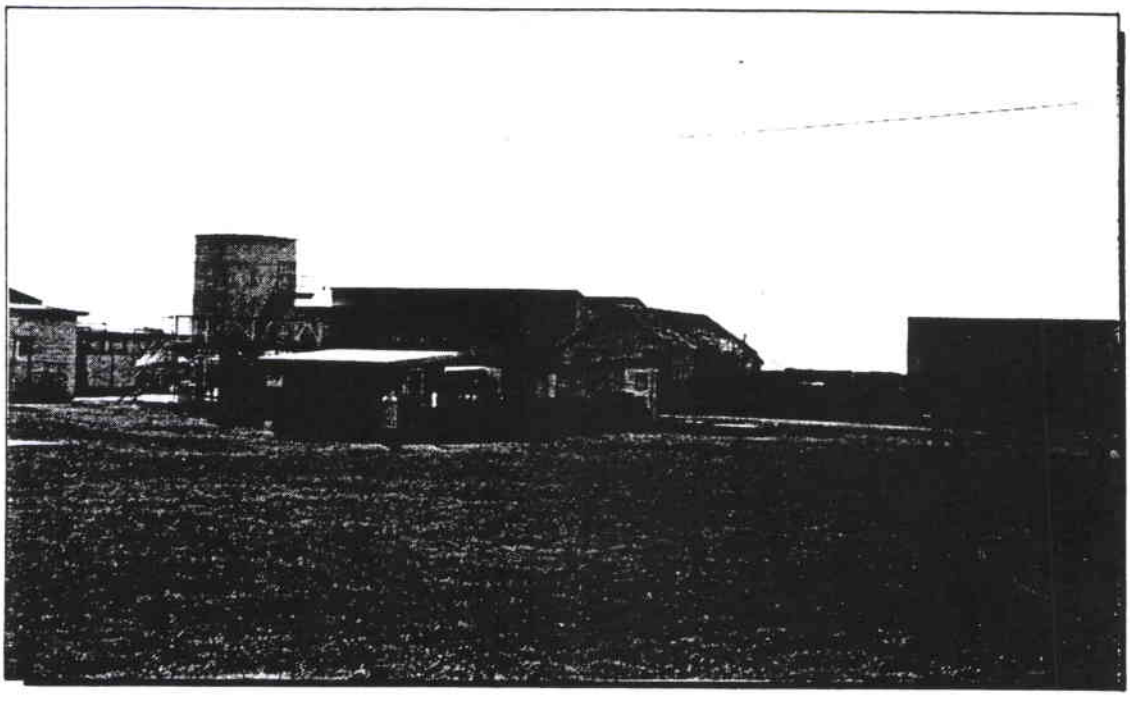
FIGURE 3-3. RESEARCH PROJECTS AT THE RICHMOND FIELD STATION

Source: University of California at Berkeley

Other features of the site include a fire hydrant at the corner of Heron Drive and Avocet Way, some landscaping, a volleyball court, a small parking lot, a large portable garbage bin, and a power line crossing the site.

Buildings 102, 105, 106, 111, 112, 118, 121, 125, 127, 136, 138, 149, 150, 152, 153, 176, 275, 276, and 278 are located on the north and east sides of the project site. The uses and occupants of these buildings include the following (Kuykendall pers. comm.):

- 102, 105, 106, 110, 112, 113, and 127 - laboratories and support facilities for the Sanitary Engineering and Environmental Health Research Laboratory (Figures 2-2 and 3-5);
- 111 - hazardous materials storage for the Sanitary Engineering and Environmental Health Research Laboratory;
- 114 - storage for Richmond Field Station Administration;
- 117, 118, and 119 - maintenance shop for the field station;
- 118 - fire test research laboratory for the Civil Engineering Department;
- 121 - storage of grounds maintenance equipment for the Engineering Department, and Office of Research Services and Industry Liaison (facilities management);
- 149 - vacant; previously used for water technology, ORU;
- 150 - machine shop for the Sanitary Engineering Department and for the Environmental Health Research Laboratory, and a laboratory for the University of California at San Francisco;
- 152 - storage for the Engineering Department, and facilities management;
- 153 - research support services and a modeling shop for the Naval Architecture and Offshore Engineering Department;
- 175 - administrative offices for the field station;
- 176 - vacant; previously used for storage;
- 275 - research towing tank for the Naval Architecture and Offshore Engineering Department;
- 276 - research towing tank for the Hydraulic and Coastal Engineering Department; and
- 278 - equipment storage for the Hydraulic and Coastal Engineering Department.



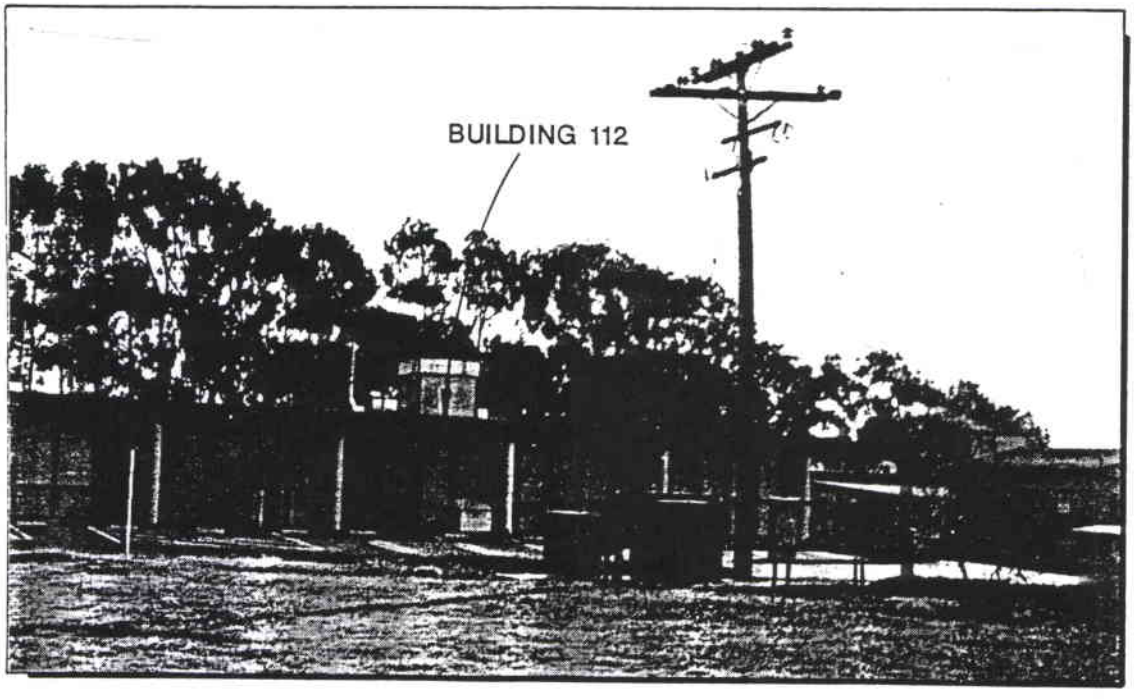


FIGURE 3-5. VIEWS OF ADJACENT SANITARY ENGINEERING AND ENVIRONMENTAL HEALTH RESEARCH LABORATORY FACILITIES

Applicable Plans and Policies

University of California Planning Documents

Long-Range Development Plan and Richmond Field Station Master Plan. The University of California has a long-range development plan governing the development of the Berkeley campus but no plan exists to guide development of the field station. The University of California is preparing a master plan for the field station that will be completed in 1991. A preliminary draft of this document was prepared during fall 1989, but major revisions have since been made to the report. The plan has not been approved by the University of California, nor has it been evaluated under CEQA. Plan approval and CEQA evaluation (presumably preparation of an environmental impact report) should occur in 1990 (Hufferd pers. comm.).

The University of California would like to promote joint research ventures between academia and private industry by converting a portion of the field station to a research center for use by the university, private companies, and government agencies. Figure 2-4 depicts a preliminary schematic site plan of the research center. This site plan will probably be modified before the draft master plan is completed.

EPA Laboratory EIR. The University of California has begun the process of preparing a project-specific EIR for the EPA laboratory project. The University of California will act as the lead agency in the CEQA process. Construction of the EPA laboratory cannot begin until the EIR has been completed.

City of Richmond Planning Documents

The field station is located in the City of Richmond, but the city does not have legal jurisdiction over the activities of the field station because it is owned by the State of California. Thus, even though the City of Richmond's planning documents address the field station property, the University of California is not obligated to adhere to the City of Richmond's plans. Nonetheless, the University of California has expressed a desire to comply with all local plans and regulations even though the University of California may not follow the standard development procedures established by the City of Richmond.

City of Richmond General Plan Land Use Element. The field station, including the project site, is designated as a "Special Industry" area by the Richmond General Plan (Richmond Planning Department 1987). Special industry land uses are located along major transportation routes in areas where compatibility with adjacent land uses is a primary concern. The field station is designated as a special industry land use because compatibility with the Marina Bay mixed use development project is an expressed concern of the City of Richmond. Industries creating significant negative externalities would be excluded from special industry areas (Richmond Planning Department 1987).

The following special industry general plan policies have been extracted from the Land Use Element of the Richmond General Plan and are relevant to the proposed project.

> Develop Special Industrial areas in locations where industrial plants can be seen by the traveling public and have convenient access to thoroughfares, railroad lines or shipping facilities. At key locations Industrial Parks should be developed and maintained to even higher standards.
>
> Provide and maintain adequate landscaped open space between structures.
>
> Set back all new buildings and structures from freeways and major thoroughfares a sufficient distance to provide a spacious setting.
>
> Establish a visual unity of all buildings and structures.
>
> Provide adequate off-street parking and loading facilities on each site with appropriate landscaping to help create an attractive appearance.
>
> Average employee density [should not] generally exceed 10 persons per net site acre.
>
> Limit all forms of activity that may be objectionable such as noise, odors, fumes, vibration, or glare so they will not be noticeable at the property line and preferably should be confined within each building. (Richmond Planning Department 1987.)

Shoreline Conservation and Development Strategy. In 1986, the City of Richmond began work on a *Shoreline Conservation and Development Strategy* (SCDS) to guide development in the vicinity of Richmond's San Francisco Bay and San Pablo Bay shorelines. Baseline environmental data were collected in 1986 and compiled in a document entitled *SCDS Technical Memorandum Number 2, Planning Analysis* (Hall, Goodhue, Haisley, and Barker July 1986a). In November 1986, *SCDS Technical Memorandum Number 3, Land Use Alternatives*, was prepared. Finally, in 1987, Hall, Goodhue, Haisley, and Barker prepared recommendations for shoreline conservation and development strategies. These recommendations were adopted, in principle, in April 1987, by the Richmond City Council. Many of the recommendations are directives to the city for governing shoreline development. The selected recommendations that are applicable to the proposed project are presented as they appear in the summary of recommendations for the SCDS. Specific policies from the SCDS relating to the recommendations are also listed.

1. Prepare a Specific Plan necessary to implement the proposed Marina Bay Business Park in the area north, west, and east of Marina Bay, including a university-oriented Research Park, to take advantage of market demand for research and development, university and business-oriented uses, and associated employment opportunities.

Policy: Establish research and development uses in the South Shoreline Area west, north, and east of Marina Bay and extending south of Stauffer Chemical to Point Isabel. Establish the Marina Bay Business Park with university-oriented research and development uses near the UC Berkeley Richmond Field Station and general research and development uses north and west of Marina Bay.

9. Establish predictable development policies and regulations that encourage RandD [research and development] and biotechnology development as well as other uses.

12. Prepare and adopt a master streetscape plan that addresses the appearance of streets in the Shoreline Area, particularly the proposed collector road from Erlandson/Regatta Streets to Harbour Way and Route 93. This plan should include recommended street sections, landscape plant palette, hardscape palette, provisions for street lighting, furniture, and signage.

Policy: For new development, require landscaping and open space to amount to 10 percent or 15 percent of the gross land area, depending on land use, including at least 5 percent for usable open space.

Policy: Require that all parking be accommodated in off-street lots. Do not permit on-street parking.

Policy: Adopt a master streetscape plan that addresses the appearance of streets in the Shoreline Area. Subjects to be addressed include a landscape palette, hardscape palette, and provisions for street lighting, furniture, and signage.

13. Improve, extend, reroute, or close surface streets, as necessary, to provide an efficient and functional local street system.

14. Adopt an official Roadway Plan Line . . . in order to establish the route for a collector road from Erlandson/Regatta [Boulevard] to Harbour Way.

16. In conjunction with the East Bay Regional Park District, establish a public access plan that provides a system of nonmotorized circulation alternatives from Point Isabel to Point Pinole, along the Shoreline where possible.

Policy: Establish a public access trail, including Class 1 separated pedestrian and bicycling facilities as feasible, from the Albany city limit around Point Isabel to the Point Isabel Shoreline Park, then along the to-be-abandoned Santa Fe right-of-way to Meeker Ditch and the new park at South 47th Street.

Policy: Encourage the University of California to improve South 47th Street south of the freeway with provisions for pedestrian and bicycle access.

Policy: Promote and encourage the dedication of a park at the end of South 47th Street as part of the University of California Field Station master plan.

18. Conserve hillsides and wetlands, including the numerous marshes and streams in the Shoreline Area (Hall, Goodhue, Haisley, and Barker 1986b).

City of Richmond Zoning Ordinance. The City of Richmond Zoning Ordinance provides detailed regulations for research and development land uses, particularly those using hazardous substances. The following discussion addresses zoning requirements for the project site with the exception of those ordinances relating to the use of hazardous substances that are addressed in Chapter 5, "Hazardous Substances."

Special Industrial District. The project site is designated as "Special Industrial District" (M-S) in the City of Richmond Zoning Ordinance (Section 15.04.145) (City of Richmond Planning Department 1987). Within this zoning classification, the project site has a subclassification labeled "Light Industrial/Research and Development" (LI/R & D). The zoning ordinance provides explicit instructions for property development within the Special Industrial District, LI/R & D (City of Richmond Planning Department 1988).

The zoning ordinance identifies 23 uses that are permitted uses or that are allowed with a conditional use permit in the Special Industrial District. The EPA laboratory would most likely fit within the category of "Research and Development Activities." This land use is permitted in Special Industrial Districts, unless the use involves one of several activities, including:

- the use of viruses or infectious materials,
- the manipulation of genetic material of living organisms,
- uses classified by the National Institute of Health as large scale (greater than 10 liters of culture) research or production, or
- uses where the laboratory requirements are at a biosafety level two or above, as defined by the National Institute of Health and the Center for Disease Control (City of Richmond Planning Department 1988).

Onsite accessory uses that are permitted uses include parking lots, administrative offices, and outdoor storage areas that meet the conditions of the zoning district (City of Richmond Planning Department 1988).

The zoning ordinance also includes standards of operation regarding emissions, odors, noise, and vibrations. The ordinance also provides specific design standards for building heights and setbacks, sidewalks, landscaping, fencing, parking, and loading areas. The

ordinance requires provision of sidewalks, curbs, and gutters on all public streets (City of Richmond Planning Department 1988).

The maximum allowed building height under the special industrial district ordinance is 50 feet. The minimum building setback on minor streets, such as Heron Drive and Avocet Way, is 15 feet. The ordinance requires, at a minimum, "green, growing ground cover" to be planted, which may include grass, shrubs, perennial flowers, and vines (City of Richmond Planning Department 1988).

San Francisco Bay Conservation and Development Commission

Jurisdiction. BCDC has permit authority over waters of the San Francisco Bay and the adjacent shoreline extending from the Golden Gate Bridge to Alameda, San Mateo, Contra Costa, Solano, Sonoma, San Francisco, and Marin Counties. BCDC's shoreline jurisdiction extends 100 feet inland from the highest tidal action. In the vicinity of the project site, BCBC's jurisdiction extends to the 6-foot contour. BCDC is mostly concerned with securing appropriate shoreline land uses and maintaining, enhancing, and expanding shoreline access for the general public (Aramburu pers. comm.).

When a project is within BCDC's limited jurisdiction, the project requires a BCDC permit prior to approval. BCDC issues two kinds of permits: major permits and administrative permits. Major permits require a public hearing before the commission and a vote by the commission. Smaller projects can obtain an administrative permit issued by the executive director of BCDC and approved on the commission's consent calendar (Aramburu pers. comm.). The permit system is designed to ensure that public access is maximized, the shoreline is developed in an aesthetically pleasing fashion, and that bay shorelines are reserved for those uses "providing substantial public benefit" (Bay Conservation and Development Commission 1988).

The proposed project site is not within the jurisdiction of BCDC because it is located approximately 250 feet from the bayshore tidal salt marsh and is thus greater than 100 feet inland from the highest tidal action. There are, however, several policies within BCDC's *San Francisco Bay Plan* that would be relevant to the project.

Bay Conservation and Development Commission San Francisco Bay Plan. BCDC prepared the *San Francisco Bay Plan* (amended in 1988) that guides shoreline development within BCDC's jurisdiction and development within areas reserved for "priority uses," such as "ports, water-related industry, waterfront recreation, airports, and wildlife areas." The plan also identifies view corridors to the bay from surrounding urbanized hillsides and roadways (Bay Conservation and Development Commission 1988).

The bay shoreline located south of the EPA laboratory project site has not been designated as a location reserved for priority uses under the *San Francisco Bay Plan*. The *San Francisco Bay Plan* section entitled "Other Uses of the Bay and Shoreline" suggests policies to govern shoreline development in areas that are not reserved for priority uses and are not within BCDC's shoreline jurisdiction. These policies are recommended but not

required. The following policies, drawn from this section, are relevant to the development of the EPA laboratory.

1. Shore areas not proposed to be reserved for a priority use should be used for any purpose (acceptable to the local government having jurisdiction) that uses the Bay as an asset and in no way affects the Bay adversely. This means any use that does not adversely affect enjoyment of the Bay and its shoreline by residents, employees, and visitors within the site area itself or within adjacent areas of the Bay or shoreline.

6. Power distribution and telephone lines should either be placed underground (or in an attractive combination of underground lines with streamlined overhead facilities) in any new residential, commercial, public, or view area near the shores of the Bay. (Bay Conservation and Development Commission 1988.)

Several specific plans have been adopted as part of the *San Francisco Bay Plan* to provide more detailed information for certain portions of the shoreline, including the south Richmond shoreline. The South Richmond Shoreline Special Area Plan was adopted in May 1977 to provide more specific guidelines for use of the shoreline in a manner consistent with BCDC's *San Francisco Bay Plan*. Much of this plan has been superseded by the draft Knox Freeway/Cutting Boulevard Corridor Specific Plan (Hall, Goodhue, Haisley, and Barker 1989). This plan has not yet been approved by the City of Richmond and is thus not evaluated in this report.

Richmond Coastline Plan. The *Richmond Coastline Plan* (Waterfront Development Committee 1973) provides policies governing the use of Richmond's shoreline. Much of this plan has been replaced by more recent shoreline plans for Richmond, although some of the policies are still relevant. The objectives of the *Richmond Coastline Plan* include:

- increasing shoreline access,
- protecting wetland communities,
- developing coastline segments in a manner that will provide jobs for Richmond residents,
- improving Richmond's image through coastline development, and
- balancing coastline uses (Richmond Waterfront Development Committee 1973).

The following policies in the *Richmond Coastline Plan* apply to the EPA laboratory project site.

Wareham should complete landscape, fencing, and sidewalk guidelines.

Conclusion:

- Impact findings: Consistency with sidewalk, landscaping, and fencing guidelines is not measurable because of a lack of details.
- Significance: None assigned.

Conclusion:

- o Impact findings: The project would result in no land use impacts (see Chapter 9 for impacts on biotic resources). Replacement of storage, research, and mowed ruderal field land uses with similar urban land uses would occur.
- o Significance: None.
- o Mitigation measures: None required.

Consistency with University of California's Land Use Plans

Conclusion:

- o Impact findings: The project would block bayshore views from nearby offices, laboratories, and workshops.
- o Significance: Less than significant.
- o Mitigation measures: None required.

As previously stated, the EPA laboratory would be constructed within several hundred feet of the shoreline and is not expected to prohibit shoreline access. The EPA laboratory project is consistent with the *Richmond Coastline Plan* policies that encourage shoreline access through the university.

Conclusion:

- o Impact findings: The project is consistent with the plans to provide expanded shoreline access.
- o Significance: None.
- o Mitigation measures: None required.

MITIGATION MEASURES

The following recommendations are suggested to alleviate potential impacts of the project. Implementation of the mitigation measures would be the responsibility of the University of California.

3.1 Assess Project Consistency with the Master Plan During Environmental Review of the Master Plan, and If Project Plans Have Not Been Finalized, Include Applicable Plan Policies and Design Standards into the Project

The environmental review of the field station master plan under CEQA (presumably preparation of an EIR) should address consistency of the proposed EPA laboratory with the master plan. If the project is found to be inconsistent with the master plan, include applicable master plan policies and design standards into the project, provided project plans have not been completed.

3.2 Ensure Compatibility with Zoning Ordinance Design Guidelines Prior to Project Implementation

The EPA laboratory should be compatible with the landscaping, fencing, and sidewalk design guidelines provided in the zoning ordinance prior to project implementation. The zoning ordinance for the Special Industrial District is located in Appendix A of this report.

3.3 Ensure Compatibility with Shoreline Conservation and Development Plan Landscaping Requirements.

The EPA laboratory should be compatible with the following SCDS landscaping requirements:

- Landscaping and open space should amount to 10-15 percent of the gross land area.
- Five percent of the landscaped area should be devoted to open space.

Given these recommendations, the project should include approximately 16,000-24,000 square feet of open space with approximately 8,100 square feet devoted to usable open space.

Demand and Capacity

The Richmond Municipal Sewer District, receives an average of 6 million gallons per day (MGD) during the dry season. The treatment plant has a design capacity of 16 MGD; however, during heavy storms the plant can process up to 40 MGD since water received through storm drainage receives only primary treatment. Stormwater can accidentally enter the sanitary sewer system through fractured sanitary sewer lines and illegal hookups, which results in increased treatment demand. The plant has a capacity problem only during exceptionally heavy storm periods (Linslay pers. comm).

Sanitary Sewer Line

The 12-inch sanitary sewer line located along the southern border of the field station would serve the proposed EPA laboratory (Figure 4-2). This line, which serves other shoreline land uses, has a capacity problem resulting from several situations. First, the sewer line has a slight uphill gradient. (Linslay pers. comm.).

Second, the line is located along the shoreline where the groundwater level is higher. Since the line is located at depths of 8-10 feet above sea level in an area where the water table fluctuates between 5 and 10 feet above sea level (depending on tides and rainfall), winter storms are capable of filling the line to capacity when the pressure outside the line is greater than the pressure in the line (i.e., when the groundwater level rises). (Linslay pers. comm.).

Third, surface drainage that should be connected to the storm drain system is actually connected to the wastewater system. These connections were made before the storm drainage and wastewater systems were separated many years ago. Flows from these storm drainage connections surcharge the sewer system during storm events. (Linslay pers. comm.).

Finally, iron oxide (rust) is building up in the sewer line which acts to decrease the line's capacity. The iron oxide is originating from contaminated groundwater infiltration at ICI Americas. The groundwater has been contaminated with metals from years of industrial uses on the site. To reduce the acidity of this metal-pervaded groundwater (once it has entered the sanitary sewer system), a basic or nonacidic chemical, such as sodium hydroxide, is added to ICI Americas' wastewater. The sodium hydroxide causes the iron to precipitate out of the water in the form of iron oxide. The iron oxide builds up on the inside of the sewer line, which in turn reduces the line's capacity. (Linslay pers. comm.).

The Richmond Municipal Sewer District recently installed a new pump near Marina Bay to increase the flow through the pipe and force the wastewater through the portion of the pipeline with an uphill gradient. The pump has solved the capacity problem with the exception of infiltration discovered on ICI Americas' property. (Linslay pers. comm.).

Based on testing performed by the Richmond Municipal Sewer District, much of the groundwater infiltration appears to be originating in the portion of the pipeline crossing ICI

Americas' property. To mitigate this problem, ICI Americas installed a "slip line" or a plastic sleeve into the sewer line. However, groundwater is still penetrating the system by flowing between the slipline and the sewer line. ICI Americas is considering remedial action for the infiltration. (Linslay pers. comm.).

The amount of infiltration occurring at the field station is not known; however, it is expected to be relatively small based on testing performed by the Richmond Municipal Sewer District. Wastewater samples from the sewer line taken at the field station and at ICI America were tested for the presence of metals, which implies contaminated groundwater infiltration. The wastewater appeared to have diluted concentrations of metals as it passed through the field station, which indicated that additional groundwater (from the field station) had not infiltrated the system and that the field station's wastewater was diluting upstream wastewater. (Linslay pers. comm.).

Sewer line infiltration implies that exfiltration (i.e., wastewater flowing out of the sewer line when the pressure inside the line is greater than the pressure outside the line) may also be occurring. Since the sewer line is close to the bay shoreline, wastewater escaping the sewer line could enter the bay with little filtration. The extent of infiltration is not known at this time.

Acid Waste Neutralization

The proposed EPA laboratory includes an acid waste pretreatment neutralization program. All waste acids would be segregated into a separate drain system for collection and neutralization. Following this pretreatment process, neutralized acid wastes would be conveyed to the Richmond Municipal Sewage Treatment Facility along with other wastewater (Husby, Johnson pers. comms.).

Storm Drainage and Flooding

Storm Drainage

Stormwater runoff flows from north to south at the field station by way of open drainage ditches, culverts, and sheet flow into drainages (Figure 4-3). Runoff water is eventually discharged into San Francisco Bay, which forms the southern border of the field station.

Runoff from half of the project site drains into a ditch and culvert system and the other half drains as surface flow and eventually enters the groundwater. Surface water on the west side of the project site flows into one of two open ditches that direct water to the bay. The eastern half of the site drains into the southeastern corner of the project site where it enters a small swale bordering Heron Drive (Figure 4-3). A small pipe underneath

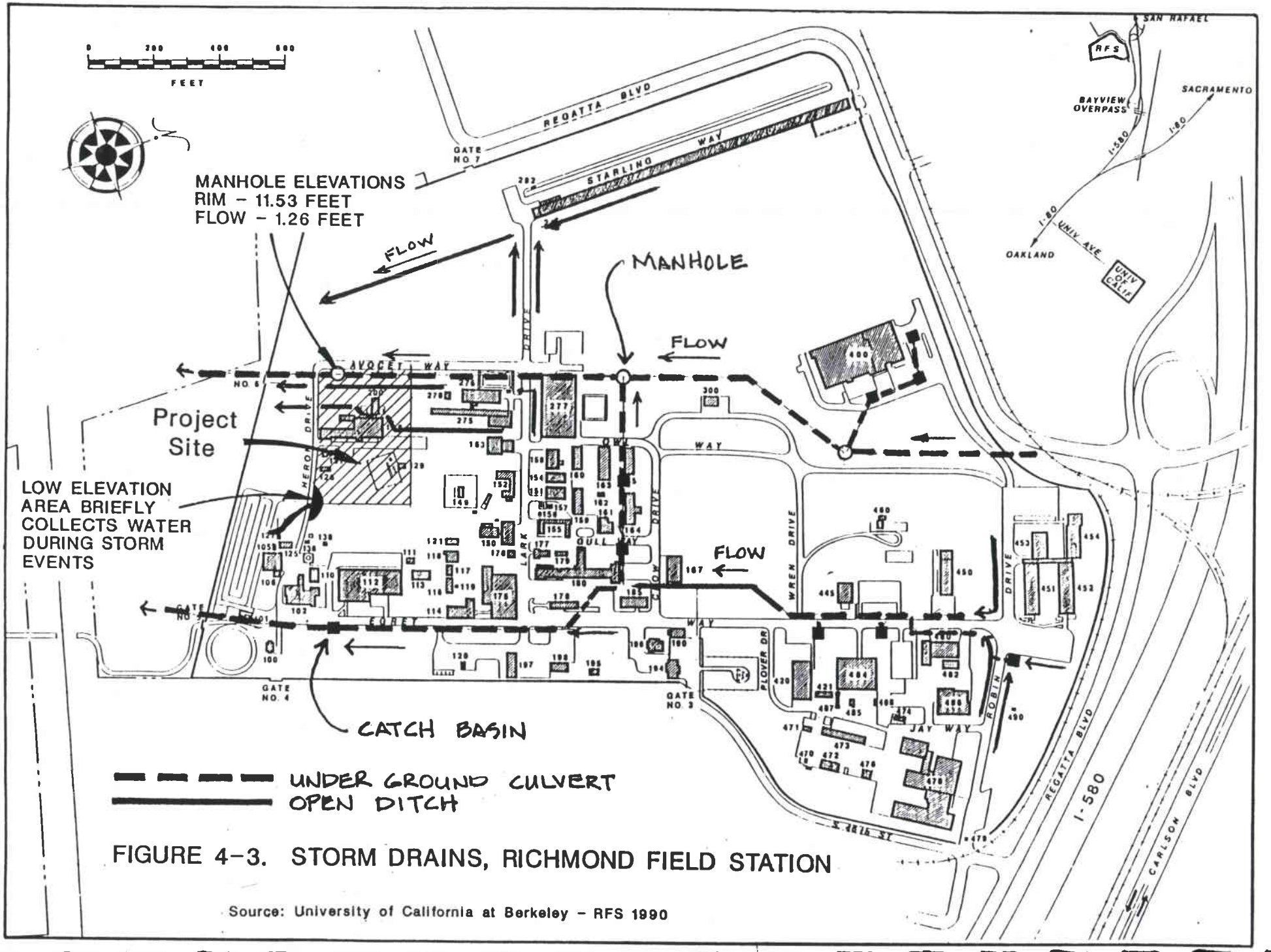


FIGURE 4-3. STORM DRAINS, RICHMOND FIELD STATION

Source: University of California at Berkeley - RFS 1990

Heron Drive connects this swale with another small swale south of Heron Drive. As runoff drains under Heron Drive and into the swale it is absorbed into the groundwater system.

Flooding

According to the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (Federal Emergency Management Agency 1979) for the southern shore of Richmond, the 100-year flood zone extends to the 6-foot contour above mean high tide. This is immediately south of the south terminus of South 32nd and South 49th Streets. The south side of Heron Drive appears to be at an elevation of 6 feet and would be expected to occasionally flood, according to the flood map. The flood zone also extends upstream along Meeker Ditch, which carries water near sea level when it's near the shoreline. The project site is not within the 100-year flood zone identified by the FEMA; however, the project site has been subject to flooding on at least one occasion.

In 1982, the combination of an extremely high tide and a 65-year storm event resulted in flooding over a large part of the field station. The extreme high tide rendered the field station's drainage ditches and culverts useless because tidal waters filled them to capacity. The stormwaters had no means of leaving the site except through the groundwater system, but the groundwater level had risen within several feet of the ground surface due to the heavy rains. Most of the floodwaters retreated into the drainage system at low tide (Kuykendall pers. comm., Rutherford & Chekene 1989).

It has been estimated, but with great uncertainty, that sea levels will rise 2-8 feet in the next 100 years due to the "greenhouse" effect. Because of the large margin of error in this estimate, the EPA has suggested using an estimate of a 4-foot rise in the sea level. Such a rise would subject large areas of the field station (including the project site) to frequent flooding unless dikes or levees are built to protect those areas (Rutherford & Chekene 1989).

Solid Waste

Nonhazardous solid waste would be disposed of by the University of California as part of its existing program to remove solid waste from the field station. Solid waste is taken to the West Contra Costa Sanitary Landfill near Parr Boulevard and Garden Tract Road. The landfill is owned and operated by a private company, Richmond Sanitary Services, the franchised hauler for the west Contra Costa area.

Richmond Sanitary Services also collects and recycles reusable materials. The landfill is equipped to handle Class 3 wastes (standard municipal wastes), as well as asbestos and pretreated infectious wastes.

Fire Flow Requirements

The 4-inch water line currently serving the project site is not capable of providing the pressure needed to fight fires since it is small and located at the end of the water system. Construction of the research library north of the proposed project site included a new 8-inch fire main to service the building because of the lack of adequate pressure. This 8-inch line feeds off the 12-inch water line that parallels the north border of the field station (Bell pers. comm.). The EPA laboratory would likely require an 8-inch water line to provide the water pressure needed to fight a fire.

Fire Hazard in the Site Vicinity

David Howard, the fire marshal for the Richmond Fire Department, has said that other than the Safeway fire in July 1988, no other emergency situations have occurred in the vicinity of the field station over the past several years. The Safeway fire destroyed the main warehouse building used by the grocery chain, which covered 13.5 acres. The fire may have started from the faulty wiring of a light fixture. Other than this incident, no other significant emergency situations have occurred near the field station (Howard pers. comm.).

Police Services

The University of California is responsible for providing police protection at the field station. Police service by the Richmond Police Department is available in emergency situations.

The university police department, headquartered at the University of California, Berkeley, has one officer keep patrolling the field station 24 hours per day. The field station is fenced and gated, which limits access. A kiosk at the entrance is manned during working hours Monday through Friday. The field station is accessible at other times via Gate Number 3 at the south end of South 46th Street. This gate is controlled by the university police department, and a police station is located at the gate in building 190. Entrance to the field station is restricted to authorized persons.

The City of Richmond has one central police station located in the civic center on Barrett Avenue (Figure 4-4). Emergency response time to the field station is 2-5 minutes depending on the location of the patrolling officer.

The crime rate per 1,000 inhabitants is typically twice as high in Richmond as compared to other California cities (Hall, Goodhue, Haisley, and Barker 1986); however, the industrial portions of Richmond typically have a lower crime rate than the residential areas. Criminal incidents are few at the field station. The field station has had fewer than five burglaries over the past 6 years (Kuykendall pers. comm.).

Electrical Service

The Pacific Gas and Electric Company (PG&E) provides electricity to the field station. A 12-kilovolt (kV) electrical line provides electricity to the field station and traverses the project site in an east-west direction (Figure 4-5). The electrical service includes both underground cables and aerial power lines.

The field station is monitored by one electric meter. The proposed laboratory would be monitored by a separate meter (Bell pers. comm.). PG&E does not have a capacity problem regarding service to the City of Richmond or to the field station (Cranston pers. comm.).

Natural Gas Service

PG&E also provides natural gas service to the field station through a high-pressure gas main on South 46th Street. An existing gas line traverses the project site (Figure 4-6). Four gas meters at the field station monitor natural gas use. The EPA laboratory would be metered separately from the field station (Bell pers. comm.). PG&E does not have a capacity problem regarding service provision to the City of Richmond or to the Richmond Field Station (Cranston pers. comm.).

ENVIRONMENTAL CONSEQUENCES

Water

Increased Water Consumption

Operation of the EPA laboratory would require approximately 2,000 gallons of water per day. This would result in an increase in water consumption at the field station of approximately 3 percent. This impact is considered less than significant since it represents a small proportion of water demand as compared to the total demand of EBMUD's service district, since there are no problems with water supply in west Contra Costa County.

Conclusion:

- Impact finding: The project would consume approximately 2,000 gallons per day.
- Significance: Less than significant.

The fire department is interested in reducing potential fire hazards at the laboratory through the use of site design techniques, including improvement of onsite water pressure, provision of at least two access points to the site, installation of sprinklers in the building, and preparation of a business plan. (Howard pers. comm.).

Conclusion:

- o Impact finding: The EPA laboratory would require the services of the Richmond Fire Department.
- o Significance: Less than significant.
- o Mitigation measures: 4.8 Implement the mitigation measures suggested by the Richmond Fire Department and required by the EPA. 4.9 Prepare a business plan for the laboratory.

Insufficient Fire Fighting Water Pressure

The minimum amount of pressure needed to adequately fight a fire at the site is 1,500 gallons per minute. The existing 4-inch line that serves that site is insufficient to provide the minimum amount of water pressure needed or required to fight a fire at the site (Howard pers. comm). The waterline should be upgraded, as necessary, to provide adequate water pressure for fire fighting.

Conclusion:

- o Impact finding: Existing water pressure at the site is not sufficient to adequately fight a fire.
- o Significance: Less than significant.
- o Mitigation measures: 4.10 Upgrade the existing waterline (as needed) to supply adequate water pressure for fire fighting.

Police Services

Increased Need for Police Protection

The proposed EPA laboratory may occasionally require the services of the Richmond Police Department in the event of an emergency. If the university and the EPA implement measures to increase safety at the laboratory, the need for police services is expected to be minimal.

Conclusion:

- o Impact finding: The laboratory would require the services of the Richmond Police Department.
- o Significance: Less than significant.
- o Mitigation measures: 4.11 Install a security system on EPA structures, as required in the Solicitation for Offers.

Electrical Service

Increased Electrical Demand

The proposed EPA laboratory would use an unknown amount of electricity. However, PG&E expects that service provision to the laboratory will be workable given available information on the size of the project. PG&E does not expect operation of the EPA laboratory to have a significant impact on PG&E's ability to serve the area (Cranston pers. comm.).

Conclusion:

- o Impact finding: Operation of the laboratory would require an unknown amount of electricity.
- o Significance: Less than significant.
- o Mitigation measures: None required.

Disruption of Existing Electrical System

Implementation of the proposed EPA laboratory would require rerouting the existing 12-kV electrical lines that cross the middle of the site in a northwest-southeast direction. The university intends to underground and reroute utilities as part of the project. The transformer containing PCBs will be removed from the project site prior to project implementation.

Conclusion:

- o Impact finding: Implementation of the project would require disruption and relocation of existing electrical lines crossing the site.

- Significance: Less than significant.
- Mitigation measures: 4.13 Reroute and underground utilities that cross the site, as proposed in the project description.

Natural Gas Service

Increased Natural Gas Demand

The proposed EPA laboratory would use an unknown amount of natural gas. However, PG&E expects that service provision to the laboratory will be workable given available information on the size of the project. PG&E does not expect operation of the EPA laboratory to have a significant impact on PG&E's ability to serve the area (Cranston pers. comm.).

Conclusion:

- Impact finding: Operation of the laboratory would require an unknown amount of natural gas.
- Significance: Less than significant.
- Mitigation measures: None required.

Disruption of Existing Natural Gas Delivery System

Implementation of the proposed EPA laboratory may require rerouting the existing natural gas line that crosses the middle of the site in a northeast-southwest direction. The university intends to underground utilities as part of the project. This impact is considered less than significant.

Conclusion:

- Impact finding: Implementation of the project may require rerouting of an existing gas line.
- Significance: Less than significant.
- Mitigation measures: 4.14 Work with PG&E to identify and implement a suitable alignment for rerouting the gas line crossing the site, if necessary.

MITIGATION MEASURES

4.1 Evaluate Water Service Infrastructure and Project Demand to Determine if Waterline Renovation Is Necessary, and if so, Make the Necessary Improvements

The university, along with EBMUD, should evaluate the capacity of the existing waterlines and the water demand of the proposed project to determine the amount of upgrading needed. The 4-inch water line serving the project site would probably require upgrading to meet fire flow requirements and increased water demand stemming from this project, as well as the remainder of the proposed research center. If it is determined that upgrading of the waterline is necessary, the university should implement measures to improve the water delivery system.

4.2 Investigate the Need to Upgrade and Expand the Onsite Sanitary Sewer System and, if Needed, Implement Measures to Increase the Sanitary Sewer Trunk Line's Capacity

The available sewer line capacity during storm events should be compared to the amount of wastewater expected to be generated by the EPA laboratory to determine if the sewer line has adequate capacity to serve the project throughout the year. The university should work with the Richmond Municipal Sewer District to address this potential capacity problem. The university should implement measures as needed to increase the sanitary sewer trunk line's capacity. For example, a plastic slip line could be inserted into the sewer line to reduce groundwater infiltration. This measure is currently being implemented by ICI to decrease leakage of wastewater from their sewer line into the environment.

4.3 Ensure the Project's Indoor Areas Are Above Potential Future Flood Levels, Determine the Risk of Site Flooding, and Reduce This Risk to an Acceptable Level, If Deemed Necessary

The EPA, the University of California, and the project developer should ensure that the indoor portions of the laboratory are elevated above potential flood levels resulting from heavy rains and extreme high tides. Structures should be designed to withstand the forecasted level and frequency of flooding. Chemical storage should be elevated above forecasted flood levels. In addition, the university should determine the available capacity of the field station's storm drainage system at the highest high tide. The university, in coordination with the Richmond Public Works Department, should determine how much additional capacity would be needed to prevent flooding of the laboratory project site during storm events. This information should be used to determine the risk of flooding on the project site. If the risk is considered high, the university should implement measures to reduce the potential for flooding to an acceptable risk level.

4.4 Reroute Surface Drainage From Properties Adjacent to the Project Site to Drainages Off the Project Site

Surface runoff carried by the swales and culverts crossing the project site should be redirected to other drainages, such as the culvert that parallels Avocet Way.

4.5 Implement a Drainage Plan for the EPA Laboratory

To manage runoff on the project site, the university should implement a drainage plan for the project site. The university appears to be planning the site drainage as evidenced by the depiction of catch basins and drainage inlets on the laboratory site plan. However, additional details of the site drainage plan are unavailable at this time.

4.6 Continue to Evaluate Potential Landfill Sites

Contra Costa County should continue to evaluate potential landfill sites.

4.7 Establish a Recycling Program at the EPA Laboratory and the Field Station

The EPA should implement a recycling program which would consist of non-contaminated glass and paper recycling. Collection could be provided by the Richmond Sanitary Service. The University of California should consider a recycling program for the entire field station, which would include the proposed research center. This mitigation measure would not reduce the impact to a less-than-significant level.

4.8 Implement the Mitigation Measures Suggested by the Richmond Fire Department and Required by the EPA

The potential for health and safety risks to humans from fire will be mitigated by the following design features which have been requested by the EPA.

- Both buildings would be sprinklered. The sprinkler systems would be hydraulically designed to meet National Fire Protection Association Flammable and Combustible Liquid Code (NFPA) 13, local authority standards and recommendations. The system would be approved by a nationally recognized insurance company [EPA 1988, Section 7.19.7]. Fire protection for all laboratory rooms, computer rooms, and core telecommunications closets would be provided through a dual sensing pre-action dry pipe sprinkler system which would be controlled by a deluge valve [U. S. Environmental Protection Agency 1988, Section 7.19.5].

- Smoke alarms would be installed in the buildings [U. S. Environmental Protection Agency 1988, Section 7.19.5].

- Manual fire alarms would be installed along the normal exit paths. The alarm signal would automatically be sent to the Richmond fire department in accordance with NFPA Standard 72B or 72C [U. S. Environmental Protection Agency 1988, Section 8.8].

- Fire doors that are normally held open by electromagnetic devices would be released automatically at the sound of the alarm [U. S. Environmental Protection Agency 1988, Section 8.8].

- Portable fire extinguishers would be located in areas of high fire hazard [U. S. Environmental Protection Agency 1988, Section 5.19.1].

- The buildings would be constructed of permanent, non-combustible construction [U. S. Environmental Protection Agency 1988 Section 5.1.4].

The risk of serious fire should be further reduced by the installation of a new water line with greater water pressure.

The building would be constructed with noncombustible material in accordance with the uniform fire code.

4.9 Prepare a Business Plan for the Laboratory

A business plan addressing the use of hazardous materials at the laboratory must be prepared and submitted to the Richmond Fire Department (and the Richmond Planning Department) before a determination of fire hazard impact can be accurately made. The planning department is expecting this information to be evaluated during the environmental review process under CEQA. The business plan, as identified in the Hazardous Materials Release Response Plans and Inventory Law of 1985, should include:

- design details of the facility (including floor plans, storage locations, and facility description);

- an inventory of hazardous materials handled or stored at the facility;

- an emergency response plan, including notification and evacuation procedures;

- a training program in safety procedures and emergency response for hazardous materials designed for new employees, including annual refresher courses; and

- precautions taken in the handling of compressed gases (Howard pers. comm. University of California, Berkeley, Campus Planning Office and EIP Associates 1989).

4.10 Upgrade the Existing Waterline (as Needed) to Supply Adequate Water Pressure for Firefighting

An evaluation of the water requirements of the laboratory, the capacity of the water line, and firefighting water pressure needs should be conducted by the university, EBMUD, and the Richmond Fire Department. If upgrading is needed to comply with fire flow requirements the university would be responsible for the cost.

4.11 Install a Security System

The university should install a security system to guarantee the safety of all EPA structures. The security system should be installed in all EPA structures and, if deemed necessary by the EPA, the fenced parking area should also be protected with a security system.

4.12 Reroute and Underground Utilities that Cross the Site, as Proposed in the Project Description

The university intends to work with PG&E to reroute the existing overhead electrical line traversing the project. This line would be rerouted to the southwest side of the project site and undergrounded, as previously agreed to by the university and PG&E. Since the electrical lines at the field station are owned by the university, it would pay for the cost of rerouting and undergrounding.

4.13 Work with PG&E to Identify and Implement a Suitable Alignment for Rerouting the Gas Line Crossing the Site, if Necessary.

The university should work with PG&E to identify and implement a suitable course for rerouting the gas line crossing the site, if necessary. The gas line should be undergrounded with other utilities as proposed in the project description. Since the gas lines are owned by the university, it should pay for the cost of rerouting and undergrounding, if needed.

CHAPTER 5. Hazardous Materials (Substances and Wastes)

INTRODUCTION

This section addresses the presence of hazardous materials (i.e., hazardous substances and wastes) in the vicinity of the EPA laboratory site and the future use, storage, and disposal of hazardous substances at the laboratory.

Common examples of potential hazardous materials problems include:

- presence of businesses that use or manufacture hazardous materials,
- presence of pesticide or herbicide residues or petroleum products used for vegetation management,
- presence of electrical transformers, and
- presence of buildings or residences constructed with materials containing asbestos.

Information Sources

Most of the information presented in this report was obtained from two documents on hazardous substances at the field station. CH2M Hill summarized the results of environmental sampling at the field station in 1988 in a technical memorandum to the University of California. Ensco Environmental Services, Inc. prepared an environmental assessment for the field station in August 1989. Other documents reviewed and incorporated into this report include:

- *Gas and Chemical Storage Facility for Storehouse, Draft Environmental Impact Report* (Baseline Environmental Consulting 1986);
- *Draft Environmental Impact Report on the Proposed Northwest Animal Facility Project, University of California, Berkeley* University of California, Berkeley, (Campus Planning Office, and EIP Associates 1989);

- *Abandoned Site Program Information System* (California Department of Health Services, Toxic Substances Control Division 1989);

- *Hazardous Waste and Substances Sites List* (California Office of Planning and Research, Office of Permit Assistance 1989);

- *Expenditure Plan for the Hazardous Substances Cleanup Bond Act of 1984* (California Department of Health Services, Toxic Substances Control Division 1989); and

- *Zoning Ordinance of the City of Richmond* (Richmond Planning Department 1988).

A site visit was conducted on January 6, 1989, by Jones & Stokes Associates to examine indications of past and present chemical storage, use, and disposal.

Assumptions and Limitations

The tasks performed to assess the significance of existing or future hazardous materials on the site provide a limited amount of information. This evaluation is not intended to be comprehensive, identify all potential concerns, or eliminate the possibility of acquiring land with environmental problems.

The scope of work was limited to a qualitative evaluation of environmental concerns associated with the potential presence of hazardous substances. This assessment did not include inaccessible areas within buildings or underground storage areas; sampling and analysis; or inspections within buildings to evaluate the presence of PCBs or asbestos.

AFFECTED ENVIRONMENT

Regulatory Setting

Definitions

The federal government's definition of hazardous substances in Comprehensive Environmental Response Compensation and Liability Act (CERCLA) refers to definitions within the Toxic Substances Control Act (TSCA), the Clean Water Act (CWA), the Solid Waste Disposal Act (SWDA), and the Clean Air Act (CAA) (Title 15, U.S.C. Section 2606 [a][1]; Title 33, U.S.C. Section 1321 [b][2][A]; Title 42, U.S.C. Section 6921; Title 42, U.S.C. Section 6901; Title 33 U.S.C. Section 1317 [a]; Title 42, U.S.C. Section 7412; and Title 15, U.S.C. Section 2606). The definition is complicated but can be generally summarized as

follows: A hazardous substance is a substance or mixture, other than oil, which may present an imminent and substantial danger to public health and welfare and all natural resources, including the environment and all inhabitants of the environment.

The California Department of Health Services defines the term hazardous material as a substance or combination of substances which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may either: 1) cause, or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating irreversible, illness; or 2) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported or disposed of, or otherwise managed (University of California, Berkeley, Campus Planning Office, and EIP Associates 1989). The definition of hazardous material includes both hazardous wastes and other hazardous substances.

According to the California Health and Safety Code (Section 25124), a hazardous waste is any hazardous material (i.e., toxic, ignitable, corrosive, or reactive) that is abandoned, discarded, or recycled (University of California, Berkeley, Campus Planning Office, and EIP Associates 1989). Specific tests for toxicity, ignitability, corrosivity, and reactivity are set forth in Title 22 of the California Code of Regulations, Sections 66693-66708.

Two types of materials that are usually considered separately from "conventional" hazardous materials are radioactive materials and infectious or biohazardous materials. Radioactive material is any material or combination of materials that spontaneously emit ionizing radiation. Biohazardous material is any potentially harmful biologic material (including infectious agents, oncogenic viruses, and recombinant DNA) or any material contaminated with a potentially harmful biologic material (University of California, Berkeley, Campus Planning Office, and EIP Associates 1989).

Regulatory Agencies

Federal Agencies. The EPA is the principal environmental regulatory agency at the federal level. Other federal agencies involved in the regulation of hazardous materials include:

- U. S. Occupational Safety and Health Administration,
- U. S. Nuclear Regulatory Commission,
- U. S. Department of Transportation, and
- U. S. National Institute of Health.

State Agencies. Within the state, the California Department of Health Services has primary regulatory responsibility, with delegation of enforcement to local jurisdictions that

enter into agreements with the state agency (University of California, Berkeley, Campus Planning Office, and EIP Associates 1989). Other state agencies involved in the regulation of hazardous materials include:

- California Regional Water Quality Control Board,
- California Department of Health and Welfare,
- California Occupational Safety and Health Administration (Cal OSHA), and
- California Office of Emergency Services.

Policies and Regulations

University and EPA policy requires compliance with all applicable state, federal, and local laws, although, neither the university nor the EPA are required to abide by local regulations since the property is owned by the state. The City of Richmond regulates use of hazardous materials within city boundaries.

In addition to the laws governing the use of hazardous materials, federal and state laws also exist to control the generation, transportation, and disposal of hazardous wastes (University of California, Berkeley, Campus Planning Office, and EIP Associates 1989).

Federal Laws. Applicable federal regulations are contained primarily in Titles 29, 40, and 49 of the Code of Federal Regulations. These include:

- Emergency Planning and Community Right-to-Know Act (EPCRTKA),
- Resource Conservation and Recovery Act (RCRA),
- Occupational Safety and Health Act (OSHA),
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA),
- Comprehensive Environmental Response Compensation and Liability Act (CERCLA),
- Superfund Amendments and Reauthorization Act Title III (SARA), and
- National Institute of Health and National Cancer Institute Guidelines for Carcinogens and Biohazards (University of California, Berkeley, Campus Planning Office, and EIP Associates 1989).

Emergency Response to Hazardous Materials Incidents

Pursuant to the Emergency Services Act, the state has developed an emergency response plan to coordinate emergency services provided by federal, state, and local governmental agencies and private persons. Response to hazardous materials incidents is one part of this plan. The plan is administered by the California Office of Emergency Services. The California Office of Emergency Services coordinates the responses of other agencies, including the EPA, the California Highway Patrol, the California Department of Fish and Game, the Regional Water Quality Control Board, the Bay Area Air Quality Management District, and the City of Richmond Fire Department (University of California, Berkeley, Campus Planning Office, and EIP Associates 1989).

In addition, pursuant to the business plan law, local agencies are required to develop area plans for response to releases of hazardous materials and wastes. These emergency response plans depend to a large extent on the business plans submitted by persons who handle hazardous materials, as described above. An area plan must include preemergency planning and procedures for emergency response, notification and coordination of affected governmental agencies and responsible parties, training, and followup (University of California, Berkeley, Campus Planning Office, and EIP Associates 1989).

The EPA must meet state requirements identified in Assembly Bill 2189 if they will be handling at least 50 gallons, 500 pounds, or 200 cubic feet of potentially hazardous materials. This bill, in addition to Assembly Bill 2185, requires preparation of a business plan by businesses or operations using certain quantities of hazardous materials. The State of California has authorized the Contra Costa County Health Department to enforce Assembly Bill 2189. The County Health Department, in turn, has contracted with the Richmond Fire Department to perform facility inspection and verify storage and use of hazardous materials (Howard 1989).

If the EPA intends to handle highly toxic materials, Assembly Bill 3777 requires the preparation of a risk management plan which is regulated by the County Health Department (Howard pers. comm.).

Existing Hazardous Materials Use in the Site Vicinity

Given that the field station's purpose is to provide space for research and that the site is located in an industrial area, many of the adjacent land uses involve hazardous materials or have involved hazardous materials in the past.

Richmond Field Station

The University of California has submitted a business plan to the Contra Costa County Department of Environmental Health which includes an emergency action plan for use in the event of an accident and safety procedures for daily use. The safety procedures provide information on accident reporting, disposal of waste materials, and equipment operation and maintenance (University of California, Berkeley, College of Engineering, Richmond Field Station 1990).

Hazardous substances used at the field station include organic solvents (such as acetone) and acids (e.g., hydrochloric acid). Building 111, located southeast of the laboratory project site, is used to store hazardous materials, including acids. The *Hazardous Materials Business Plan* includes more specific information about chemicals used at the field station (University of California, Berkeley, College of Engineering, Richmond Field Station Administration 1990).

Project Site

Building 128 was previously used by Solid Waste Management and Resource Recovery. The building is presently vacant.

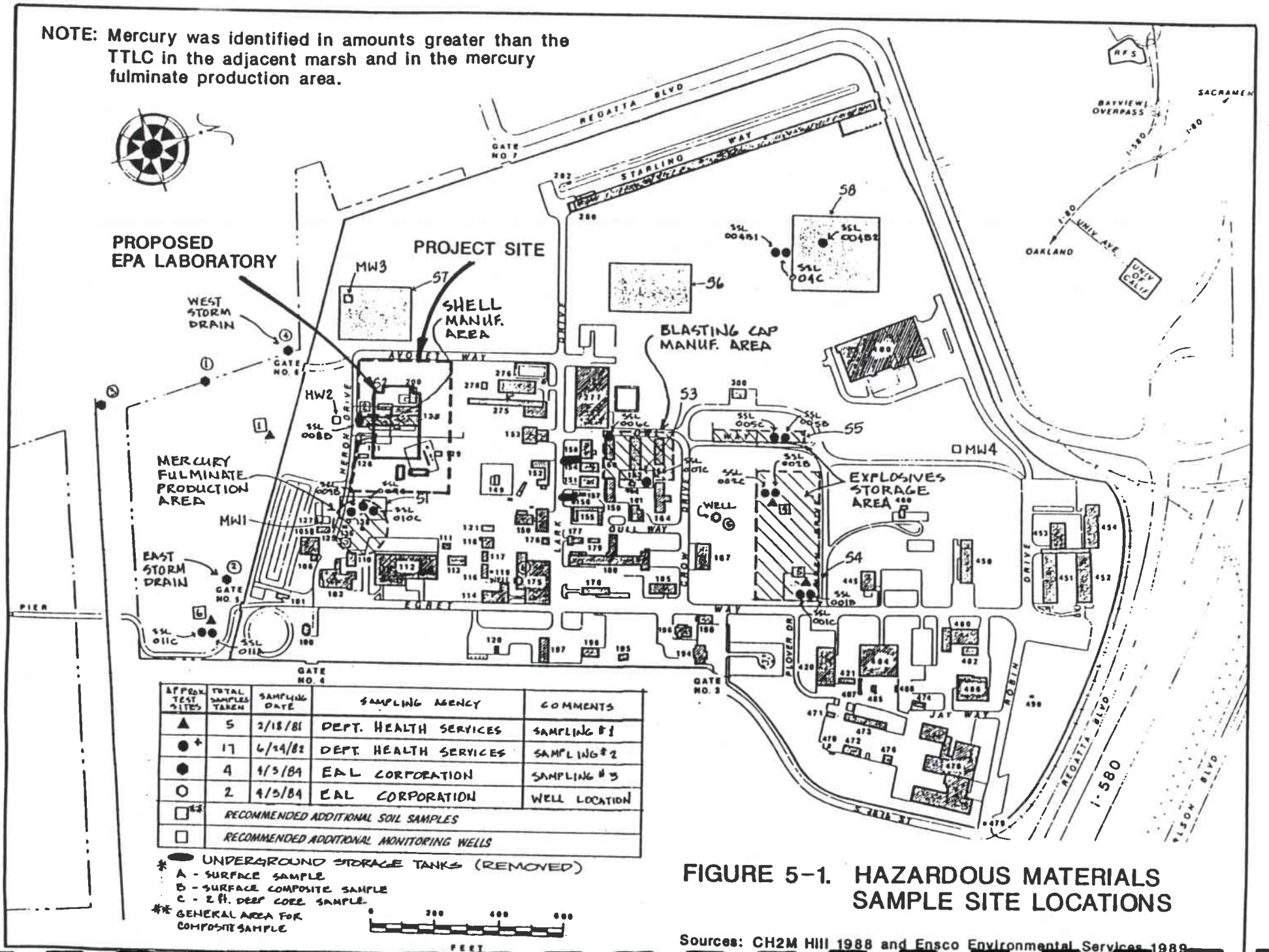
Historical Hazardous Materials Usage at the Richmond Field Station

Between 1850 and 1950 the eastern portion of the field station was used for the production of explosives and munitions and the handling of related hazardous materials. Some time after 1900, California Cap Company purchased portions of the field station from the Hercules Powder Company, one of several explosives manufacturers located at the field station.

By the 1920s California Cap Company had acquired additional field station parcels from other small explosives companies, making it the sole manufacturer of explosives at the site. California Cap Company manufactured explosives until the end of World War II, at which time the property was sold to the University of California (Ensco Environmental Services, Inc. 1989). California Cap Company's facility included a mercury fulminate (an explosive salt) production facility, a shell manufacturing facility, a blasting cap manufacturing facility, and an explosives storage area (Figure 5-1).

In 1950, the field station was sold to the University of California. As part of the purchase agreement, California Cap Company agreed to remove all hazardous materials from the field station (Ensco Environmental Services, Inc. 1989). California Cap Company reportedly complied with this requirement; however, subsequent site testing and onsite observations revealed potential hazardous waste problems. For example, several explosions of unknown magnitudes occurred between 1950 and 1953 when the University of California attempted to clear the vegetation by burning the field station (ICF Technologies, Inc. 1988).

NOTE: Mercury was identified in amounts greater than the TTLC in the adjacent marsh and in the mercury fulminate production area.



APPROX. TEST SITES	TOTAL SAMPLES TAKEN	SAMPLING DATE	SAMPLING AGENCY	COMMENTS
▲	5	2/18/81	DEPT. HEALTH SERVICES	SAMPLING #1
●+	17	6/24/82	DEPT. HEALTH SERVICES	SAMPLING #2
⬢	4	4/5/84	EAL CORPORATION	SAMPLING #3
○	2	4/5/84	EAL CORPORATION	WELL LOCATION
□**	RECOMMENDED ADDITIONAL SOIL SAMPLES			
□	RECOMMENDED ADDITIONAL MONITORING WELLS			

* ⬬ UNDERGROUND STORAGE TANKS (REMOVED)
A - SURFACE SAMPLE
B - SURFACE COMPOSITE SAMPLE
C - 2 ft. DEEP CORE SAMPLE
** GENERAL AREA FOR COMPOSITE SAMPLE

FIGURE 5-1. HAZARDOUS MATERIALS SAMPLE SITE LOCATIONS

Sources: CH2M Hill 1988 and Ensco Environmental Services 1989

Environmental Sampling and Evaluation for Hazardous Materials

The following discussion summarizes the findings of previous hazardous material at the field station.

Department of Health Services Testing - 1981. In 1980, the California Department of Fish and Game, Cal OSHA, the San Pablo Sanitary District, and the University of California became concerned about potential mercury contamination at the field station. The hazardous materials department of the California Department of Health Services began an abandoned site investigation in 1981. Twelve soil samples were taken in 1981 throughout the field station with one sample taken at the project site in the vicinity of the previous shell manufacturing facility (Figure 5-1). Each sample was analyzed for metals and DDT. The results of the testing indicated elevated levels of mercury (Table 5-1). Arsenic, copper, zinc, lead, and DDT were also identified in the samples, but in quantities less than total threshold limit concentrations (TTLCs). The highest levels of mercury were found in the adjacent shoreline marsh, south of the field station and the project site. The marsh sample was a composite sample from six locations in the marsh (ICF Technologies, Inc. 1988).

Department of Health Services Testing - 1982. The Department of Health Services tested the field station again in 1982 to check their previous results. They collected 17 soil samples and analyzed metals, DDT, and DDE. One of the samples was obtained from the marsh and one from the proposed EPA laboratory site. No detectable mercury, DDT, or DDE were identified in the samples. However, arsenic, zinc, copper, and lead were detected in amounts higher than those found in the remainder of the field station, but less than found in the TTLCs (Table 5-1) (ICF Technologies, Inc. 1988).

The California Department of Health Services concluded that no mercury or DDT contamination had occurred on the site and that the Richmond Field Station would be removed from the abandoned hazardous wastes sites list (ICF Technologies, Inc. 1988). The California Department of Health Services submitted a recommendation to the EPA stating that no further action was required.

Bay Area Regional Water Quality Control Board Testing - 1984. In 1984, the Bay Area Regional Water Quality Control Board requested that the university test surface runoff and groundwater for contaminants. The university hired EAL Corporation to test for metals and the results were all below TTLCs. The university did not assess the potential presence of DDT (ICF Technologies, Inc. 1988).

EPA Evaluation - 1988. In 1988, a field investigation team hired by the EPA (ICF Technology, Inc. 1988) determined that no further action under CERCLA was necessary for the Richmond Field Station site and that the site was not eligible for the national priority list because:

- there were no observed releases to the groundwater, surface water, or air; and
- no groundwater or surface water within 3 miles of the site was used for drinking water (ICF Technologies, Inc. 1988).

Table 5-1. Summary of Hazardous Waste Testing at the Richmond Field Station

	Arsenic (ppm)	Chromium (ppm)	Manganese (ppm)	Mercury (ppm)	Lead (ppm)	Zinc (ppm)	Copper (ppm)	DDT (ppm)	DDE (ppm)
CH2M Hill (1988)									
S1-Composite	18	24.6	482	260*	36.4	436.0	223.0	BDL	BDL
S2-Composite	13	30.9	533	0.53	19.0	100.0	47.5	BDL	BDL
S3-Composite	4.4	92.1	554	0.34	16.0	24.5	16.0	BDL	BDL
S4-Composite	5.5	44.7	749	0.39	9.0	30.9	15.0	BDL	BDL
S5-Composite	4.8	49.0	819	0.38	38.1	40.5	24.2	BDL	BDL
S6-Composite	2.8	28.3	372	0.07	7.7	19.0	15.0	BDL	BDL
EAL Corporation (1984)	Below TTLC	Below TTLC	Below TTLC	Below TTLC	Below TTLC	Below TTLC	Below TTLC	Not Analyzed	Not Analyzed
Department of Health Services (1982)	283	–	–	BDL	985	910	577	BDL (Hoffman Marsh)	BDL (Hoffman Marsh)
Department of Health Services (1981)	190	–	–	105*	524	789	506	1.7	–
TTLC standard	500	2,500	No standard	20	1,000	5,000	2,500	No standard	No standard

* Above total threshold limit concentration.
BDL = Below detectable limits.
TTLC = total threshold limit concentration (Title 22 of the California Code of Regulations).

The field investigation team did, however, recommend that the site be held as active for review under the new hazards ranking system expected to be implemented sometime during 1990. The recommendation to keep the site on the active list was based on the following conclusions:

- mercury, DDT, and other metals were originally detected in the soils and water of the shoreline marsh;
- previous sampling appeared to be inadequate to fully characterize site contamination;
- onsite surface water drains directly into the shoreline marsh and could potentially transport contaminants to the aquatic food chain (ICF Technologies, Inc. 1988).

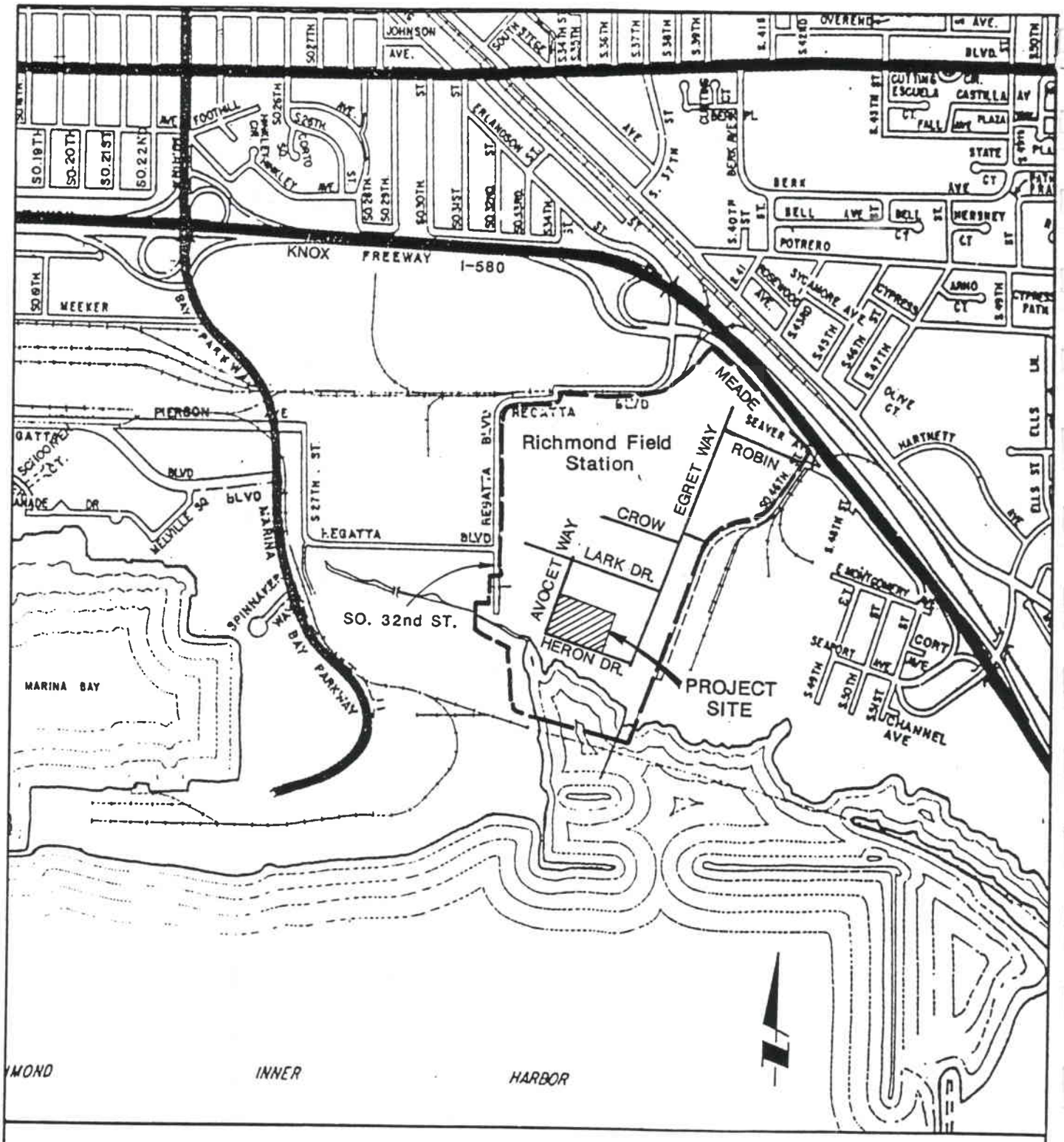
Thus, the field station is currently on the EPA's site evaluation list for further investigation into the potential presence of hazardous materials. It is not on the Superfund national priority site list, although if evidence is found indicating that the site is contaminated, it could possibly be listed on the national priority site list.

CH2M Hill Testing - 1988. At the request of the university, CH2M Hill tested six areas of the field station in 1988 for metals, pesticides, and volatile organics. The property immediately southeast of the EPA laboratory site (the mercury fulminate production area) was tested. No volatile organics or pesticides were detected during the sampling and metals were detected in low quantities over most of the site except for the old mercury fulminate production area. Mercury was observed at 13 times the TTLC at this site (260 parts per million). High concentrations of lead, zinc, and copper were also identified but the amounts did not exceed the TTLCs.

Ensco Environmental Services, Inc. - 1989. Ensco Environmental Services, Inc. prepared an environmental assessment for the field station in 1989 at the request of the university for the purposes of developing a master plan for the field station. Ensco conducted a physical site assessment, contacted knowledgeable persons, reviewed existing documentation, and prepared conclusions and recommendations (Ensco Environmental Services, Inc. 1989).

Several underground fuel and solvent storage tanks were previously located near buildings 119, 154, and 156. These tanks have been excavated and removed from the field station. No contamination of the soil underneath the tanks had occurred (Ensco Environmental Services, Inc. 1989).

Based on a review of historical aerial photographs, interviews with key field station personnel, and a review of available public records, Ensco Environmental Services, Inc. also concluded that soils and groundwater beneath the field station may have been subject to environmental impairment from manufacturing and handling of hazardous materials associated with the long history of industrial activities on the field station and at adjacent sites.



NOTE: DARKENED STREETS INDICATE ARTERIALS

FIGURE 6-1. EXISTING ROAD ALIGNMENTS, RICHMOND CALIFORNIA

Richmond Field Station Roadway Network

The field station is fenced and gated to limit access to authorized persons. The main gate is located near the intersection of South 46th and Meade Streets. A delivery entrance is located at the south terminus of South 46th Street. The main gate is closed on weekends but the delivery entrance is open for general use.

Roadways within the field station that would be used to reach the project site include Robin Drive, Egret Way, Lark Drive, Avocet Way, and Heron Drive.

The university previously considered connecting Lark Drive (also known as Griffin Avenue) to Regatta Boulevard on the west side of the field station to provide access to the EPA laboratory. This entrance would have served the EPA laboratory only and not the entire field station. This circulation pattern has been temporarily abandoned. Instead, the EPA laboratory would be reached by the main gate and would use the field station's existing circulation system. The university plans to evaluate the other circulation pattern as part of their research center master plan at a future date.

Existing Traffic Volumes

South 46th Street at Meade Street

The City of Richmond has traffic counts for South 46th Street near Meade Street, but they are no longer valid due to major changes in the circulation pattern.

The only traffic using South 46th Street (south of I-580) would be that affiliated with either the field station or ICI Americas. Since ICI Americas has a main gate at Meade Street and East Montgomery Avenue, trips generated by ICI Americas at Meade and South 46th Streets are expected to be minimal. With ICI Americas' planned expansion, the total number of trips generated by ICI Americas employees is roughly 185 during morning and evening peak hours (370 trips total) (ICI Americas Agricultural Products 1989). ICI Americas has roughly 450 employees that work different shifts. Delivery trips are expected to be substantially less and are expected to occur mainly in the midday period.

The number of trips generated by the field station fluctuates. The number of people at the field station each day varies from 150 to 300 depending on the research projects that are active. Because many of the research projects employ graduate students, the total number of people at the field station is dependent on class and vacation schedules. Also, most of the researchers are not at the field station on a daily basis, because of class schedules. In addition, the University of California Extension program occasionally offers classes at the field station. Deliveries also account for some of the field station's trips. Given these variables, the number of trips using the main gate of the Richmond Field Station varies from 250 to 600 each day. Most of these occur during standard working hours.

Regatta Boulevard at South 32nd Street

The most recent traffic counts in the vicinity of the field station were obtained on the east-west segment of Regatta Boulevard, near the intersection with South 32nd Street. The counts were collected in May 1989 (Table 6-1).

The 24-hour count for Regatta Boulevard is 3,743. The typical morning and evening peak hour (6:30 a.m.-8:30 a.m. and 4:30 p.m.-6:30 p.m.) averages are 174 and 260 vehicles per hour, respectively. The midday average (10:30 a.m.-2:30 p.m.) is 335 trips per hour. Consumers visiting the Price Club, located at the northwest corner of the intersection of Regatta Boulevard and South 32nd Street, cause the peak volume to occur in the midday hours. The volume to capacity ratio (V/C) of traffic on Regatta Boulevard is currently around 0.40 (City of Richmond Public Works Department 1989).

Public Transportation

Public transportation is provided by Alameda County (AC) Transit. AC Transit bus route number 10 provides service every 30 minutes from the El Cerrito del Norte BART station along Cutting Boulevard to East Montgomery Avenue, near the entrance to ICI Americas, during peak or commute hours. The number 78 bus provides service between 6:00 a.m. and 10:00 p.m. every 20 minutes from the Richmond BART station to 32nd Street and Cutting Boulevard. Use of this route by field station employees would require patrons to cross I-580.

The Comprehensive Service Plan (a master plan for AC Transit) recommends expanding bus route 10 to provide service at 30-minute intervals from 6 a.m. to 10 p.m. (Markowitz 1989).

Shuttle Bus Service

The University of California operates a shuttle bus service between the Berkeley campus and the field station. The first shuttle leaves the Berkeley campus from the Hearst Mining Circle (northwest part of campus) at 7:35 a.m. and arrives at the field station at 7:55 a.m. Beginning at 9:10 a.m., the shuttle bus leaves Hearst Mining Circle on an hourly schedule until 4:10 p.m. The last bus leaves the field station at 5:00 p.m. and arrives at the Berkeley campus at 5:30 p.m. The shuttle bus operates Monday through Friday only.

Table 6-1. 24-Hour Traffic Count for East-West
Regatta Boulevard at South 32nd Street
May 1989

Time	Day	Count
11:30 a.m. - 12:30 p.m.	Tuesday	344
12:30		361
1:30		314
2:30		356
3:30		287
4:30		266
5:30		253
6:30		203
7:30		128
8:30		30
9:30		18
10:30		14
11:30 p.m. - 12:30 a.m.	Wednesday	4
12:30		5
1:30		9
2:30		38
3:30		21
4:30		61
5:30		94
6:30		151
7:30		196
8:30		120
9:30		150
10:30		320
24-Hour Average		3,743

Source: City of Richmond Public Works Department 1989

Bicyclist and Pedestrian Access

Persons move around the field station on foot and by bicycle, although very few (if any) persons use these modes to travel to the field station. This is mainly because the field station is surrounded by industrial and commercial land uses. Few residential areas are located near the field station except for the Marina Bay residential complex and the Richmond Annex, located in the southeast corner of Richmond, north of I-580. The industrial land uses create the impression of a lack of safety and isolation, and the distance factor is a hindrance to biking and walking to work. According to the Richmond Police Department, the industrial portions of Richmond are relatively safe.

In addition, physical barriers to nonautomobile transport restrict pedestrian and bicyclist access. The San Francisco Bay prohibits access from the south and the railroad tracks and I-580 limit access from the north and east. In addition, no designated bicycle or pedestrian paths were observed in the vicinity of the field station.

The City of Richmond and the Bay Conservation and Development Commission have planned a shoreline path (i.e., the regional shoreline trail that will eventually encircle the bay) extending through Richmond and the field station. The trail route would follow the Santa Fe Railroad right-of-way just south of the field station. The plan proposes a pedestrian access trail to the field station and vehicle access and parking southwest of the Bayview overcrossing. Implementation of this plan would increase and facilitate bicycle access to the field station (The Planning Collaborative, Inc. 1988).

Parking

Parking is scattered throughout the field station in small parking lots to provide ready access to each building. Only 50 percent of the field station's parking capacity is used on a typical weekday (Markowitz 1989).

The City of Richmond zoning ordinance recommends that one parking space be developed for every 350 square feet of gross floor area of laboratory activities (City of Richmond Planning Department 1988).

Railroad Lines

Several different railroads operate in the vicinity of the field station. Southern Pacific has a railyard northwest of the field station (Figure 3-1); the Santa Fe Railroad line runs along the San Francisco Bay shoreline south of the field station; the Safeway distribution center has a railyard; and ICI Americas uses a spur. Trains cross Meade Street on an at-grade crossing near the field station. When a train is using this crossing, access between the

Regatta/Erlandson overcrossing and the field station is blocked. This could cause serious traffic congestion given development plans for the south shore area (Markowitz 1989a).

ENVIRONMENTAL CONSEQUENCES

Roadway Network

The EPA laboratory would have one main access point, located at the existing main gate. Deliveries would be handled through gate 3. This access is equivalent to the existing circulation system. Implementation of the proposed project would not change the existing roadway network.

Conclusion:

- o Impact finding: Implementation of the proposed project would not change the existing roadway network.
- o Significance: None assigned.
- o Mitigation measures: None required.

Trip Generation

Operation of the EPA laboratory would increase the number of persons at the field station by approximately 25. Following a 25-percent expansion planned for the laboratory, the total number of EPA laboratory employees would rise to 33. As previously stated, the field station's existing population fluctuates between 150 and 300 persons. The proposed project is expected to add approximately 76 trips to roads in the vicinity of the field station, including the interior network of field station roads: South 46th Street, Meade Street, Seaver Avenue, Regatta Boulevard, and Bayview Street. Most of these trips also would use I-580 at some point.

Thirty-three (maximum) of the EPA trips would occur during the morning peak period and an additional 33 trips would occur during the evening peak volume. The remaining 10 trips would occur throughout the day, mainly during the midday period. When compared to the existing traffic that uses the main gate of the field station (i.e., 250-600 trips per day), the proposed project would equal roughly 15 percent of the field station's traffic at project buildout (includes expansion). Fifteen percent is a substantial increase over existing levels, but existing levels are relatively low. The addition of 76 trips each day through the main gate is not considered significant.

regional development patterns, rather than the result of a few incrementally significant emission sources.

The state 1-hour ozone standard is 0.10 ppm, not to be equaled or exceeded. The federal 1-hour ozone standard is 0.12 ppm, not to be exceeded more than three times in any 3-year period.

Existing Air Quality Problems in Richmond

The potential for the accumulation of pollutants is lower in the vicinity of the field station, as compared to other parts of the Bay Area, because of the frequent strong winds occurring in the area. Richmond has rarely exceeded state and federal ambient air quality standards, unlike other locations in the San Francisco Air Basin. Since 1981, Richmond has had one air pollution violation: the state ozone standard was exceeded in 1983. No violations of the remaining ambient air quality standards were documented by BAAQMD between 1981 and 1988 (Table 7-2) (California Department of Health Services 1989).

Emissions in the Richmond area are mainly from automobiles traveling in Richmond, Berkeley, and Oakland, and from the industrial land uses in Richmond. Chemical plants, petroleum processing, and rock-crushing operations located north and northeast of the field station are considered major point sources for air pollution emissions in the Bay Area (Baseline Environmental Consulting 1986).

ICI, located adjacent to the east border of the field station, emits approximately 0.5 pound of organic compounds (mostly acetone) each year. Trace amounts of other solvents, chemically related to kerosene, are occasionally emitted by ICI. The emissions do not exceed BAAQMD standards, although BAAQMD does not have standards for acetone and kerosene. ICI estimates that approximately 0.5 pound of dust is emitted each year, including 0.45 pound of inert material and 0.05 pound of active material (ICI Agricultural Products 1989).

Air Quality Standards for Toxic Air Pollutants

Few standards exist for emission of hazardous materials into the atmosphere. The National Emissions Standards for Hazardous Air Pollutants provide federal ambient air quality standards for the emissions of nine toxic substances: arsenic, asbestos, benzene, beryllium, cadmium, coke oven emissions, mercury, radionuclides, and vinyl chloride.

Table 7-2. Summary of Carbon Monoxide and Ozone Monitoring Data for the Richmond Monitoring Station

	Parameter	Carbon Monoxide 1985	Carbon Monoxide 1986	Carbon Monoxide 1987	Carbon Monoxide 1988	Ozone 1985	Ozone 1986	Ozone 1987	Ozone 1988
Richmond	Peak 1-hour value (ppm)	8.0	10.0	8.0	8.0	0.09	0.07	0.09	0.07
	Peak 8-hour value (ppm)	4.3	5.0	4.8	5.9	N/A	N/A	N/A	N/A
	Days above standards	0	0	0	0	0	0	0	0

Notes: N/A = Not applicable.
ppm = Parts per million by volume.
Federal 1-hour carbon monoxide standard is 35 ppm; state 1-hour carbon monoxide standard is 20 ppm.
Federal and state 8-hour carbon monoxide standards are 9 ppm.
Federal 1-hour ozone standard is 0.12 ppm; state 1-hour ozone standard is 0.09 ppm.

Source: California Air Quality Data 1985-1988.

filtered in a 99-percent filtration process and the filtered air would be released into the atmosphere. Because of the efficient filtration process, the potential for release of hazardous materials into the environment is expected to be less than significant.

Conclusion:

- Impact finding: The project could result in a minimal amount of hazardous materials being emitted into the atmosphere through the fume hoods.
- Significance: Less than significant.
- Mitigation measures: None required.

Bay Area Air Quality Management District Permit

The BAAQMD requires acquisition of construction and operation permits for projects with equipment that may cause air pollution. Permitting for operations that may release hazardous materials into the atmosphere is also required for projects that use certain quantities of hazardous materials. However, research laboratories are typically exempt from this permit. Exemption would be determined following consultation with the BAAQMD.

Conclusion:

- Impact finding: The project may require air quality permits from the BAAQMD depending on the potential for equipment to cause air pollution, and the quantities of hazardous materials to be used at the laboratory.
- Significance: None assigned.
- Mitigation measures: Consult with the BAAQMD concerning the potential need for a permit for equipment that may cause air pollution and for the potential release of hazardous materials into the atmosphere.

MITIGATION MEASURES

7.1 Reduce Dust at the Construction/Demolition Site with Water Trucks

Methods to reduce generation of dust (i.e., total suspended particulate matter) should be employed during construction and demolition activities, particularly those activities occurring near existing buildings.

7.2 Remove All Asbestos-Containing Materials Prior to Demolition of Structures

The university should remove all asbestos-containing materials (if any exist on site) prior to demolition of structures.

7.3 Consult with the Bay Area Air Quality Management District Concerning the Potential Need for a Permit for Equipment That May Cause Air Pollution and for the Potential Release of Hazardous Materials into the Atmosphere

The EPA should consult with the BAAQMD regarding the possible need for a BAAQMD permit for the release of hazardous materials into the atmosphere.

ENVIRONMENTAL CONSEQUENCES

Construction Noise

Construction equipment and activities typically generate noise levels of 85-90 dBA at a distance of 50 feet, 75-85 dBA at a distance of 100 feet, and 65-75 dBA at a distance of 200 feet from the noise source. Construction noise would mainly affect offices connected with the Naval Architecture and Offshore Engineering Department and the Sanitary Engineering and Environmental Health Research Laboratory. These land uses are about 100-200 feet from the project site. Project construction is expected to generate noise levels of 60-80 dBA. The eucalyptus windbreak would attenuate the noise reaching the Naval Architecture and Offshore Engineering Department. These operations are not considered to be sensitive receptors, but individuals working in these facilities throughout the day would probably find the construction noise annoying.

Construction activities are not expected to affect the Marina Bay residential development because occupied portions of the residential development are no closer than 1,000 feet from the site. The Marina Bay development is the only sensitive receptor in the vicinity of the project site.

Conclusion:

- o Impact finding: Project construction is expected to expose adjacent land uses to noise levels of 60-80 dBA.
- o Significance: Less than significant.
- o Mitigation measures: None required.

Operation Noise

Operation of the EPA laboratory is expected to generate noise from the ventilation system and the boiler building. The noise from these sources would be diffused by walls and other project design features and is thus expected to be insignificant.

Conclusion:

- o Impact finding: Noise from operation of the ventilation system and the boiler would have little impact on adjacent land uses.

- Significance: Less than significant.
- Mitigation measures: None required.

Landscape Maintenance

Operation of landscape maintenance equipment, such as lawn mowers and leaf blowers, would create noise for short periods of time. Landscape maintenance already occurs at other parts of the field station. This impact is expected to be less than significant because of the temporary nature of the noise source.

Conclusion:

- Impact finding: Operation of landscape maintenance equipment would create noise for short periods of time.
- Significance: Less than significant.
- Mitigation measures: None required.

Automobile Trips Generated by the Project

Automobile trips generated by the project are not expected to significantly increase traffic noise in the vicinity of the project site.

Conclusion:

- Impact finding: Additional automobile trips would generate an insignificant amount of noise.
- Significance: Less than significant.
- Mitigation measures: None required.

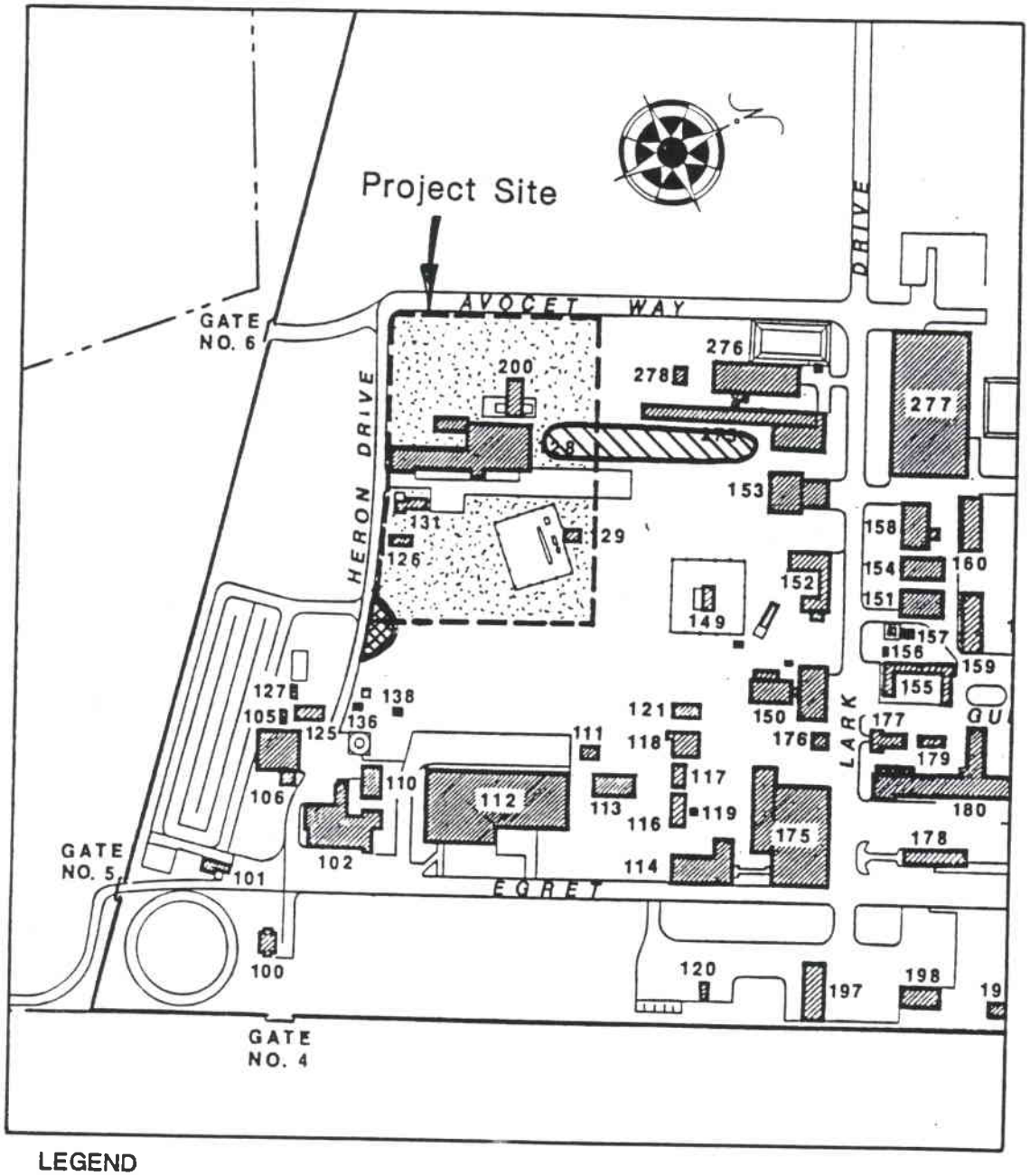


FIGURE 9-1. PROJECT SITE VEGETATION, RICHMOND FIELD STATION

Wildlife

The eucalyptus stand at the field station provides good-quality wildlife habitat because the grove is near other communities, including coastal prairie, annual grassland, and tidal salt marsh. The juxtaposition of different habitat types makes the communities more valuable collectively than individually.

The eucalyptus trees provide important perching, roosting, and nesting substrate for numerous species of birds, including raptors. Red-tailed hawk, great horned owl, and black-shouldered kite have active nest sites in eucalyptus trees at the field station, foraging in the surrounding grassland and marshland habitat (Environmental Collaborative 1989). No raptor nests have been observed on the project site. Other birds that use the eucalyptus include hummingbirds, warblers, sparrows, and finches.

Mowed Grassland

Vegetation

Vacant parcels adjacent to existing structures support grassland that is mowed periodically. On the survey days, these areas supported grass stubble and associated forbs. Most of the grass species were not identifiable. Identifiable species present in the mowed grassland included wild oats, soft chess, ryegrass, ox-tongue, English plantain, mustard, and fennel.

A small patch of saltgrass was identified in the southeastern corner of the project site on the lowest portion of the site. The western half of the project site appears to drain to this corner, helping to support the saltgrass, a facultative wetland species. A centrally located portion of the mowed grassland southeast of building 129 is dominated by what appears to be native bunchgrasses consisting of either purple needlegrass or squirreltail grass. Since the site has been mowed, a positive identification was impossible.

Wildlife

The mowed grassland is not as valuable to wildlife species as native grassland or even introduced annual grassland because of the considerable disturbance to the plant community. Mowed grassland can support some of the species typically found in annual grassland, but in fewer numbers. It provides foraging habitat for small mammals and birds and is occasionally used by raptors for foraging.

Wildlife species commonly found in annual grassland that probably reside in the project site's mowed grassland include California vole, Botta's pocket gopher, western harvest mouse, California ground squirrel, common garter snake, and gopher snake (Environmental Collaborative 1989).

Several raptor species, including red-tailed hawk, black-shouldered kite, northern harrier, American kestrel, and great horned owl, forage throughout the field station grasslands. These species forage mainly in the fields west of Avocet Way and east of building 280. American kestrels are frequently seen perched on the power lines along Avocet Way. Other birds commonly observed on the project site include killdeer, rock dove, mourning dove, black phoebe, Brewer's blackbird, and house finch.

Special-Status Plant Species

For the purpose of this report, special-status plants include species in the following categories:

- species that are currently listed, proposed for listing, or candidates under review for listing as threatened or endangered under the federal Endangered Species Act (50 FR 39526-39584);

- species that are currently listed, proposed for listing, or candidates under review for listing as rare, threatened, or endangered under the California Endangered Species Act (California Department of Fish and Game 1989); and

- species that are considered "rare, threatened, or endangered in California and elsewhere" by the California Native Plant Society (Smith and Berg 1988).

A search of the California Department of Fish and Game (DFG) Natural Diversity Data Base (NDDB) (1989) uncovered no documented occurrences of special-status plant species on the project site. Suitable habitat is present on the project site for only one of the three species recorded by NDDB for the region: the Santa Cruz tarweed. No individuals of Santa Cruz tarweed were observed during the field surveys, and none were reported in surveys earlier this year (Environmental Collaborative 1989).

Special-Status Wildlife Species

For the purpose of this report, special-status wildlife include species from the following categories:

- species that are federally listed, proposed, and candidate threatened or endangered wildlife (50 CFR 17.11 and 17.12 and 54 Federal Register 554-579);

- State of California-listed, threatened and endangered species (California Administrative Code, Title 14, Section 670.5);

- California fully protected species (California Fish and Game Code, Sections 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]); and

- California species of special concern (Remsen 1978 and Williams 1986).

The project site is within the geographic ranges of several special-status wildlife species (Table 9-1). Most of these species are associated with the tidal salt marsh, located 250-400 feet south of the project site. The status of these species at the project site is briefly summarized below.

Special-Status Wildlife Species Associated with Tidal Wetlands

The California black rail, California clapper rail, salt marsh vagrant shrew, salt marsh wandering shrew, San Pablo vole, and salt marsh harvest mouse are typically found in salt marshes and use adjacent herbaceous upland habitats as escape cover during high tides. The salt marsh at the project site provides suitable breeding habitat for these species, and the upland non-native grassland (immediately adjacent to the salt marsh) provides suitable escape cover. The nearest known population for these species is approximately 4-5 miles northwest of the field station (Environmental Collaborative 1989).

Even though these species use upland communities adjacent to marshland, they usually do not venture far from the edge of the water. The salt marsh harvest mouse, for example, typically travels less than 20 feet from the shoreline and is rarely willing to cross a levee, particularly if the levee is lacking cover. Given the distance between the field station's tidal salt marsh and the project site, these species are not expected to be found on the project site.

Other Special-Status Wildlife Species

Salt Marsh Yellowthroat. The salt marsh yellowthroat is a warbler species normally found in marshes of San Francisco and San Pablo Bays. Yellowthroats occupy salt marsh habitats during winter and breed in woody swamps, brackish marshes, and freshwater marshes (Foster 1977). Yellowthroats nest in dense vegetation near water. Willows, coyote brush, mustard, star thistle, and cattails provide suitable nesting substrates for yellowthroats.

The salt marsh yellowthroat has decreased in distribution and abundance in the San Francisco Bay Area. Wetland habitat loss and habitat fragmentation are the primary reasons for their population decline (Foster 1977).

Prior to 1940 in Contra Costa and Alameda Counties, yellowthroats were observed nesting along San Pablo Creek, Wildcat Creek, Cerrito Creek, and Bay Farm Island (Grinnell and Miller 1944).

No yellowthroats were found at those locations during 1975-1976 surveys. Most of the suitable nesting habitat in Contra Costa County has been destroyed. (Foster 1977.) The

Table 9-1. Special-Status Wildlife Species Potentially Occurring at the Richmond Field Station

Species	Legal Status[a] Federa/State	Preferred Habitat	Potential for Regular Occurrence at the Project Site
Black-shouldered kite	--/CFP	Grasslands, wetlands	High
Northern harrier	--/SSC	Wetlands, grasslands	High
California black rail	FC/ST	Coastal salt marsh	None
California clapper rail	FE/SE	Coastal salt marsh	None
Salt marsh yellowthroat	FC/--	Coastal salt marsh and adjacent riparian and scrub habitats	High
Samuel's song sparrow	FC/--	Coastal salt marsh and adjacent riparian and scrub habitats	High
Salt marsh vagrant shrew	FC/SSC	Coastal salt marsh	Low to none
Salt marsh wandering shrew	FC/SSC	Coastal salt marsh	Low to none
San Pablo vole	FC/--	Coastal salt marsh and adjacent areas	Low
Salt marsh harvest mouse	FE/SE	Coastal salt marsh	None

[a] Status definitions:

FE = Federally listed as endangered.
FC = Federal candidate for listing.
ST = State listed as threatened.
SE = State listed as endangered.
SSC = State species of special concern.
CFP = California fully protected.

Source: Natural Diversity Data Base 1989.

nearest recent nesting sites include Kentfield in Marin County (7 miles to the west), and the Napa Marsh in Napa and Solano Counties (approximately 20 miles to the north) (Foster 1977, Natural Diversity Data Bank 1989).

Salt marsh yellowthroats have been observed foraging during the nonbreeding season along the fenceline between gates 5 and 6 at the field station, but no nesting activity has been observed there (Loughman pers. comm.). Low-quality nesting habitat exists in portions of the tidal wetlands at the south end of the field station. No yellowthroats were observed during the field surveys.

Samuel's Song Sparrow. The Samuel's (San Pablo) song sparrow is restricted to the marshlands around San Pablo Bay. The Samuel's song sparrow's habitat has been reduced by urbanization in the southern portion of its range, and the population is now fragmented into small groups of individuals. The nearest recorded observations of this song sparrow are at San Pablo Creek and Wildcat Creek (approximately 4 miles north of the project site). (Jurek 1974.)

Four song sparrow nesting territories have been observed at or adjacent to the field station this year (Loughman pers. comm.). One nest was located near gate 5, and a singing sparrow was observed east of gate 5 near the corner fence. Another singing sparrow was observed at the pond south of gate 5 along the south border of the field station. One juvenile song sparrow was observed near gate 6, but its nest was probably located in the slough adjacent to the field station. This assumption stems from the lack of suitable nesting habitat north of gates 5 and 6, but suitable habitat is present south of these gates. No song sparrows were observed during the field surveys.

Black-Shouldered Kite. Black-shouldered kites nest in riparian and oak woodlands and in other trees, including eucalyptus. Kites forage in grasslands, mowed grasslands, ruderal fields, wetlands, and agricultural fields. A pair of kites was observed nesting in the eucalyptus grove north of the project site (Environmental Collaborative 1989). Kites are frequently observed foraging in the herbaceous habitats at the field station.

Black-shouldered kites are recognized and monitored as "California fully protected" species by the NDDB under Section 3511 of the state Fish and Game Code. Fully protected birds may not be taken or possessed except as authorized by the DFG (Environmental Collaborative 1989).

Northern Harrier. Northern harriers require dense wet meadows and grasslands for nesting and foraging (Call 1978). The coastal prairie and annual grassland at the field station provide nesting and foraging habitat for the harrier (Environmental Collaborative 1989). The mowed grassland of the project site provides marginal foraging habitat because it is near annual grasslands, which are good foraging habitat. Northern harriers have been observed foraging in the field west of Avocet Way during both the breeding and non-breeding seasons.

Conclusion:

- o Impact finding: The project would require removal of 20-30 eucalyptus trees.
- o Significance: Less than significant.
- o Mitigation measures: None required.

Wildlife

The loss of 20-30 eucalyptus would displace birds using the eucalyptus. This impact is considered less than significant because the birds use the trees at the project site less than they use other eucalyptus on the field station and because other eucalyptus are available for relocation.

Conclusion:

- o Impact finding: The project would displace birds using the eucalyptus.
- o Significance: Less than significant.
- o Mitigation measures: None required.

Mowed Grassland

Vegetation

Approximately 2.0 acres of mowed grassland would be removed to construct the project. Additional grassland acreage would likely be affected by construction and support activities. Adverse impacts on disturbed grassland are considered less than significant because disturbed grasslands and the species associated with them are common throughout California.

Conclusion:

- o Impact finding: The project would require removal of roughly 2.0 acres of mowed grassland.
- o Significance: Less than significant.
- o Mitigation measures: None required.

Wildlife

The loss of mowed grassland habitat at the project site would eliminate or displace wildlife associated with this habitat. This impact is considered less than significant because grasslands are common locally and regionally.

Conclusion:

- o Impact finding: The project would eliminate or displace wildlife associated with the mowed grassland habitat.
- o Significance: Less than significant.
- o Mitigation measures: None required.

Special-Status Species

Vegetation

No special-status vegetation is expected to occur on the project site, and only marginal habitat for special-status plant species exists on the project site.

Conclusion:

- o Impact finding: No special-status vegetation has been identified on the site.
- o Significance: None.
- o Mitigation measures: None required.

Wildlife

Special-Status Species Associated with Tidal Wetlands. The California black rail, California clapper rail, salt marsh yellowthroat, salt marsh vagrant shrew, salt marsh wandering shrew, and salt marsh harvest mouse would not be affected by the project because no direct impacts on the salt marsh and adjacent annual grassland would occur.

Conclusion:

- o Impact finding: The project would not affect special-status species associated with tidal wetlands.

- Significance: None.
- Mitigation measures: None required.

Black-Shouldered Kite. The impact on black-shouldered kites is considered less than significant because the reported nest site would not be disturbed by the project. However, some foraging habitat would be eliminated. This loss of foraging habitat is considered less than significant due to its small size and relatively poor quality in its present condition (mowed), as well as the size and quality of foraging habitat adjacent to the site.

Conclusion:

- Impact finding: The project would eliminate mowed grassland foraging habitat for the black-shouldered kite.
- Significance: Less than significant.
- Mitigation measures: None required.

Northern Harrier. Marginal foraging habitat for the northern harrier would be eliminated by the project. This impact is considered less than significant because high-quality coastal prairie and salt marsh foraging habitat occurs near the site.

Conclusion:

- Impact finding: Marginal foraging habitat for the northern harrier would be eliminated by the project.
- Significance: Less than significant.
- Mitigation measures: None required.

Monarch Butterfly. No monarch butterflies have been documented either on the project site or within 500 feet of the site. Thus, elimination of 20-30 eucalyptus trees at the southern end of the grove is not expected to affect the monarch butterflies using the northern portion of the eucalyptus grove.

Conclusion:

- Impact finding: Removal of 20-30 eucalyptus on the project site is not expected to affect the monarch butterfly.
- Significance: Less than significant.
- Mitigation measures: None required.

MITIGATION MEASURES

The EPA laboratory project would not result in significant or potentially significant impacts on the biotic community. Thus, no mitigation measures have been recommended.

Soils

The coastal lowland areas are composed of deep alluvial soils and bay mud. The alluvium has been deposited at the shoreline by runoff from the hills of the East Bay. The bay mud has been deposited from bay tidal action. Shoreline soils consist of soft, gray silty clay (bay mud), with silt, sand, and gravel (Hall, Goodhue, Haisley, and Barker 1986).

The field station's subsurface soil conditions can be divided into two groups, geographically defined as the areas north and south of the City of Richmond's sewer easement in the vicinity of Heron Drive. (See Figure 4-2 for the sewer alignment.)

A profile of the soils in the area north of the sewer alignment is best represented by the logs of two wells drilled at the Richmond Field Station. The soil layers consisted of stiff, silty clay and sandy clay in the upper 8 feet. The clays are underlain by layers of poorly sorted gravel, sand, and clay to a depth of about 40 feet. Clays and gravelly clay layers were encountered from 40 to 90 feet. Pea gravel was encountered from a depth of 90-102 feet. In some locations in this area highly plastic black clay, which may be expansive, is present in the upper 3-4 feet.

The soil profile in the area south of the sewer alignment consists of a surface layer of artificially placed fill, overlying a deposit of soft gray silty clay, commonly referred to as young bay mud. The young bay mud is underlain by a stiffer deposit of silty clay with interbedded sand and gravel lenses called old bay mud. The old bay mud is, in turn, underlain by layers of sand, gravel, and clays, which overlay bedrock.

The project site lies within the Clear Lake clay soil series, which is a poorly drained, fine-textured alluvium. The predominance of clay in the soil results in a high shrink-swell potential. Runoff is typically slow, and the soil is subject to flooding once every 7-10 years in areas lacking surface drainage (U. S. Soil Conservation Service 1977).

Soil Sampling for Hazardous Wastes

High concentrations of mercury have been identified in the soils near the EPA laboratory project site. The mercury was left from a previous mercury fulminate production facility. This issue is addressed in Chapter 5, "Hazardous Materials."

Shoreline Filling

The Richmond shoreline has been altered over the past 100 years as a result of fill activity. Placement of fill material in the field station's shoreline marsh occurred between 1959 and 1968 (Master Plan Geotech). Fill placement at the field station was relatively small scale (less than 15 acres) compared with that at Marina Bay. Between 1930 and 1942

roughly 150 acres of fill was deposited at Marina Bay (Hall, Goodhue, Haisley, and Barker 1986). The project site is located on alluvium approximately 200 feet north of fill placed by the University of California.

Seismicity

Active Faults

Two active faults have the greatest potential to affect the project site: the Hayward Fault and the Wildcat Fault. The Hayward Fault has had major earthquakes registering above 7.0 on the Richter scale in recent history (i.e., 1836 and 1868). Earthquakes of this level are expected at an interval of 50 to 100 years.

The San Andreas Fault, located 15 miles west of Richmond, can also jar Richmond, as evidenced by the October 17 earthquake (7.1 on the Richter scale) centered near Watsonville, California in the Santa Cruz Mountains, approximately 80 miles south of the project site. Groundshaking caused a number of Bay Area structures to collapse, but the field station fared well. Damage was limited to one object falling from a shelf (Bell pers. comm.)

The greatest earthquake on the San Andreas Fault occurred in 1906 and measured greater than 8.0 on the Richter scale. An earthquake of this magnitude may recur at 100-to 1,000-year intervals. Smaller earthquakes occur more frequently on all three faults (Hall, Goodhue, Haisley, and Barker 1986).

Ground Shaking

Ground shaking may result in transformation of the ground surface (lateral spreading and lurching) near the shoreline. Lateral spreading and lurching can influence structures in this area (Hall, Goodhue, Haisley, and Barker 1986a). Ground shaking would be amplified at the field station because of the low shear strength of unconsolidated soils (Rutherford & Chekene 1989).

Tsunamis

Tsunamis, also known as seismic sea waves, have been documented in San Francisco Bay. The probable maximum extent of a tsunami in the bay would be approximately 7.0 feet above mean sea level. A wave of this size could possibly reach the project site, which is at the 10-foot contour (above mean high tide). Tsunamis of this magnitude are expected to occur at 500-year intervals (Hall, Goodhue, Haisley, and Barker 1986).

Liquefaction

Ground shaking can result in a phenomenon called liquefaction. This occurs when sand, silt, or gravel becomes saturated with water and loses its strength. Alluvial deposits, such as those found on the project site, are susceptible to liquefaction. The project site is located between two areas of the field station that have the potential for liquefaction: the fill areas along the shoreline and loose sand lenses in the northern part of the field station (Hall, Goodhue, Haisley, and Barker 1986, Rutherford & Chekene 1989).

ENVIRONMENTAL CONSEQUENCES

Soils

The high shrink-swell potential, low strength, and poor drainage of Clear Lake clay can influence construction of roads and structures. This impact is considered to be potentially significant. Proper construction techniques, such as the use of deep foundations, can minimize this impact.

Conclusion:

- o Impact finding: The high shrink-swell potential of Clear Lake clay soils could affect construction.
- o Significance: Potentially significant.
- o Mitigation measures: 10.1 Use deep foundations to mitigate for expansive soils, if necessary.

Project construction could temporarily leave soils uncovered allowing soils to erode. This impact would be easily mitigated with proper construction techniques.

Conclusion:

- o Impact finding: Soils left exposed during the construction period could be subject to erosion.
- o Significance: Less than significant.
- o Mitigation measures: 10.2 Secure soils exposed during the construction period.

Seismicity

Ground Shaking

Ground shaking could potentially affect the stability of structures near the bay shoreline. This could result in a potentially significant impact. Placement of buildings greater than 100 feet from the shoreline (as is the case with the proposed project) greatly reduces the potential for structural problems from lateral spreading and lurching.

Even though no serious emergencies have resulted from previous earthquakes at the field station, the potential for a sizable earthquake does increase the risk of structural damage to the facility. To reduce this risk, the project should be consistent with Title 24 of the California Administration Code, as required by law and the *University Policy on Seismic Safety*.

Conclusion:

- Impact finding: Ground shaking could potentially result in structural damage.
- Significance: Less than significant.
- Mitigation measures: 10.3 Comply with Title 24 of the California Administrative Code and the *University Policy on Seismic Safety*.

  10.4 Perform a site-specific geotechnical investigation of the project site.

Ground shaking could also result in the spilling or leakage of stored chemicals at the facility. The possibility of a chemical spill at the laboratory as a result of ground shaking is considered potentially significant because of the conceivable hazard to human health and the environment.

Conclusion:

- Impact finding: Ground shaking could potentially result in a chemical spill.
- Significance: Potentially significant.
- Mitigation measures: 10.5 Use interior design techniques to prevent objects from falling.

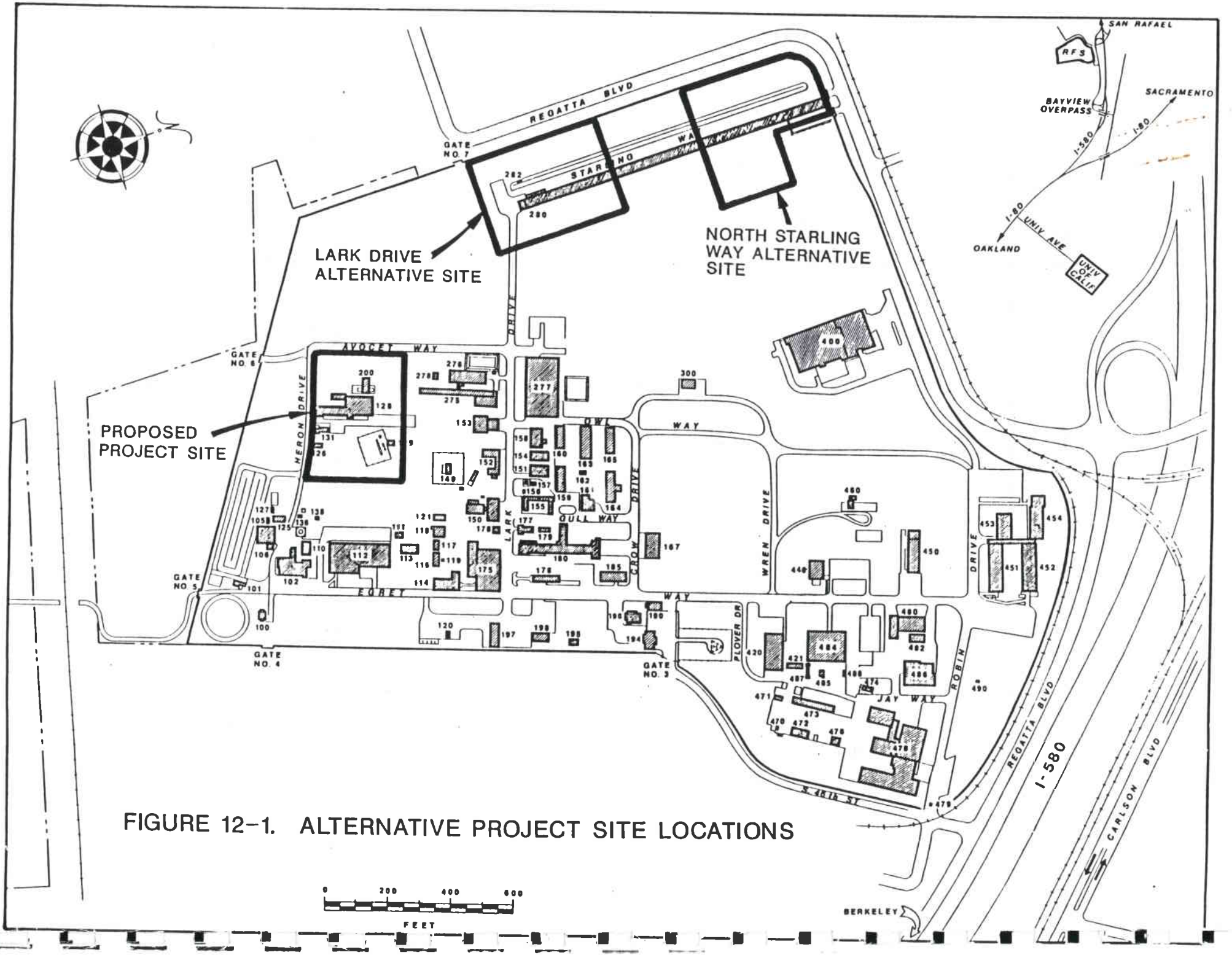


FIGURE 12-1. ALTERNATIVE PROJECT SITE LOCATIONS

Existing land uses and habitat types include annual grassland, coastal prairie grassland, wetland vegetation, a warehouse, a concrete channel modeling the flow of the Kissimee River, and Starling Way. These uses would be converted to a laboratory, parking lot, and accessory buildings.

Those persons traveling to the laboratory would have vehicle access via Regatta Boulevard near the Price Club at a location identified as "Gate 7" by the University of California. Lark Drive would be extended through the field station to Regatta Boulevard to serve the laboratory, but through traffic would not be permitted from Regatta Boulevard to the field station via Lark Drive (Hufferd pers. comm.). (The university plans to eventually open Lark Drive to serve as a public entrance to the research center once the master plan is implemented.)

The Lark Drive site contained potential COE jurisdictional wetlands that would be eliminated as part of the laboratory project. The EPA chose to withdraw this site from consideration based on the presence of these potential COE jurisdictional wetlands. Thus, further identification of impacts associated with this alternative is unnecessary.

North Starling Way Alternative

The 4.2-acre North Starling Way Alternative is located at the north end of Starling Way, approximately 800 feet north of the Lark Drive Alternative (Figure 12-1). The site is "L-shaped" to accommodate the planned expansion of the Northern Regional Library Facility. The north end of the site extends 400 feet in an east/west direction along Regatta Boulevard. The south portion of the site extends 600 feet along Regatta Boulevard.

This alternative is similar to the Lark Drive Alternative except for the proposed access. The North Starling Way Alternative would likely be reached by the southward extension of 34th Street from Regatta Boulevard. The extension of 34th Street to Lark Drive and the expansion of Lark Drive to Regatta Boulevard would not be implemented under this alternative. These changes in circulation patterns may be implemented in the future as part of the master plan the university is preparing.

This site was chosen as an alternative to the Lark Drive site to avoid coastal prairie grassland and minimize impacts to COE jurisdictional wetlands identified east of building 280. However, this alternative site was also withdrawn from consideration when it was determined that potential COE jurisdictional wetlands were present on the site. Thus, further identification of impacts associated with this alternative is unnecessary.

No-Project Alternative

Project Description

Under the No-Project Alternative, a new EPA laboratory would not be constructed at any location in the San Francisco Bay Area. The EPA would continue to use the Las Vegas, Nevada laboratory for their environmental programs. The field staging area currently located in Alameda would be moved to Treasure Island. This project is not consistent with the objectives of the proposed project of developing a regional laboratory in the bay area.

Land Use and Policy Issues

Under the No-Project Alternative, the site would remain as currently developed in the short term. Views of the site and from the site would not change. However, since the university intends to develop a research center at the field station, one could reasonably expect that the site would be developed with research and development land uses in the near future.

Public Utilities and Services

Implementation of the No-Project Alternative would result in no increase in demand for public services and facilities at the field station. Unlike the proposed project, this alternative would not require the relocation of existing gas lines, electrical lines, and the drainage system. This alternative would not subject the EPA laboratory to the possibility of flooding in the event a significant storm coincides with extreme high tides.

Hazardous Materials

Under the No-Project Alternative, no hazardous materials would be brought to the site.

Circulation

Circulation would remain in its existing condition under the No-Project Alternative.

Air Quality

Air quality would not change under the No-Project Alternative.

Noise

Noise levels would remain as they currently exist under the No-Project Alternative.

Biotic Resources

The biotic resources of the project would not be disturbed under the No-Project Alternative.

Geology and Soils

Seismic hazards such as tsunamis and ground shaking would have no impact on the EPA laboratory under the No-Project Alternative.

Cultural Resources

Unknown cultural resources potentially on the site would remain undisturbed under the No-Project Alternative.

4.13 Work with PG&E to Identify and Implement a Suitable Alignment for Rerouting the Gas Line Crossing the Site, if Necessary.

The university should work with PG&E to identify and implement a suitable course for rerouting the gas line crossing the site, if necessary. The gas line should be undergrounded with other utilities as proposed in the project description. Since the gas lines are owned by the university, it should pay for the cost of rerouting and undergrounding, if needed.

7.1 Reduce Dust at the Construction/Demolition Site with Water Trucks

Methods to reduce generation of dust (i.e., total suspended particulate matter) should be employed during construction and demolition activities, particularly those activities occurring near existing buildings.

7.3 Consult with the Bay Area Air Quality Management District Concerning the Potential Need for a Permit for Equipment That May Cause Air Pollution and for the Potential Release of Hazardous Materials into the Atmosphere

The EPA should consult with the BAAQMD regarding the possible need for a BAAQMD permit for the release of hazardous materials into the atmosphere.

10.2 Secure Soils Exposed During the Construction Period

Bare soils should be secured during the construction process. Construction should be done during the dry season, if possible.

10.3 Comply with Title 24 of the California Administrative Code and the University Policy on Seismic Safety

Construction of the EPA laboratory should comply with the provisions of Title 24 of the *California Administrative Code,* using the most recent edition of the *California Uniform Building Code* for seismic standards. Title 24 gives specifications and design formulae to reduce seismic hazards in new buildings. Project implementation should also comply with the *University Policy on Seismic Safety* as administered by the Campus Seismic Review Board. Design details should be consistent with recommendations by a California-registered engineering geologist to be retained by the developer (Campus Planning Office, University of California, Berkeley, and EIP Associates 1989).

10.4 Perform a Site-Specific Geotechnical Investigation of the Project Site

Onsite geotechnical investigations should be conducted under the direct supervision of a California-certified engineering geologist. The investigation should address anticipated ground acceleration at the building site and the potential for structure displacement caused by seismically induced vibration (Campus Planning Office, University of California, Berkeley, and EIP Associates 1989). Geotechnical investigations should be conducted at the project site prior to construction to identify potential liquefiable soils, such as bay mud, sand, silt, or clay.

The engineering geologist should present recommendations for the abatement of geotechnical hazards at the site, consistent with the provisions of the *University Policy on Seismic Safety* (Campus Planning Office, University of California, Berkeley, and EIP Associates 1989).

11.1 Stop Work if Cultural Resources Are Revealed During Project Construction

Although no evidence of cultural resources was identified during the field survey, resources may potentially exist below the ground surface, particularly beneath placed fill material. If cultural resources are observed during future construction activities, work should be stopped at least 100 feet from the site until a qualified archeologist can inspect the resource and decide on further action, which may include testing, evaluation, and mitigation (Holman & Associates 1989).

Measures Recommended to Mitigate Potentially Significant Impacts

4.3 Ensure the Project's Indoor Areas Are Above Potential Future Flood Levels, Determine the Risk of Site Flooding, and Reduce This Risk to an Acceptable Level, If Deemed Necessary

The EPA, the University of California, and the project developer should ensure that the indoor portions of the laboratory are elevated above potential flood levels resulting from heavy rains and extreme high tides. Structures should be designed to withstand the forecasted level and frequency of flooding. Chemical storage should be elevated above forecasted flood levels. In addition, the university should determine the available capacity of the field station's storm drainage system at the highest high tide. The university, in coordination with the Richmond Public Works Department, should determine how much additional capacity would be needed to prevent flooding of the laboratory project site during storm events. This information should be used to determine the risk of flooding on the project site. If the risk is considered high, the university should implement measures to reduce the potential for flooding to an acceptable risk level.

5.1 Continue to Implement Safety Precautions Taken at the Las Vegas Laboratory and Prepare a Hazardous Materials Business Plan

The EPA should continue to implement safety precautions taken at the Las Vegas laboratory regarding requirements for fire extinguishers, use of fume hoods, storage of hazardous substances and wastes, handling of chemical spills, and disposing of waste materials. The EPA should also prepare a hazardous materials business plan as previously suggested in this chapter in the section entitled "Hazardous Materials Management Planning." This plan would outline types and quantities of hazardous materials and wastes to be located at the laboratory, compliance with Richmond's hazardous waste regulations, evacuation procedures, and an employee training program for handling hazardous materials.

5.2 Assess the Potential Presence of Mercury at the Former Mercury Fulminate Production Area, Assess the Health Risk, and Complete the Appropriate Remedial Action, If Necessary

The university is continuing to test for mercury and other hazardous materials throughout the field station. A sampling plan proposed by the university and Jonas & Associates is currently under review by the EPA. Jonas & Associates has proposed sampling for mercury and nitrite/nitrate near the proposed project site. Both mercury and nitrogen are components of mercury fulminate, which was previously produced at the field station near the southeast corner of the project site. Jonas & Associates will test three composite samples near the former shell manufacturing facility (building 128, which is on the project site). In addition, they will test two samples collected from the former blasting cap manufacturing area (located near buildings 165, 163, and 160), and six samples from the former explosive storage area (located north of building 167 and south of Wren Drive). (Jonas & Associates 1990b.) Figure 4.7 shows the manufacturing and storage locations in relation to the proposed project site.

Once the extent of the mercury contamination is clearly documented, the university, in coordination with the EPA, will prepare a remediation plan to contain the hazardous waste. Remedial actions may include:

- installing fences, warning signs, or other security or site control precautions;
- implementing drainage controls to reduce environmental migration;
- capping the contaminated soils to reduce environmental migration;
- using chemicals or other materials to retard the spread of the release or to mitigate its effects;
- excavating, consolidating, or removing highly contaminated soils from drainage ditches to reduce environmental migration; or

- o containing, treating, disposing, or incinerating hazardous materials to reduce the likelihood of human, animal, or food chain exposure. (Jonas & Associates 1990a.)

The level of significance following mitigation measure implementation would range either from significant and unavoidable to less than significant. If the mitigation measures cannot contain the hazardous material, the impact would be considered significant and unavoidable.

report on the proposed Northwest Animal Facility project, University of California, Berkeley. (SCH# 89071809.) Campus Planning Office. Berkeley, CA.

_____. Community Development Department and EIP Associates. 1989. Draft environmental impact report for Contra Costa County solid waste management plan/county general plan amendment for COSWMP landfill sites. Martinez, CA.

Ensco Environmental Services, Inc. 1989. Environmental Assessment of University of

APPENDIX A. Zoning Ordinance of the City of Richmond Special Industrial District

25. ON-SITE ACCESSORY USES.

a. Those uses that are clearly incidental and accessory to those uses listed above, may be allowed if they are sited within the property boundaries of the primary use. Including but not limited to the following:

1. Administrative offices.
2. Food service facilities.
3. Recreation amenities including private landscaped open space.
4. Parking lots.
5. Outdoor storage and activity areas meeting the required conditions of the district.

b. The following accessory uses may be permitted if approved by the Commission according to the procedure set forth in Section 15.04.190.

1. Motor vehicle, rail or water terminal for freight or passengers.
2. Radio, telephone, or television transmitters and dish-type receivers requiring licensing by the Federal Communications Commission.
3. Schools or instructional facilities, including day care facilities.
4. Any accessory uses determined by the Planning Director to exhibit nuisance characteristics including but not limited to the emission of noise, smoke, vapor, odor, dust, light, glare, or excessive vibration (refer to Standards of Operation, Section 15.04.145 C.).

26. SUPPORT USES AS PRIMARY USES.
The following uses may be permitted if approved by the Commission according to the procedure set forth in Section 15.04.190.

a. Administrative services including information processing and management and records storage.
b. Commercial facilities (e.g. retail, general offices, lodging).
c. Industrial services.
d. Institutional, educational and recreational facilities.
e. Parking lots.

D. USE OF HAZARDOUS MATERIALS.

1. Standards: The permitted on-site quantities and uses of hazardous materials for an activity are listed in Table 1.

2. Definition of Hazardous Materials and Hazardous Materials Quantities.

a. Hazardous Materials. Hazardous materials classifications and definitions are from Appendix VI-A of the Uniform Fire Code, 1988 edition. This reference to the 1988 Uniform Fire Code is for the purposes of definition only. These terms are also further defined in Titles 29 and 49, Code of Federal Regulations (Fed-OSHA; Transportation). Hazardous Materials belonging to more than one category are subject to the regulations of the more stringent category.

b. Bulk Plant. Hazardous materials at the bulk plant level are primarily manufactured, synthesized, processed, blended, or packaged. Materials are stored in large fixed containers. Bulk plant quantities are larger than the amount transported in or out in any single shipment.

c. Bulk Storage and/or Distribution. Hazardous materials at the bulk storage or distribution level are primarily collected, repackaged, blended or stored on-site; may be used or sold on-site. The materials are generally transported to the site in an unpackaged form and are then transferred to the activity's storage container by hose, pipeline, conveyor belt, etc. On-site usage of rail car, tanker truck, or similar vehicle for storage is considered at this quantity level.

d. Commercial Packaged. Hazardous materials at the commercial package level are stored in discrete containers which are handled individually, palletized or unitized for purposes of transportation. Packaged materials are used or sold on site. Packages may include cylinders, drums, boxes, glass jars,etc.

e. Lab Amounts. Hazardous materials at the lab amount level are primarily those amounts which are less than Commercial Packaged amounts, are generally recognized by the industry as that which is required for normal laboratory research and development activities, and which, if an incident were to occur, would not have impacts beyond the immediate premises.

f. Household Packaged. Hazardous materials at the household packaged level are packaged and distributed in a form intended or suitable for sale through retail sales outlets for consumption by individuals for purposes of personal care or household use.

3. Permitted. Conditionally Permitted and Not Permitted Uses of Hazardous Materials.

TABLE 1

	HI Bulk Mfg Plant	HI Bulk Stor &Dist	HI Comm Pkg Amts	HI Lab Amts	LI/R&D Bulk Mfg Plant	LI/R&D Bulk Stor &Dist	LI/R&D Comm Pkg Amts	LI/R&D Lab Amt
EXPLOSIVES AND BLASTING AGENTS High explosives Peroxides capable of detonation Low explosives Blasting Agents	NO	CUP	CUP	P	NO	NO	NO	P
TOXIC MATERIALS Class A & B poisons	CUP	CUP	CUP	P	NO	CUP	CUP	P
HIGHLY UNSTABLE MATERIALS Organic peroxides Class I-II Oxidizers Class 4 Phyrophoric materials Unstable materials Class 4-3 Water-reactive materials Class 3	CUP	CUP	CUP	P	NO	CUP	CUP	P
RADIOACTIVE MATERIALS In amounts licensed by State	NO	CUP	P	P	NO	NO	CUP	P
MODERATELY HAZARDOUS MATERIALS Corrosives Flammable gases Flammable liquids Flammable solids Organic peroxides Class III Oxidizers Class 3-2 Water-reactive materials Class 2	CUP	CUP(a)	P	P	CUP	CUP(a)	P	P
MATERIALS WITH LIMITED HAZARDS Combustible liquids Irritants Oxidizers Class 1 Organic peroxides Class IV-V Sensitizers Unstable materials Class 2-1 Water-reactive materials Class 1	P(b)	P	P	P	CUP(a)	P	P	P

Permissibility: P = Permitted, CUP = CUP required, NO = Not permitted

Notes:
(a) If stored underground, then permitted outright.
(b) If one-half mile or closer to a residentially zoned or developed parcel, school, college or hospital, then a CUP is required.
(c) If conflicts arise between Table 1 and Section 15.04.145 C.1 through 26, the more restrictive regulations shall apply.

See next page for qualifiers and exceptions.

4. Qualifiers and Exceptions

a. In addition to these regulations, all storage or use of hazardous substances must be approved by the Fire Chief and be in conformance with all applicable fire and building codes.

b. Unless otherwise stated in Table 1, packaged quantities of hazardous substances for on-site use or sale are permitted in the zones.

c. Household Packaged hazardous substances are exempt from these provisions; however, the provisions of Section 15.04.193 may apply.

d. An existing use would be subject to Table 1 requirements if the quantity of material used increases to a higher quantity level or the category of chemicals used changes to a higher (more hazardous) category (e.g. a change from a Moderately Hazardous Material to a Toxic Material).

5. Conditional Use Permit Review for Hazardous Substances Use. Required CUP for hazardous substance use shall be processed as follows:

a. Procedures: Same as outlined in Section 15.04.190 of the Richmond Municipal Code.

b. Evaluation Factors: Factors to be evaluated in reviewing requests shall include, but are not limited to:

1. The amount of, and level of hazard presented by the substance;
2. Safety measures being proposed;
3. The potential for odors and toxic fumes;
4. The number of people and amount of land and structures which would be at risk if there were a major accident;
5. Location of the site in relation to identified areas of special environmental concern such as water courses, water wells, underground aquifers, or fish and wildlife habitats;
6. Location of the site in relation to designated routes for the transport of hazardous substances; and
7. Any other public welfare concerns identified by the staff.

c. Approval Criteria: The request may be approved if it is found:

1. The activity will not create an unreasonable risk to the public health and safety or to the surrounding properties and activities; and

H. AREA.

1. MINIMUM SETBACKS FOR BUILDINGS (Letters and numbers in parenthesis indicate minimum landscaping and screening requirements as defined in Section 15.04.145 I.)

	HI	LI/R&D
Minor Streets	10 '(L1)	15'(L1)
Collector Streets	25' (L1)	25'(L1)
Side property lines, except where they abut a street than street setbacks apply	10'	10'
Rear property lines, except where they abut a street than street setbacks apply	0'	0'
Abutting residential parcels and recreational amenities	15'(S3)	15'(S3)

2. MINIMUM SETBACKS AND LANDSCAPING REQUIREMENTS FOR EXTERIOR DEVELOPMENT:

Exterior development is permitted <u>only</u> in the HI Areas with the following minimum setbacks and landscaping requirements (see Section 15.04.145 I for definitions of landscaping requirements).

a. <u>Exterior Activities</u>: outdoor processing, assembly, or fabrication of goods; maintenance, repair and salvage of equipment.

Minor Streets	10'(L1/S2)
Collector Streets	25'(S2/L1 & L2)
Side and rear property lines, except where they abut a street than street setbacks apply	0'(S2)
Abutting residential parcels and recreational amenities	0'(S3)

b. <u>Exterior Storage:</u> includes outdoor storage of raw or finished goods including gases, oil, chemicals, gravel, etc.; building materials, packing materials, salvage goods, machinery, equipment, damaged vehicles, etc.

Minor Streets	10'(L1/S2)
Collector Streets	25'(S2/L1 & L2)

2. b. Exterior storage (continued)

Side and rear property lines except where they abut a street than street setbacks apply	0'(S2)
Abutting residential parcels and recreational amenities	0'(S3)

3. PAVING

a. HI zones: Exterior development subject to vehicular traffic and accessible by driveway and/or curb cuts shall be paved per the requirements of the Department of Public Works.

b. LI/R&D zones: All exterior development, exclusive of landscaped areas, shall be paved.

4. EXTERIOR DEVELOPMENTS NOT MEETING THE STANDARDS SPECIFIED ABOVE IN SECTION 15.04.145 H.2.

a. Exterior developments may not be expanded into required setback areas.

b. Expanded exterior development areas must comply with the regulations of this section.

c. Exterior development expansions over 1,000 square feet shall require compliance with all street side landscaping and screening regulations for the entire development. If there is less than two feet available for street side landscaping and screening, only an S2 screening is required.

d. Exterior development areas in zones where not permitted may continue, but may not be expanded. In addition, they must be landscaped and screened if the primary use is modified by:

1. Expansions of floor area over 20 percent; or
2. There are additions, alterations or repairs exceeding 50 percent of the value of the existing building or improvement; or
3. There is change of use to another activity category.

The landscaping and screening shall meet the standard for exterior storage in that zone.

I. LANDSCAPING AND SCREENING.

1. <u>Minimum materials for required landscaping</u>:

a. Open areas: Required open areas shall be landscaped, seeded or left in natural condition, and may include trails, pathways, recreational areas or furniture for pedestrians. Open areas may not be paved, graveled, filled, excavated, covered by structures, or used as storage areas.

b. L1: Green growing ground cover. May include grass, shrubs, perennial flowers, and vines. Plantings should be made in such number or size to cover 100 percent of the landscaped area within two growing seasons. Where required ground cover areas are 15 feet or wider, a line of trees shall also be provided at the rate of one tree for every 30 lineal feet, or fraction thereof. Where required ground cover areas are less than 15 feet wide, trees may be required.

c. L2: Low hedge. May include hedge plants and shrubs. Plants should be of such type and number to reach a height of three feet within three years and to be of such density as to be at least 75 percent opaque year round.

d. L3: High hedge. May include trees, hedge plants and large shrubs. Plants should be of such type and number to reach a height of six feet within three years and to be of such density to be at least 75 percent opaque year round.

e. S1: Low solid screen. A fence or wall three to four feet high and fully sight obscuring. May be painted, view obscuring wood board fence or masonry wall of uniform material that is designed and constructed to withstand a 15 pound-per-square foot wind load and deterioration resulting from contact with soil, vermin and weathering. Wire fences with dark colored, durable, matt finishes (both wire and posts) and vinyl slats are permitted if also planted with fast growing trees, hedge plants, upright shrubs or evergreen vines and used in combination with L1 or L2 landscaping.

f. S2: High solid screen. A screen six to eight feet high and sight obscuring. May be painted, view obscuring wood board fence or masonry wall of uniform material that is designed and constructed to withstand a 15 pound-per-square foot wind load and deterioration resulting from contact with soil, vermin and weathering. Wire fences with dark colored, durable, matt finishes (both wire and posts) and vinyl slats are permitted if also planted with fast growing trees, hedge plants, upright shrubs or evergreen vines and used in combination with L1 or L2 landscaping. May also be a masonry wall with lattice work resulting from an open brick pattern or use of open masonry blocks.

g. S3: Solid wall. A wall six to eight feet high and fully sight obscuring. The wall may be masonry, brick, concrete or exposed aggregate and is designed and constructed to withstand a 15 pound-per-square foot wind load and deterioration resulting from contact with soil, vermin and weathering.

h. Street trees. Street trees shall meet the requirements of the Parks and Landscaping Division of the Public Works Department.

APPENDIX B. Common and Scientific Names of Wildlife Species Potentially Occurring on the EPA Laboratory Site or Mentioned in the Text

APPENDIX O

POPULATION AND EMPLOYMENT ANALYSIS

APPENDIX O. POPULATION AND EMPLOYMENT ANALYSIS

This section examines the potential effects of the proposed project on population and employment in the City of Richmond. According to Appendix G of the California Environmental Quality Act Guidelines (State CEQA Guidelines), a project will normally have a significant effect on the environmental if it will induce substantial growth or concentration of population.

SETTING

POPULATION

Contra Costa County

Population

Contra Costa County encompasses 720 square miles of land area and 18 incorporated cities. The social environment is diverse, ranging from the older urban areas along the San Francisco and San Pablo Bays to the predominantly rural areas in the east county. The area between the East Bay hills and the Diablo Range to the east represents the largest expanse of the county and includes 10 of the 18 incorporated cities (e.g., Concord, Walnut Creek, Antioch, and Pleasanton) and over half of the more than 790,000 county residents (Association of Bay Area Governments 1989).

The county's total population is comprised of more than 303,000 households, which is 14.9% higher than in 1985, when the figure stood at 266,500. The average household consisted of 2.65 people in 1985 (Contra Costa County Community Development Department 1989).

The county grew from a population of 100,450 in the 1940s to 555,389 in 1970. The county population expanded almost 300% from 1940 to 1950, 140% from 1950 to 1960, and another 140% from 1960 to 1970 (Contra Costa County Community Development Department 1989, Association of Bay Area Governments 1989). The rate of growth in the county over the last 20 years has ranged from a low of 0.6% between 1973 and 1974 to a high of 2.8% from 1978 to 1979, with growth averaging 1.7% (Association of Bay Area Governments 1989). With a population increase of 20.4% since 1980, Contra Costa County became the fastest growing county in the Bay Area during the 1980s (Table O-1). The county models statewide trends for migration, which accounts for slightly over half of the county's growth (Contra Costa County Community Development Department 1989).

Population Projections

Projections by the Association of Bay Area Governments (ABAG) indicate that 71,000 people will be added to the county's population over the next 5 years (1.8% each year). Total county population is expected to increase by 52,000 between 1995 and 2005 (1.2% each year), and another 33,000 will be added between 2000 and 2005 (0.74% each year; Table O-1). County projections show a gradual tapering off of population growth. Fifty-eight percent of the new residents will locate in eastern Contra Costa County (Antioch, Brentwood, and Pittsburg). With 35% opting for the central portion of the county (along the Interstate 680 [I-680] urban corridor), the remaining 6% would be expected to locate in the western section of the county.

This growth will be at odds with job availability, with 73% of new jobs located in central Contra Costa County and only 13% going to the west county area. This imbalance will be most pronounced in the eastern portion of the county, where 58% of the new residents will locate, but job growth will only increase by 14%. This trend will exacerbate the jobs/housing balance, creating further transportation problems. These population figures are based on ABAG assumptions for future national, regional economic, and regional demographic activities (Association of Bay Area Governments 1989).

City of Richmond

Population Statistics

Although the City of Richmond was not incorporated until 1900, urbanization of the city can be traced back to the 1890s, when the city began to exhibit the industrial character that would be the catalyst for its growth over the next 50 years. During the World War II expansion period between 1940 and 1943, the city's population grew from 23,234 to over 100,000; most of this growth was stimulated by the presence of the major shipyards along the southern shoreline. Many workers were housed in dormitories and other temporary housing, some of which still exists today (Hall, Goodhue, Haisley & Barker 1987).

Postwar Richmond has seen little new development and in fact has experienced a population decline, with the population ranging from 70,000 to 80,000. More recently, some former industrial lands have been converted to nonindustrial uses in the hilltop area (Hall, Goodhue, Haisley & Barker 1987), the brickyard area, and along Marina Bay.

Richmond lagged behind the county growth rate in the 1980s, but is now growing steadily at an estimated rate of 1.2% per year (Table O-1). Growth is expected to taper off again

after 1995. The population currently stands at about 98,800 (Association of Bay Area Governments 1989).

The number of housing units in Richmond has increased from 33,621 in 1980 to an estimated 38,630 in 1990, representing a 15% increase in the last 10 years. The vacancy rate increased from 3.35 to 4.97% between 1980 and 1989, reflecting a reduction in use of older structures in the central and southern areas of the city. Recent substantial growth has occurred in various areas of north Richmond, most notably the Hilltop Mall area (Farah pers. comm.). Lower birth rates have caused a decline in persons per household to 2.575; this decline corresponds closely with the county figure of 2.595 (California Department of Finance 1989).

Population Projections

The populations of Richmond and those areas in its sphere of influence (El Sobrante; north Richmond; and several small, unincorporated areas) are expected to increase from 98,000 in 1990 to 105,600 in 2005 (Table O-1) (Association of Bay Area Governments 1989). This represents a 6.8% increase in total population, compared with a 20% increase in population for the county. Most of this growth could be located in currently undeveloped areas along San Francisco and San Pablo Bays. (Farah pers. comm.).

Future housing development in Richmond is expected to occur on the bayfront in south Richmond, in the Brickyard Cove, and in Marina Bay. The areas around Hilltop Mall and the Chevron tank farm are also experiencing growth in residential land uses. Construction of the north Richmond bypass (also known as the Richmond Parkway), connecting I-580 and I-80, is expected to attract growth in the vicinity of the parkway. Most of these developments will be complete by 1995. ABAG projections indicate that 5,900 new households will

exist in the City of Richmond by 2005 and that most available land (as defined by current general plan policy) will be developed (Association of Bay Area Governments 1989).

EMPLOYMENT

Contra Costa County

Employment Sector Growth

The county has extensive and varied transportation facilities: ports accessible to ocean-going vessels, railroads, freeways, and rapid-transit lines connecting the area with Alameda County and San Francisco. These advantages, combined with a mild climate and available land, make Contra Costa County attractive for both industrial and residential uses (Contra Costa County Economic Development Department 1989).

The county enjoyed a healthy employment growth rate in the period from 1960 to 1990, nearly tripling the number of persons employed (Table O-2). The county ranked fourth in employment growth among nine Bay Area counties during this 30-year period, with a rate approximately 40% greater than the average for the Bay Area counties. Contra Costa County's predominant employment sectors involve services and retail trade, which together account for over 50% of total jobs. Other sectors that make up a large portion of the county's employment include construction; manufacturing; transportation, communication, and utilities; and finance, insurance, and real estate (FIRE). Government and wholesale trade constitute a small portion of the county's employment.

Those sectors that have grown the fastest over the past 10 years include FIRE (an average of 8.9% per year) and construction (an average of 6.1% per year). Those sectors that have shown the least growth include government (0.8% per year); manufacturing (0.5% per year);

and transportation, communication, and utilities (1.6% per year). Overall, employment in the county has grown an average of 4.5% each year over the past 10 years. Table O-3 summarizes ABAG estimates and projections for the various employment sectors. (Association of Bay Area Governments 1989.)

The county's labor force grew an estimated 31% between 1980 and 1990, from 321,141 to 421,000. In the next 10 years, nearly 89,800 workers are expected to be added, representing a 21.3% increase (Association of Bay Area Governments 1989).

Unemployment

The county boasts an unemployment rate that is relatively low compared with other California counties; this trend was consistent through both the 1970 and 1980 censuses, during which the county had unemployment rates of 4.9% and 5.8%, respectively (Contra Costa County Community Development Department 1989). The unemployment rate rose sharply in 1982 because of a recession but has fallen steadily in years since, from 8.0% in 1983 to 4.6% in 1988 (Table O-4).

Employment Projections

ABAG estimates that in the 1980-1990 period 90,500 new jobs were created in the county (an average increase of 2% per year) and that by 2005 another 96,700 jobs will be added (representing an average increase of 4% each year over the 1990 figure) (Table O-5). County unemployment is also expected to rise over the next 5 years because jobs are expected to grow more slowly than population. (Contra Costa County Economic Development Department 1989).

In the coming decade, the proportion of jobs related to services and finance, insurance, and real estate will increase, while the proportion of government; retail trade; and transportation, communications, and utilities jobs will decrease (Association of Bay Area Governments 1989).

City of Richmond

Employment Sector Growth

Richmond's labor force over the 1970-1980 period grew from 32,439 to 33,005. This 1.7% increase lags well behind the county growth of 44% for the same period (Contra Costa County Community Development Department 1989). Richmond's lack of immigration and the aging population structure probably account for this extremely low labor force growth rate. Labor force participation for residents over 16 years of age remained stable at approximately 59%, which is compatible with the county figure. The City of Richmond, including its sphere of influence, is expected to add 6,000 employed residents from 1990 to 2005, which would representing a 6% increase in total employed residents.

From 1980 to 1990, an estimated 6,186 new jobs were created in the City of Richmond, representing a job increase of 18.1%. This figure lags behind the county increase of 20% (Association of Bay Area Governments 1989).

Unemployment

Unemployment in Richmond over the 1970-1980 period rose from 6.9% to 9.3%. These figures contrast with the county figures of 4.9% and 5.8%, respectively, and are high compared to most other California cities (Contra Costa County Community Development Department 1989).

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WRT
121 Second Street, 7th Floor
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September 12, 1989

Dear Ms. Dietzgen,

RE: ADDITIONAL RESEARCH INTO HISTORIC STRUCTURES ON THE RICHMOND FIELD STATION PROPERTY, RICHMOND, CONTRA COSTA COUNTY, CALIFORNIA

At your request I have just completed a re-inspection of the Field Station property to visually evaluate the age of the structures there; the question had come up whether or not any of the existing structures might be considered important by either state or federal law. There are differences in how the state and federal governments treat the issue of historic significance, which I will explain below. First I would like to list those properties which I believe have at least one of the qualities for a potential determination of significance, namely that of age.

1. Building 190:
this is a two storey stucco with wood trim building with a hipped "dutch" style roof. Extensively remodeled, the building is presently being gutted--it would appear that they are tearing out the lath and plaster and are installing sheetrock at least on the first floor. This building may date to the 1920's or earlier.

2. Building 196:
next to building 190, this two storey bungalow style building still retains its original outer sheething--1x4 shiplap siding on the first storey, with shingles continuing up the second storey to evolve into a diamond pattern shingling into the eves. The inside of this building has recently been re-sheetrocked, but architectual details, such as the interior trim, the ballusters and exterior trim point to construction during the 1920's or earlier; similar trim elements are found on houses dating to the turn of the century in San Francisco.

3. Buildings 152,155,159,160,161,163,165 and 100:
these buildings are all found in the southern central portion of the project, with the exception of building 100, which is located at the southeastern corner of the property along what I now believe was the original shoreline before the filling began.

All of these structures are build of wood; coved siding, large window areas and low peaked roofs suggest that with the exception of building 100 (approximately 20x20 feet in size), these buildings were used as barracks or offices. The style of building and the construction details are similar to structures found around the Bay Area build directly before or during World War II.

The remainder of the buildings found inside the grounds are varieties of utility buildings built of three styles of corrugated iron; some of them have additions of cinder block, others are mostly built of wood, with a 1x8 v-rustic siding being the most common. These wood buildings may also date from the war period. By a simple visual examination, there is no way to determine the age of the steel buildings.

With rare exception, the buildings inside the property are in good to excellent shape, and most are evidently being used for one thing or another. Future development plans may have to deal with the buildings however, if there are plans to tear them down. Depending on who ends up buying the property, the actual treatment of the historic structures will fall under either state or federal guidelines for cultural resources. The differences between the California Environmental Quality Act (CEQA) and the National Environmental Protection Act (NEPA) are found more in the manner they are utilized by local planning agencies when development plans are submitted. The CEQA process is generally more lax about how a determination is made concerning the significance of an historic structure, the NEPA process, under Section 106 guidelines for the determination of eligibility to the National Register of Historic Places, is by far and away more detailed and time consuming.

If the structures listed in this letter become a planning issue, these are the criteria which will be used to judge whether they are significant or not:

1. Age of structure:
   under CEQA guidelines, this is a vague marker; buildings older than 50 years, depending on their location, are sometimes considered significant. For the federal government, any building build prior to the <u>end</u> of World War II is considered historically significant based upon age.

2. Architectual style:
   unique examples of a particular style are considered to be important by both state and federal agencies

3. Buildings or locations which figure in local history, or associated with important local persons or events:
   these factors are used by both state and federal agencies to determine the significance of a building.

Criteria 1 and 2, should they become an issue, are research areas best done by a qualified architectual historian. Such an individual would be able to critique the design of a building, and approximate its age based upon design criteria. Criterion 3, producing an historical sketch of the buildings, their occupants and a description of their uses historically, is work which can be done by a qualified historical archaeologist or historian.

My best guess is that if the project ever gets reviewed under CEQA, none of the buildings would be considered significant based either on age or architectual style; the buildings' place in local history is anyone's guess--again, I suspect that local historical concern for the historical significance of the field station as a whole would be low.

Under federal guidelines however, the buildings might be considered significant based upon age (they probably all predate World War II). Architectual style is another criterion now considered more important; at a meeting with CalTrans last month, part of the discussion was about the importance of wartime housing/barracks at the federal level of review.

I would like to close by pointing out that these are only possible scenarios which might come into effect if and when the area is considered for development or re-use of existing structures; a further level of research into the significance of the buildings on the property may be required.

Sincerely,

Miley Paul Holman
Holman & Associates

APPENDIX Q

SAMPLING AND ANALYSIS REPORT
RICHMOND FIELD STATION

Jonas & Associates Inc.

SAMPLING AND ANALYSIS REPORT

RICHMOND FIELD STATION

December 24, 1990

Q

SAMPLING AND ANALYSIS REPORT

UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION
Richmond, California

December 24, 1990

Prepared for:

University of California
Richmond Field Station
47th Street and Hoffman Boulevard
Richmond, California 94804

Prepared by:

Jonas & Associates Inc.
1056 Dale Place
Concord, California 94518

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SAMPLING AND ANALYSIS REPORT
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

1.0 INTRODUCTION

The University of California (UC), Richmond Field Station (RFS) is located at 1301 South 46th Street in Richmond, California 94804. Beginning in the 1840s, several explosives manufacturing companies were operating in an area that is now the south-eastern portion of RFS. At the beginning of the 1900s, the California Cap Company (CCC) bought the land and one of the explosive manufacturing operations from the Hercules Powder Company.

CCC ceased operations at the end of World War II in 1945. UC purchased the property in 1950. The property is currently owned and operated by UC. Several different facilities, including research laboratories and administrative offices are located on this property. Currently, the United States Environmental Protection Agency (EPA) is considering construction of a laboratory at the site of the former shell manufacturing area. Due to the proximity of this proposed building to a former explosives manufacturing facility where mercury fulminate was produced, on December 1989, the University of California Richmond Field Station initiated a Removal Site Evaluation (RSE) - Engineering Evaluation/Cost Analysis (EE/CA) at the former mercury fulminate and shell manufacturing areas. Jonas & Associates Inc. (J&A) was retained in December 1989, to conduct this investigation.

In addition to the investigation initiated by the UC, EPA requested that UC perform a site characterization of the entire RFS. As a result, a Sampling and Analysis Plan (SAP) was prepared and submitted to EPA for review and approval. Upon incorporation of EPA's comments and approval of the October 11, 1990 SAP, field investigation began. Soil, water and submerged sediment samples were collected from October 17, 1990 through December 1, 1990. This report summarizes the results of this site characterization investigation.

2.0 SAMPLE COLLECTION AND ANALYSIS

As discussed in Section 1, Introduction, of this report, sampling and analysis of soil, sediment and surface water have been performed. Samples were collected and analyzed with respect to the requirements of the October 11, 1990 Environmental Sampling and Analysis Plan for the Richmond Field Station. Data were analyzed per Contracts Laboratory Program (CLP) procedures. Appendix A presents a table of the results.

A total of eight areas were identified for sampling. These areas are: 1) former mercury fulminate; 2) former shell manufacturing; 3) marsh, slough and the Bay; 4) former explosive storage; 5) former test pit; 6) former blasting cap manufacturing; 7) Buildings 118, 120, and 121; and 8) background. These areas are identified in figure 2-1.

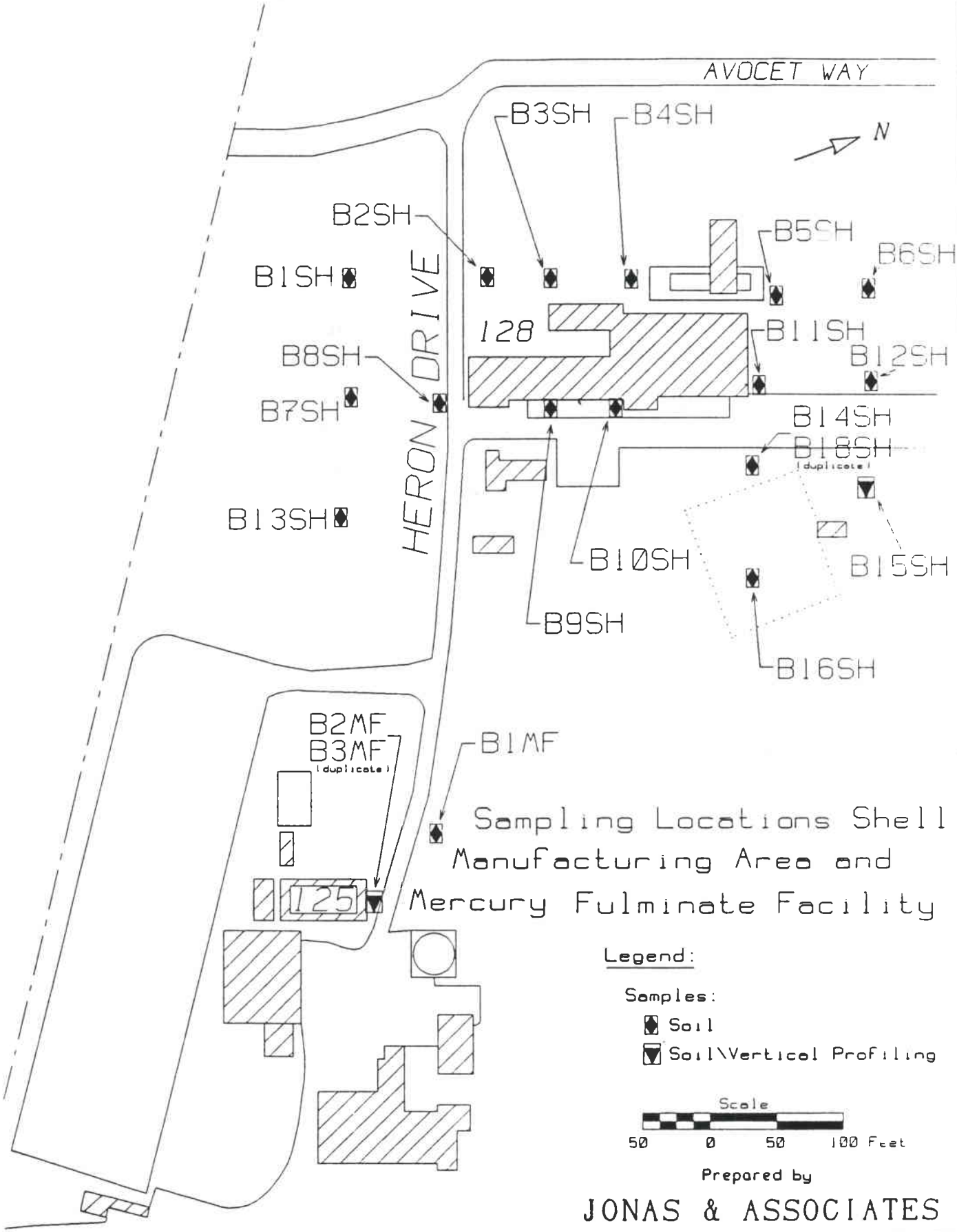

Figure 2-2

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Figure 2-2

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2.3 Marsh Area

Approximately 30 acres of salt marsh are located southeast of RFS. Parts of the salt marsh have been filled by both UC and the CCC. The salt marsh was divided in 1959 by the construction of the Santa Fe Railroad embankment. The construction of the rail line was the result of a 1943 easement granted to the Santa Fe Land Improvement Company by CCC. UC, upon purchase of RFS, took over the easement agreement. This rail line connected the post office on Pt. Isabel to Marina Bay, and was in use until the early 1980s. The rail line has been partially torn up and the right-of-way is planned to become part of a trail around the Bay (Mikklesen 1989).

According to a report prepared by Dr. Joyce Gutstein (1989a) another change made in the marsh was the demolition of a section of an old pier. The pier had been in existence since at least 1899 and originally extended from the shore to the slough. In its earlier history it was used for the unloading of barges to a narrow gauge rail line which terminated at the pier. The inner marsh portion of the pier was demolished by the UC in 1976 and replaced with a road. The road was then moved to its present location to comply with Bay Conservation and Development Commission requirements. The onsite Sanitary Engineering Environmental Health Research Laboratory (SEEHRL) uses the pier and a small pumping station at the end of the pier for the pipeline which transports baywater from an offshore platform to SEEHRL. No other structures are present in the marsh.

According to a previous report by ICF, Department of Health Services, during a 1981 sampling event identified mercury and DDT in the marsh.

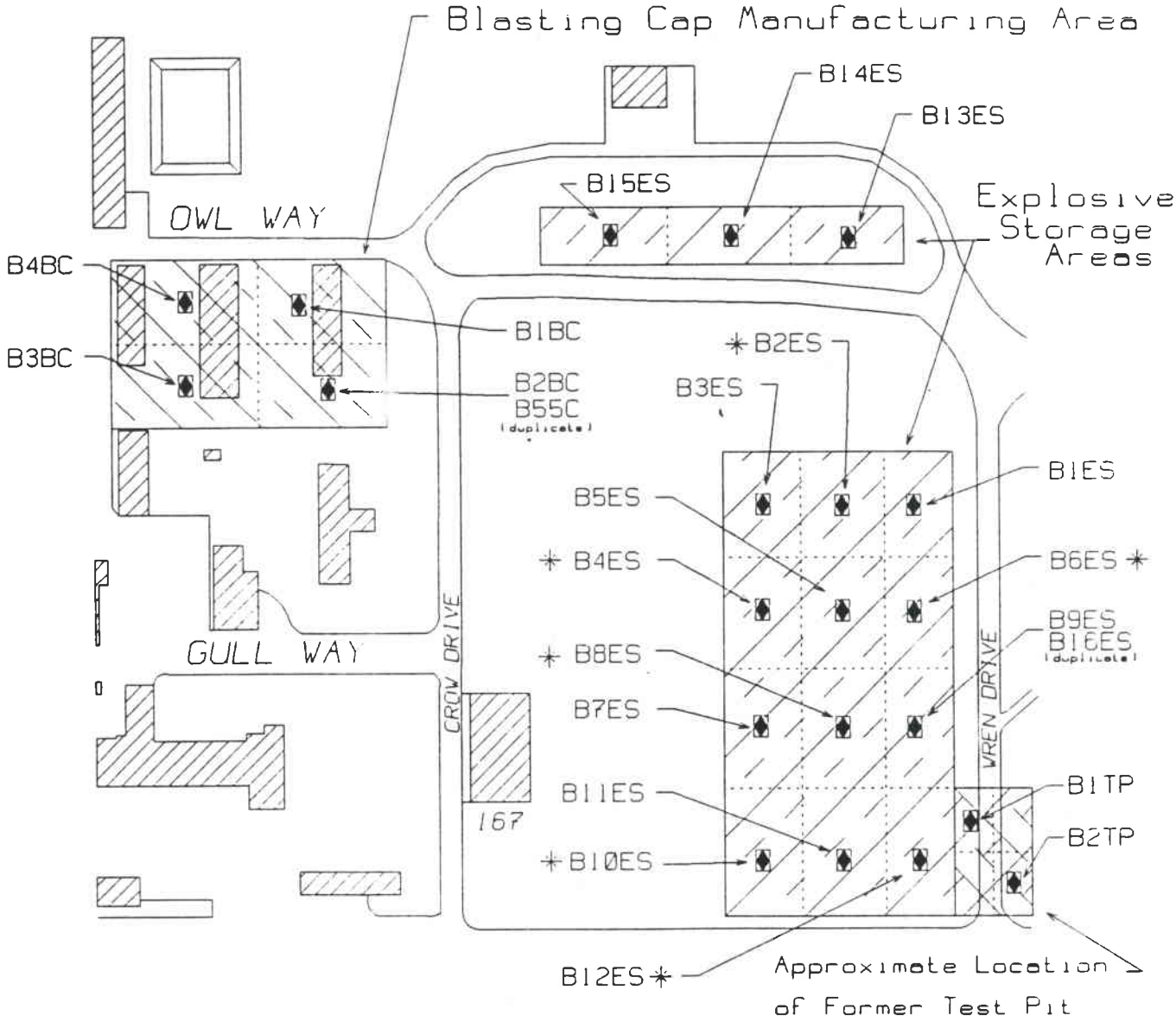
In order to assess chemical concentrations in the marsh area, ten discrete soil samples and one duplicate were collected from the marsh area, based on a 200 by 100 foot grid pattern. Sample locations are identified in Figure 2-3. Soil samples were collected from a depth of 0.5 to 1.0 feet. These samples are identified as B1MA through B11MA, in this report.

Five surface water samples with one duplicate and five submerged sediment samples with one duplicate were collected from the four surface water "pools" located in the marsh area at the time of sampling. One drainage water and one submerged sediment sample were collected from the west storm drain. Since the east storm drain was dry, only a sediment sample was collected.

Three sediment samples were collected from the slough running northwest by southeast of the RFS, located at the edge of the marsh area. Four surface water samples (two flood tide and two ebb tide) were also collected from this slough. Two surface water and two sediment samples were collected from the Bay. One composite submerged sediment sample was collected from two locations at the end of the pier. Another composite soil sample was collected from two locations where the pier meets the old Santa Fe Railroad right-of-way.

All samples were analyzed for TAL Metals. Two of the marsh samples located northeast of the marsh and two of the samples located northwest of the marsh, were also analyzed

Figure 2-4



Legend:

Samples:

Soil

* These samples will be analyzed only if other concentrations in the area are significant

Scale

75 0 75 150 Feet

N

Sampling Locations - Former Explosive Storage and Blasting Cap Areas and Test Pit

Prepared by

JONAS & ASSOCIATES

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			AJ 12-20-1990

Date: 12-20-1990	Figure 2-4	Drawing Number
Scale as shown		

2.7 Buildings 118, 120, 121

Small amounts of chemicals have been stored outside Buildings 118, 120, 121. On September 19, 1990, J&A conducted a site visit of these buildings and surrounding lots. The purpose of the site visit was to interview facility personnel familiar with the chemical/waste storage and disposal activities at these buildings and to identify any areas that might require characterization.

During the site visit several areas of surface soil discoloration were observed. The discoloration consisted of a black staining in all cases and no greater than two stained areas were observed per building. These stains corresponded with previous temporary drum storage areas adjacent to Buildings 118, 120, and 121. Based on the information provided by RFS personnel, kerosene was a suspected chemical near Building 118; thinner (mineral spirits), kerosene, and petroleum hydrocarbons near Building 120; and diesel fuel near Building 121.

One discrete soil sample per location was collected from the stained soil areas near Buildings 118, 120, and 121. Figure 2-5 presents the locations of these samples. Since diesel and kerosene waste are excluded from Federal regulations under 40 CFR, Part 261 and 262, State requirements were followed with respect to the required analyses. The soil samples were analyzed for Total Extractable Hydrocarbons (EPA Method Number 8015) and Total Volatile Hydrocarbons (TVH) with Benzene, Toluene, Xylene and Ethyl Benzene (BTX&E) (EPA Method 8015 modified/8020). These analyses were performed to assess any potential soil contamination that may have been present, as a result of previous chemical storage activities.

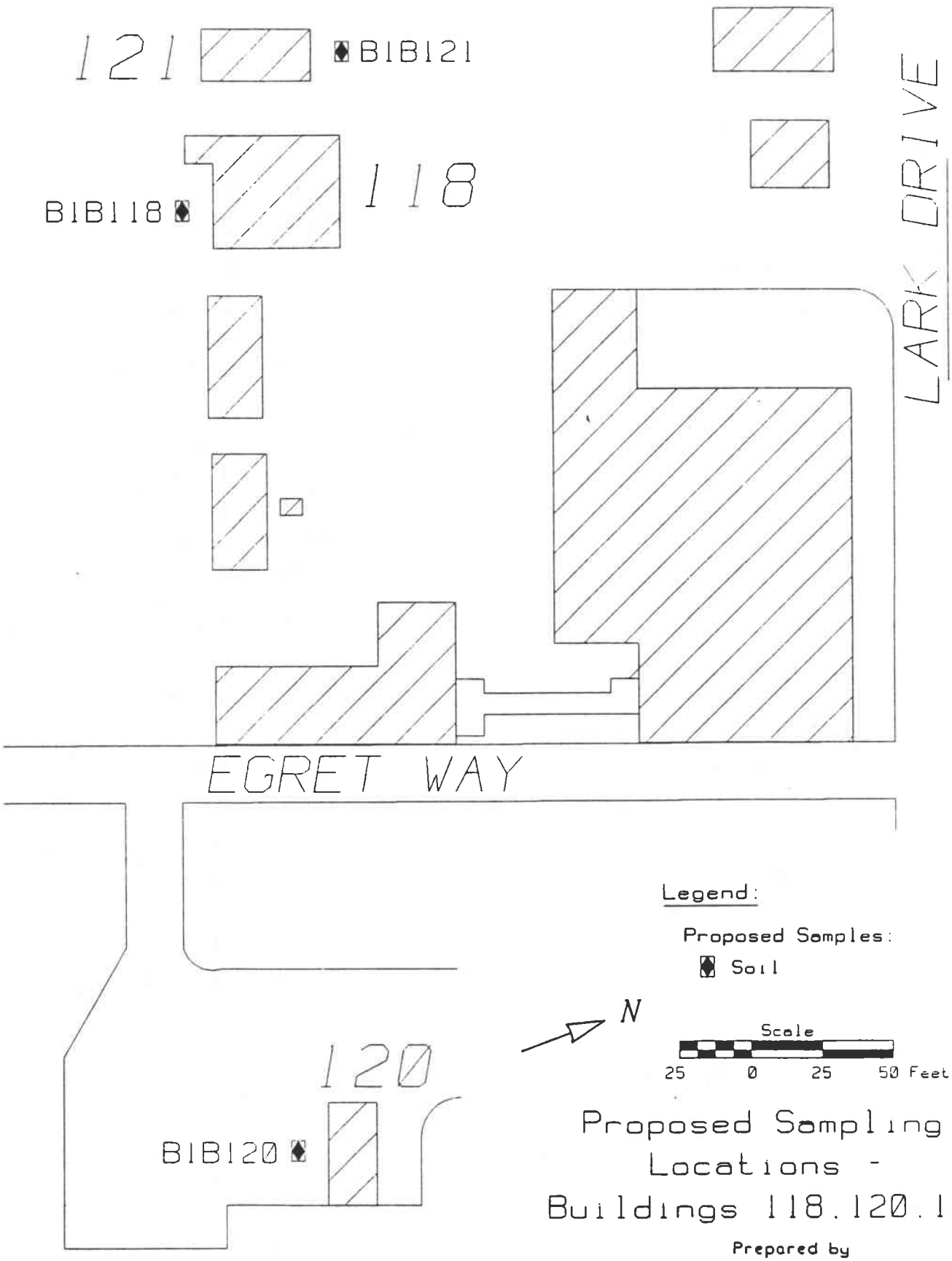
2.8 Background Samples

From historical reports of the Richmond Field Station, the area adjacent to Building 400 appears to have had little if any impact by activities at the facility. Currently, no activities are being conducted at this part of the RFS. Therefore, this area was selected to represent background conditions. The general location of this area is identified in Figure 2-1, presented earlier in the report.

Figure 2-6 presents the locations of the background samples. Two background soil samples were collected and analyzed for TAL Metals and cyanide. Samples were collected at a depth of 0.5 to 1 foot. The samples were collected approximately 120 feet apart.

3.0 DISCUSSION OF RESULTS

In conjunction with the requirements of the October 11, 1990 Environmental Sampling and Analysis Plan, samples were collected and analyzed for analytes specific to each area of interest. All samples were analyzed using the protocols identified in the EPA Contract Laboratory Program. This section of the report presents a discussion of the results.



Proposed Sampling Locations - Buildings 118.120.121

Prepared by

JONAS & ASSOCIATES

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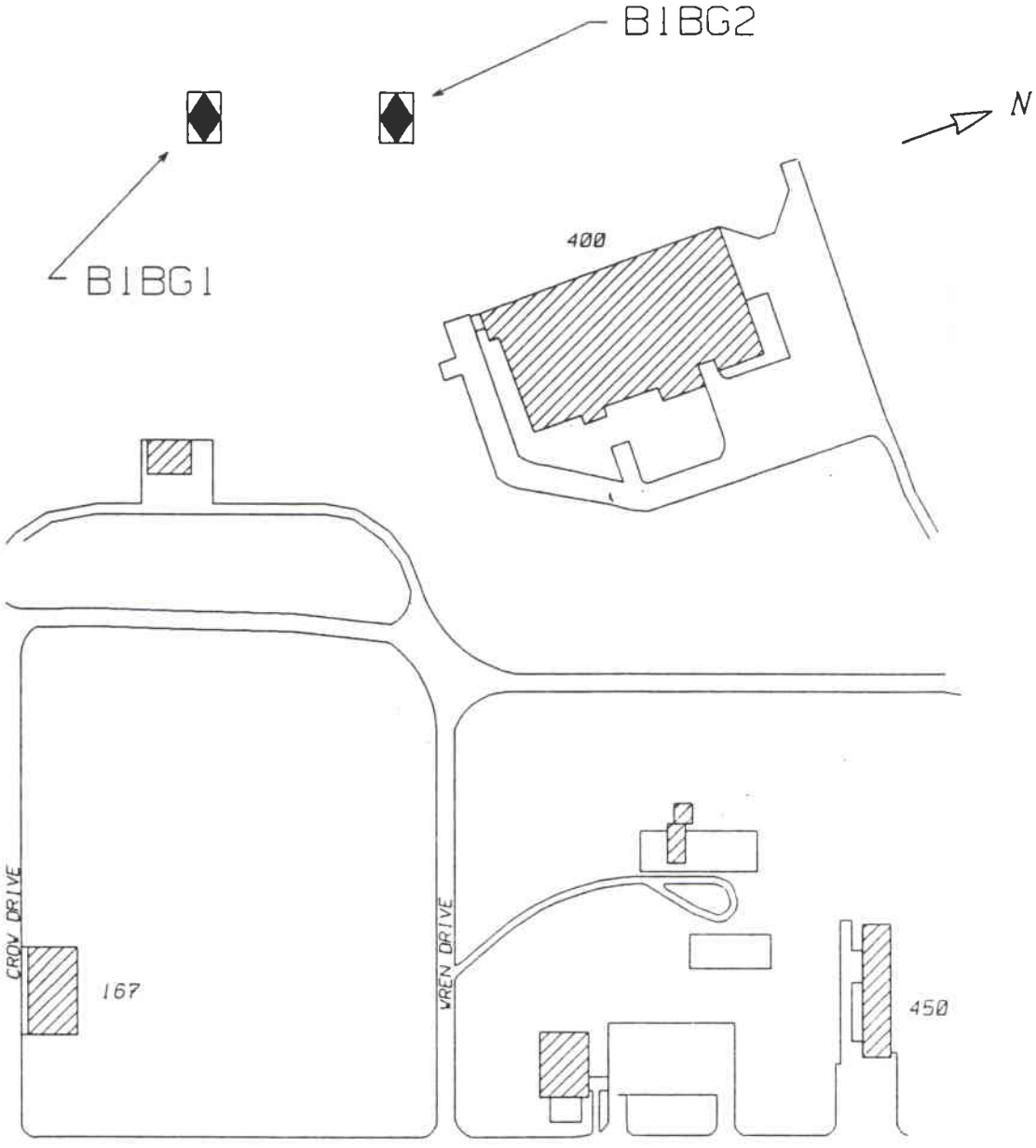
Date: 9-30-1990 Scale as shown	Figure 2-5	Drawing Number 90-101-S4424



Scale

100 0 100 200 Feet

Legend:

Samples:

Soil/Background

Locations of Background Samples

Prepared by

JONAS & ASSOCIATES

Date: 12-20-1990	Figure 2-6	Drawing Number
Scale as shown		

Figure 2-6

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Approved by

NJ 12-20-1990

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Appendix A presents the laboratory results of samples collected at the Richmond Field Station, from October through December, 1990. Figure 2-1 identifies the general locations of the various areas of interest discussed in this section.

3.1 Former Mercury Fulminate Facility

Soil samples were collected in the area of the former Mercury Fulminate Facility and tested for the Target Analyte List (TAL) of 22 Metals. Since this area had been intensively investigated previously, the October-December 1990 sampling concentrated on the areas of highest known mercury concentrations. A vertical profile (B2MF) was collected in the area of sample B-18, where 630 mg/Kg mercury had been previously identified. A second location (B1MF) sampled at the former Mercury Fulminate Facility was at the location where 180 mg/Kg of mercury was previously found in sample B-12.

Figure 3-1 present the results of samples B1MF, B2MF1.5, and B3MF. B1MF was collected in the location where 180 mg/Kg mercury was previously detected. B1MF identified a mercury concentration of 317 mg/Kg. This concentration confirms the presence of significant concentration of mercury. Other concentration of metals identified in B1MF appeared to be within acceptable ranges.

Figure 3-2 presents the locations of the vertical boreholes in the region of the former Mercury Fulminate Facility (e.g., MW-1 & B2MF). Six vertical profile samples were collected from boring B2MF. These are identified on Plate 1, along with mercury results. B3MF was collected as a duplicate of B2MF1.5. As presented on Plate 1, B2MF1.5 and B3MF are 4.4 mg/Kg and 11.0 mg/Kg mercury, respectively. Therefore, the duplicate samples agree with each other within an acceptable range of variability for duplicate soil samples. But earlier samples and specifically B-18 showed significantly higher concentrations of mercury at the same location (e.g.,630 mg/Kg Hg). The reason for this variation is probably due to the natural heterogeneity of the soil in the area where the sample was collected. This is also probably compounded by the small sample size (0.2 grams) required for analysis by CLP procedures. A typical laboratory sample size for non-CLP analysis is 1 to 2 grams. Therefore significant heterogeneity in the soil, compounded by a small sample analysis size probably resulted in the variation between the current sampling results and previous results.

Samples collected below the 1.5 foot level at the location of boring B2MF were all below 2.6 mg/Kg. In B2MF, mercury concentrations decrease down to Not Detected, at 9 feet below the surface. The deepest sample collected from boring B2MF, at 14 feet below the surface had 2.03 mg/Kg mercury.

Lead concentrations found in soil samples B2MF1.5 and B2MF4 were identified at concentration of 388 mg/Kg and 697 mg/Kg, respectively. B3MF identified a lead concentration of 1140 mg/Kg. This represents the highest concentration of lead identified during the current sampling round. As stated earlier, B3MF is a duplicate sample collected at the same location and depth as B2MF1.5. All of these concentrations appear to be elevated. The cause of these elevated lead concentrations could be the presence of a paint shop in Building 125. Boring B2MF and B3MF are located in front of Building 125.

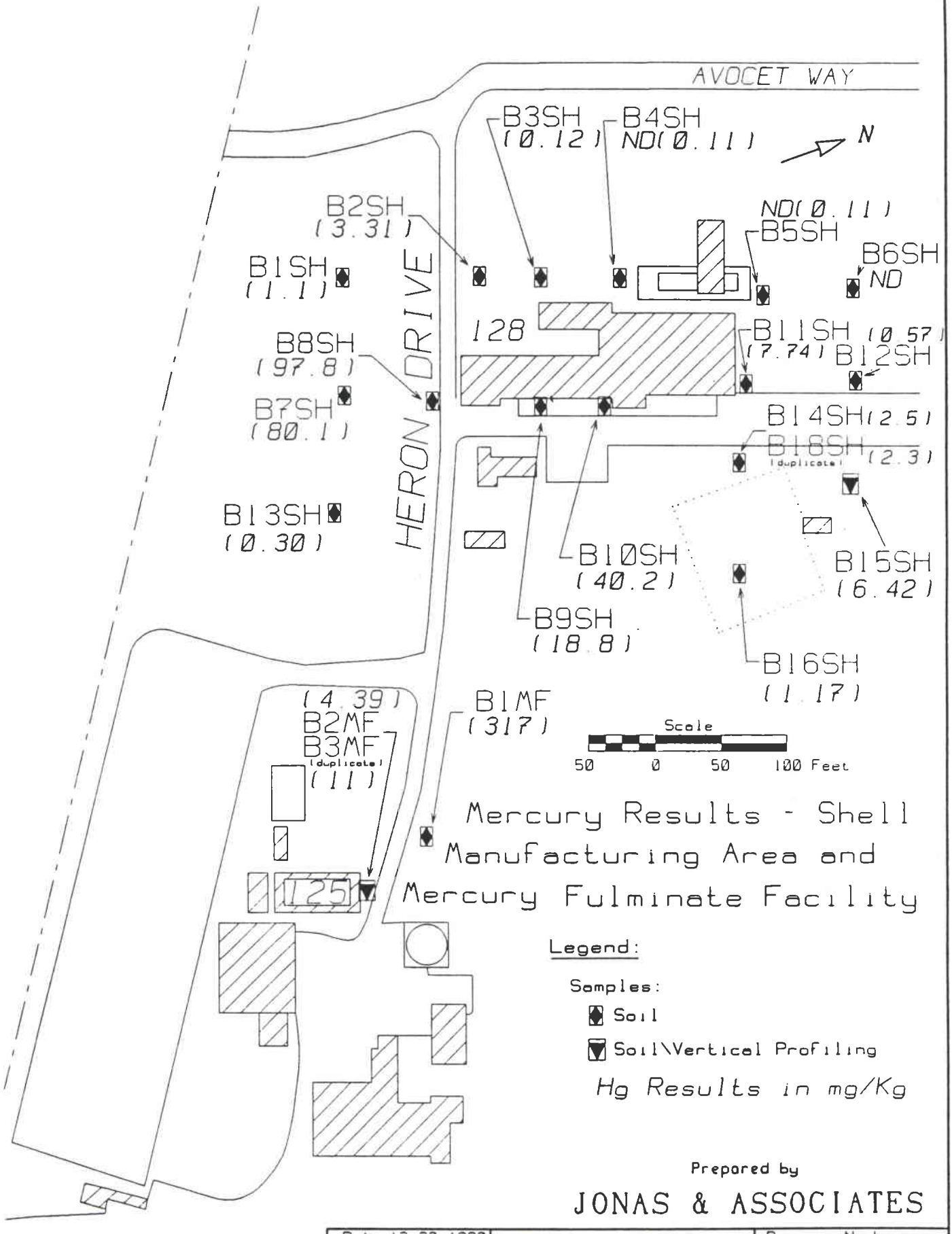

Figure 3-1

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Figure 3-1

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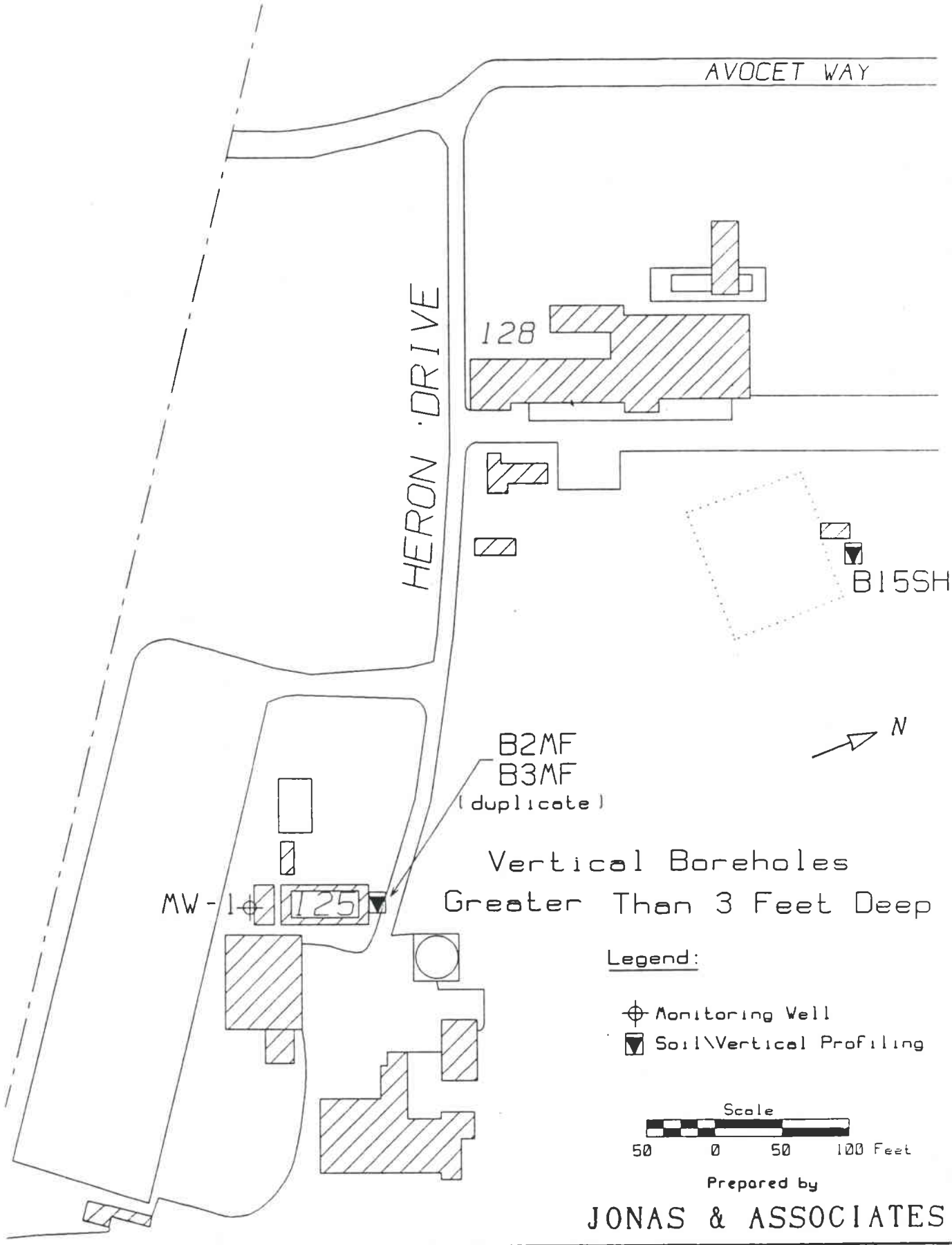

Figure 3-2

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Date: 12-20-1990
Scale as shown

Figure 3-2

Drawing Number

STRATIGRAPHIC COLUMN

PROJECT	JOB NO.	SHEET NO.	COLUMN NO.
Richmond Field Station	UCRFS	1 OF 1	B2MF

BEGAN / COMPLETED	COORDINATES	GROUND ELEV.	TOTAL DEPTH	LOGGED BY
10-24-1990 & 12-1-1990	N/A	N/A	14 Feet	MARTA WILLIAMS

DEPTH (FEET)	LITHOLOGIC DESCRIPTION	SAMPLE NUMBER	CONCENTRATION (MG/KG)
1.5	SILTY CLAY - Dark brown, organic-rich, silty clay with very fine sand.	B2MF1.5-120190	4.39
		B3MF-120190 (duplicate)	11.0
4.0	SILTY CLAY - Gray, silty clay with fine sand.	B2MF4-120190	2.60
6.5	SILTY CLAY - Tan, silty plastic clay.	B2MF6.5 102490	0.46
9.0	SANDY SILTY CLAY - Gray to tan, sandy silty clay. Moist to saturated.	B2MF9-102490	(ND)0.12
11.5	GRAVEL-BEARING SILTY CLAY - Brown silty clay with subangular gravel and very fine sand. Saturated.	B2MF11.5-102490	1.63
14.0	SILTY CLAYEY SAND - Multi-colored sand with brown silty clay. Saturated.	B2MF14-102490	2.03
	Base of borehole at 14'.		

MERCURY (MG/KG) 1 2 3 4 5 6

JONAS AND ASSOCIATES	PLATE 1 BORING B2MF WITH MERCURY RESULTS	COLUMN NO. B2MF

Copper concentration was also found to be elevated in soil sample B3MF, at 451 mg/Kg. The cause of this elevated copper concentration is currently unknown.

Other metal analysis of samples collected at the former Mercury Fulminate Facility appear to be within acceptable ranges, based upon U.S. Geological Survey professional papers on Elemental Composition of Surfacial Material in the Conterminous United States.

3.2 Former Shell Manufacturing Area

Figure 2-2, presented in the previous section, identifies the locations of samples collected in the former Shell Manufacturing Area, during the October-December 1990 sampling round. Figure 3-1 presents the mercury results.

As identified in Figure 3-1, significant concentrations of mercury were identified in samples B7SH, B8SH and B10SH, at 80.1 mg/Kg, 97.8 mg/Kg and 40.2 mg/Kg, respectively. The distribution of these elevated concentrations, with respect to the other samples collected at the former Shell Manufacturing Area, indicate a linear structure. The cause of this lineation is unknown, but it could be associated with a former structure at the site and/or a drainage ditch. The vertical extent of mercury in the location of this lineation is currently unknown.

Plate 2 presents the results of mercury analysis in vertical profile at B15SH. As identified in this plate, the only significant concentration of mercury was identified at 1.5 feet below the surface, at 6.42 mg/Kg. All other samples collected down to a depth of 14 feet were below 0.30 mg/Kg mercury. Therefore, in the area of B15SH, mercury appears to be concentrated at the surface and decreases significantly with depth.

Copper results of samples collected at the former Shell Manufacturing Area also appear to be elevated. The highest concentration found was at 804 mg/Kg copper. The cause of these elevated concentrations of copper is unknown.

Lead concentrations also appeared to be elevated in some of the soil samples collected. The highest concentration of lead found at the former Shell Manufacturing Area was at 313 mg/Kg. The cause of elevated concentrations of lead is also unknown.

3.3 Marsh, Slough, Drains and Bay

Figure 2-3 presents the locations of samples collected in the area of the marsh, slough, drains and San Francisco Bay. Samples were analyzed for Target Analyte List of 22 Metals, pesticides and PCBs.

In general the results of sampling of the marsh indicated the presence of elevated concentrations of some metals. Some relatively low concentrations of pesticides were also identified. No PCBs were identified.

STRATIGRAPHIC COLUMN	PROJECT: Richmond Field Station	JOB NO.: UCRFS	SHEET NO.: 1 OF 1	COLUMN NO.: B15SH
BEGAN / COMPLETED: 10-24-90 & 12-1-1990	COORDINATES: N/A	GROUND ELEV.: N/A	TOTAL DEPTH: 14 Feet	LOGGED BY: MARTA WILLIAMS

DEPTH (FEET)	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	SAMPLE	SAMPLE NUMBER	MERCURY (MG/KG) 1 2 3 4 5 6	CONCEN-TRATION (MG/KG)
1.5	1, 2, 3	SILTY CLAY - Dark brown, organic-rich, silty clay with very fine sand.	■	B15SH1.5-120190	■	6.42
4.0	4, 5, 6	GRAVEL-BEARING SILTY CLAY -Tan, subangular gravel in silty clay.	■	B15SH4-102490	■	0.30
6.5	7, 8	SILTY CLAY - Dark brown, silty clay. Organic matter present, prossibly roots.	■	B15SH6.5-102490	■	0.26
9.0	9, 10, 11	GRAVEL-BEARING SILTY CLAY -Tan, subangular gravel in silty clay. Moist.	■	B15SH9-102490	■	0.11
11.5	12, 13	SANDY SILTY CLAY - Dark brown, sandy silty clay. Moist.	■	B15SH11.5-102490	■	0.11
14.0	14, 15	SANDY SILTY CLAY - Tan, sandy, gravel-bearing silty clay. Moist to saturated. Base of borehole at 14'.	■	B15SH14-102490	■	0.25

JONAS AND ASSOCIATES	PLATE 2 BORING B15SH WITH MERCURY RESULTS	COLUMN NO.: B15SH

Figure 3-3 presents the areal distribution of mercury in the soils and sediments of the marsh, slough and Bay. Mercury concentrations ranged from Not Detected to 35.9 mg/Kg. The 35.9 mg/Kg mercury was identified in soil sample B4MA, located adjacent to an area of apparent fill. Other elevated concentrations of mercury were generally located in the eastern section of the marsh, also in a general location where fill was used. A preliminary indication is that the elevated mercury concentration are associated with fill. Mercury was detected in most of the samples collected in the marsh.

A San Francisco Bay mud sample, collected approximately 125 feet offshore, identified 0.14 mg/Kg mercury in sample SD2BAY. A sample of bay mud collected closer to the RFS had 1.5 mg/Kg mercury, in sample SD1BAY. Three mud samples, collected along the slough, had mercury concentrations ranging from 1.37 mg/Kg to 2.87 mg/Kg.

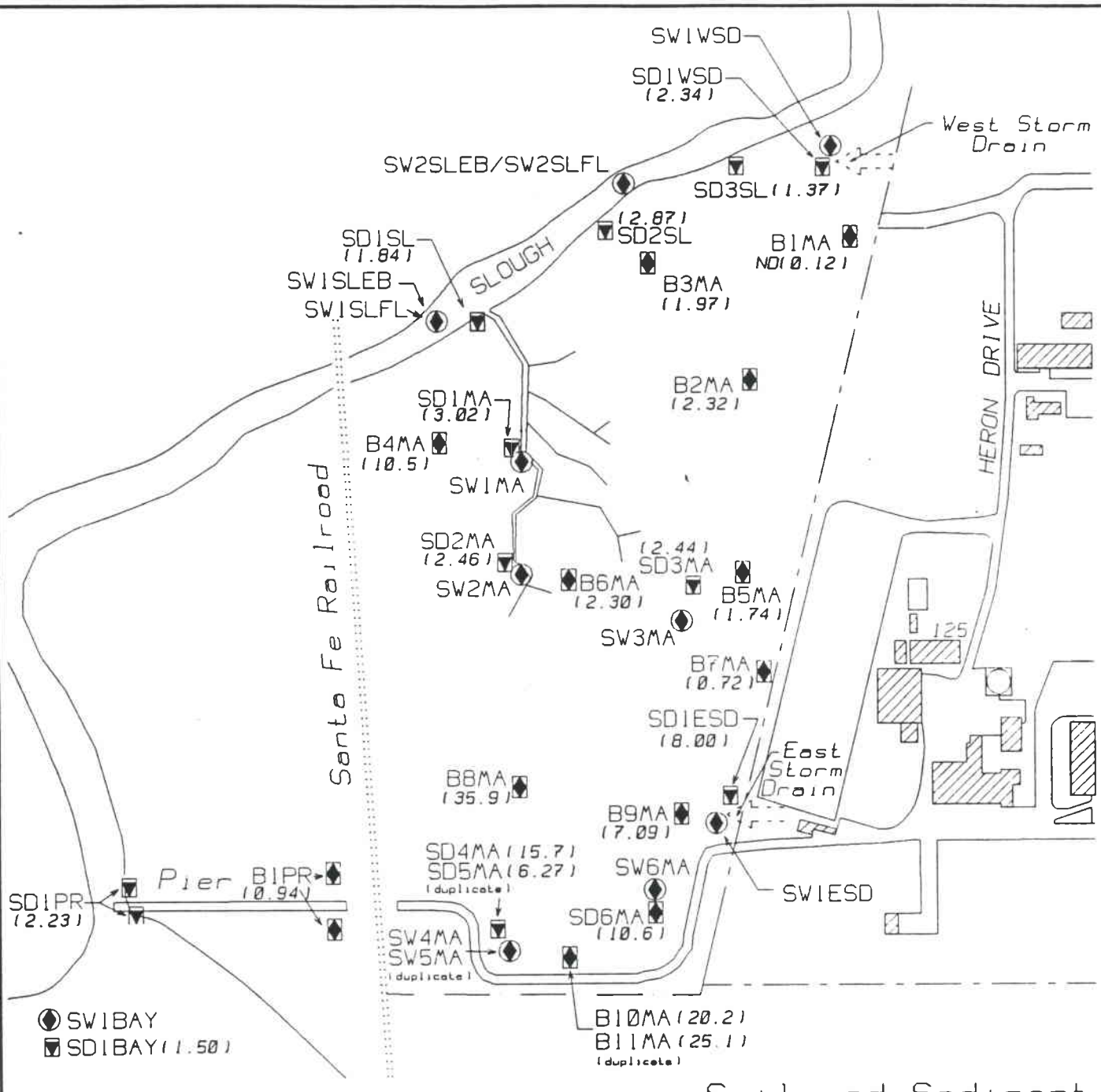
Mercury was also analyzed in surface waters collected in the marsh, slough and San Francisco Bay. Figure 3-4 presents the results of mercury analysis of surface waters. Most samples did not detect concentrations of mercury, with a detection limit of around 0.0002 mg/L. The highest concentration found in the marsh was 0.0004 mg/L. Mercury was not detected in any surface water samples collected from the slough. The surface water collected at the Bay (SW1BAY) had the highest concentration of mercury in water, at 0.00045 mg/Kg.

Significant concentrations of arsenic were identified in soil and sediment samples collected from the marsh. Figure 3-5 graphically displays arsenic concentrations found in the marsh, slough and bay. As identified in this figure, highest arsenic concentrations appear to be in the eastern section of the marsh, adjacent to ICI Americas. The highest arsenic concentration identified in the marsh was 2210 mg/Kg, in soil.

Both soil and submerged sediment samples of the marsh identified elevated concentrations of copper. The highest concentration of copper identified in the marsh was 823 mg/Kg, in sediment sample SD6MA. The source for these elevated copper concentrations is unknown.

Lead was also identified at elevated concentrations in the marsh. The highest concentration of lead detected was 814 mg/Kg, in SD6MA. As identified in Figure 3-4, SD6MA is located at the eastern edge of the marsh. Other metals detected in the marsh, slough and Bay appear to be within acceptable ranges.

As stated previously, pesticides were also identified in marsh samples. Specifically, 0.042 mg/Kg alpha-BHC, 0.336 mg/Kg 4,4'-DDD, and 0.129 mg/Kg 4-4'-DDT were identified. DDD and DDT were common pesticide, which are now banned. Both of these pesticides tend to be persistence in the environment. No PCBs were identified in marsh, slough or Bay samples.



Legend:

Samples:

Soil

Submerged Sediment

Hg Results in mg/Kg

Surface Water

Soil and Sediment Results for Mercury Slough, East and West Storm Drains, Marsh and Bay

Prepared by

JONAS & ASSOCIATES

Figure 3-3

Drawing Number

Drawn by AJ

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Approved by

12-20-1990

Date: 12-20-1990

Scale as shown

Figure 3-3

Drawing Number

3.4 Former Explosive Storage Areas

Figure 2-4, presented in the previous section, identifies the sampling locations for the former Explosive Storage Areas, Blasting Cap Area and the Test Pit.

In general, only very low concentrations of mercury were identified in former Explosive Storage Areas. Mercury concentrations for these areas are graphically displayed in Figure 3-6. Mercury concentrations ranged from Not Detected to a high of 1.37 mg/Kg, in soil. Because of these low concentrations it is not necessary to analyze the other six samples collected in the area, which were held pending the finding of mercury analyses.

The only metal in the former Explosive Storage Area which appeared to have elevated concentrations was copper. Three samples had elevated concentrations, ranging from 516 mg/Kg to 736 mg/Kg. All other samples analyzed had copper concentrations less than 78 mg/kg.

3.5 Former Test Pit Area

Two samples were collected in the location of the former Test Pit Area. Figure 2-4 present the sampling locations of these two samples. Figure 3-6 presents mercury results.

Mercury concentration of the two samples collected at the former Test Pit Area were 2.9 mg/Kgl and 6.7 mg/Kg. These concentrations are not abnormally high, with respect to other locations at the facility.

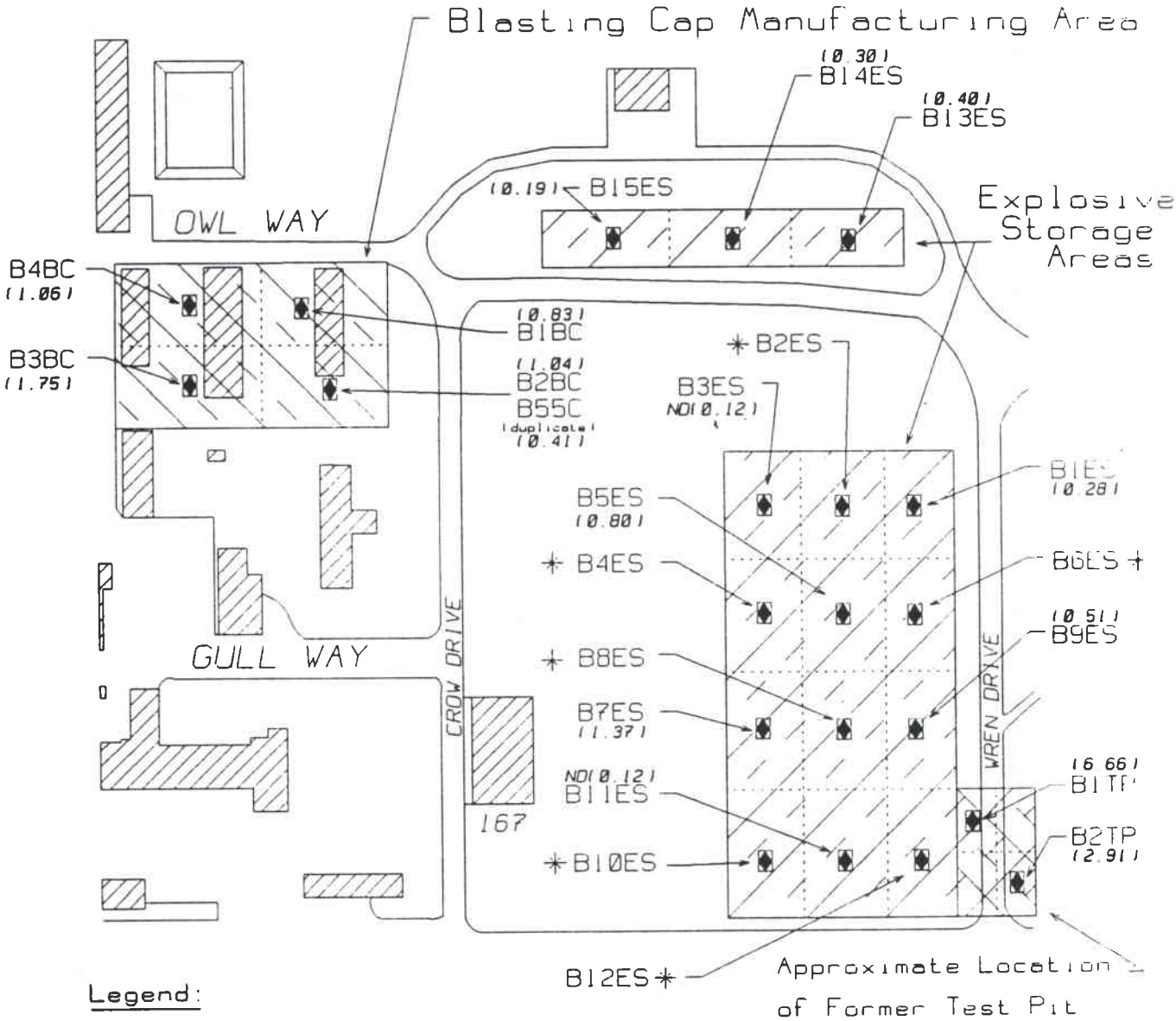
Copper is the only metal analyte with elevated concentrations in the location of the former Test Pit. Copper was identified at concentrations of 899 mg/Kg and 1140 mg/Kg, from the two samples collected. The source of these elevated copper concentrations is unknown.

3.6 Former Blasting Cap Manufacturing Area

Four samples were collected in the area of the former Blasting Cap Manufacturing Area. Figure 2-4 presents the sampling locations and Figure 3-6 presents the results of mercury analysis.

As identified in Figure 3-6, mercury concentrations ranged from 0.41 mg/Kg to 1.75 mg/Kg. These concentrations are low.

All other metals were generally low in concentrations and within acceptable ranges.



Legend:

Samples:

Soil

Hg Results in mg/Kg

* These samples will be analyzed only if other concentrations in the area are significant

Scale

75 0 75 150 Feet

N

Mercury Sampling Results - Former Explosive Storage and Blasting Cap Areas and Test Pit

Prepared by

JONAS & ASSOCIATES

Date: 12-20-1990	Figure 3-6	Drawing Number
Scale as shown		

Figure 3-6

Drawing Number

Checked by

Approved by

NJ 12-20-1990

Drawn by

3.7 Buildings 118, 120 and 121

A total of three samples were collected in the general location of Building 118, 120 and 121. All the samples were analyzed for Total Petroleum Hydrocarbons as gasoline, kerosene, and diesel. Benzene, toluene, ethylbenzene, and xylene were also tested for in the soils.

The results of the analysis of petroleum hydrocarbons are presented in Figure 3-7. As identified in this figure, petroleum hydrocarbons were identified in each of the samples analyzed. But based upon other regulatory determinations on petroleum hydrocarbons, the only concentration of concern is the 1550 mg/Kg of diesel. The other concentrations are all relatively low and probably not of concern.

3.8 Background Samples

As discussed earlier, "background" samples were collected adjacent to Building 400 on the Richmond Field Station. Two soil samples were collected and analyzed for the Target Analyte List of 22 Metals. Concentrations found in these two samples are presented in Appendix A. Figure 3-8 identifies the locations of the background samples with mercury results.

The results of background samples generally identified only low concentrations of metals Mercury concentrations were both Not Detected, with a detection limit of 0.11 to 0.12 mg/Kg.

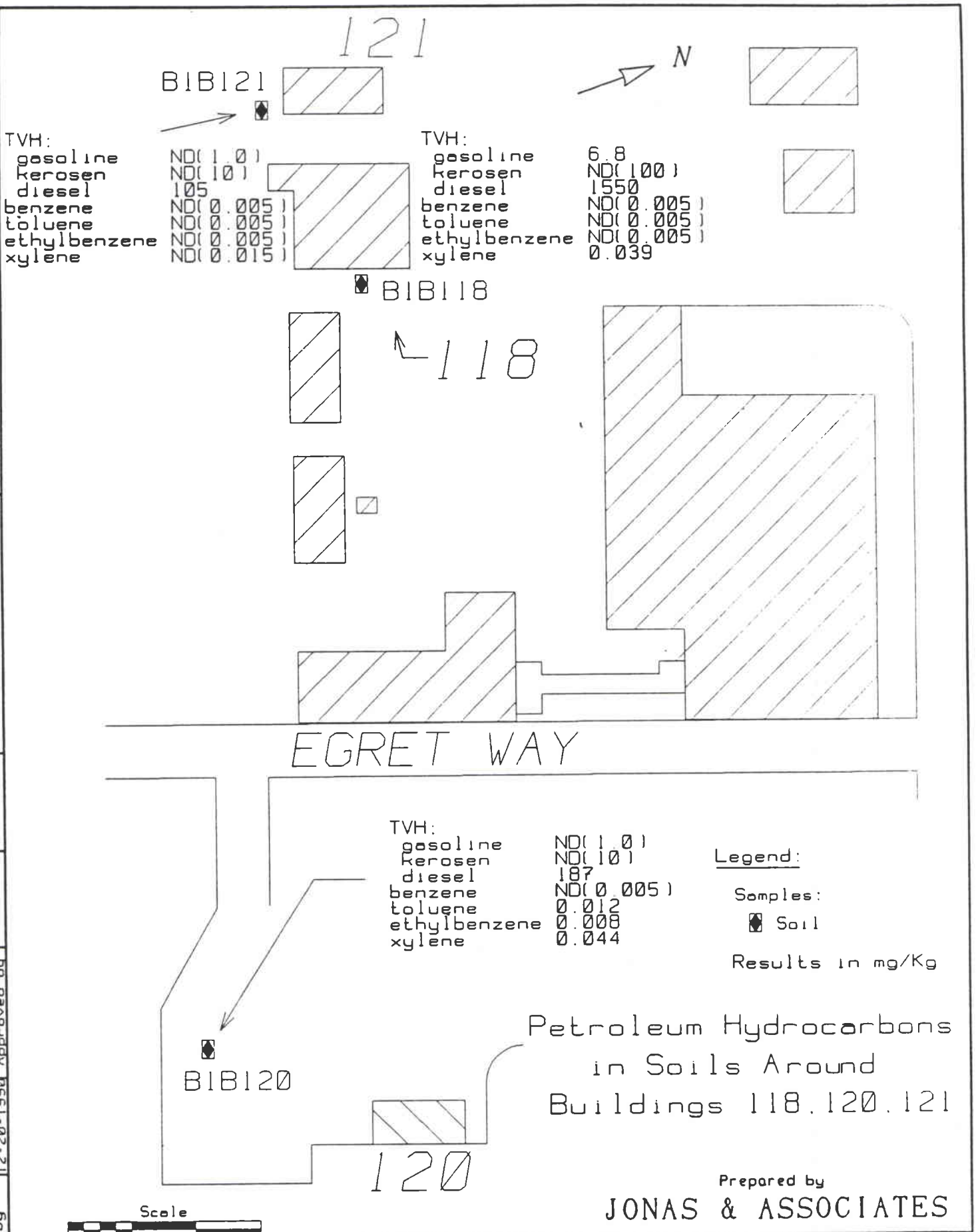
4.0 REGIONAL DISTRIBUTION OF SAMPLING RESULTS

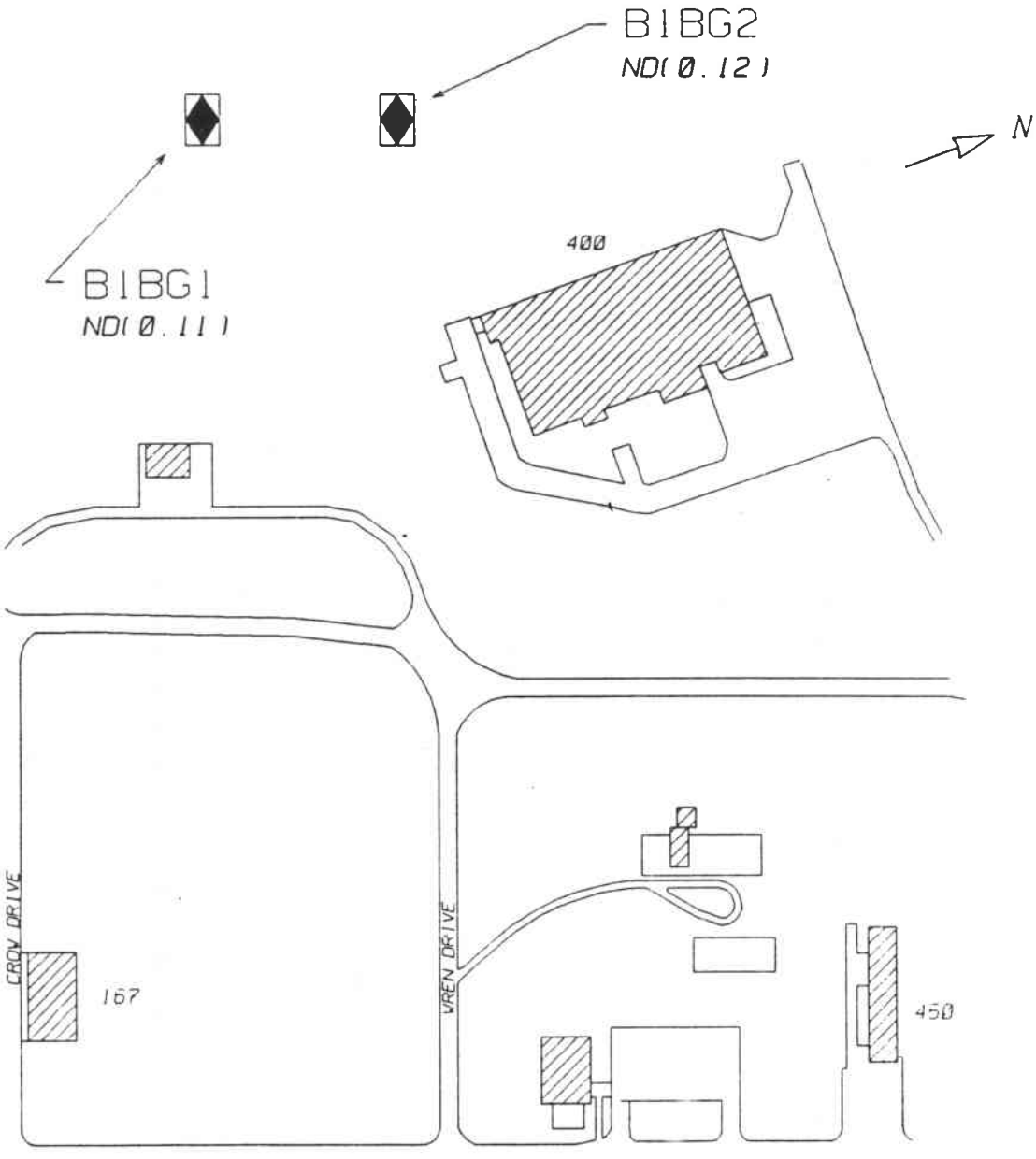
To analyze the regional distribution of sampling results, a graphical analysis was performed. This section of the report presents the results of this analysis.

As identified in the previous discussion, it appears that the metals of primary concern are mercury, arsenic, lead and copper. The regional distribution of these chemicals are discussed in this section. Only the results for the current sampling round are presented.

Figure 4-1 presents the regional distribution of mercury with respect to the general locations sampled. As identified in this bar graph, mercury at the site appears to be localized at the general location of the former Mercury Fulminate Facility and the former Shell Manufacturing Area. Background concentrations, sampled adjacent to Building 400, did not detect any mercury. The former Blasting Cap, Explosive Storage and Test Pit all had very low, if any, concentrations of mercury. As is also seen in Figure 4-1, the marsh had concentrations of mercury, but generally at lower concentration levels than the former Mercury Fulminate Facility and Shell Manufacturing Area.

Figure 4-2 graphically displays the distribution of arsenic across the facility. As is clearly indicated by this figure, the arsenic appears to be localized in the marsh. Arsenic is generally not found in significant concentrations across the RFS facility at the sampling locations analyzed. The only two exceptions are relatively low concentrations found in one sample from the former Mercury Fulminate Facility and in one sample from the former Shell Manufacturing Area.


121
N
B1B121
TVH:
gasoline ND(1.0)
kerosen ND(10)
diesel 105
benzene ND(0.005)
toluene ND(0.005)
ethylbenzene ND(0.005)
xylene ND(0.015)
TVH:
gasoline 6.8
kerosen ND(100)
diesel 1550
benzene ND(0.005)
toluene ND(0.005)
ethylbenzene ND(0.005)
xylene 0.039
B1B118
118
EGRET WAY
TVH:
gasoline ND(1.0)
kerosen ND(10)
diesel 187
benzene ND(0.005)
toluene 0.012
ethylbenzene 0.008
xylene 0.044
Legend:
Samples:
Soil
Results in mg/Kg
B1B120
120
Petroleum Hydrocarbons
in Soils Around
Buildings 118.120.121
Prepared by
JONAS & ASSOCIATES
Scale
25 0 25 50 Feet
Date: 12-20-1990
Scale as shown
Figure 3-7
Drawing Number
Figure 3-7
Drawing Number
Drawn by
AJ
12-20-1990
Checked by
Approved by



Scale

100 0 100 200 Feet

Legend:

Samples:

Soil/Background

Hg Results in mg/Kg

Mercury Results for Background Samples

Prepared by

JONAS & ASSOCIATES

Date: 12-20-1990	Figure 3-8	Drawing Number
Scale as shown		

Figure 3-8

Drawing Number

Checked by

Approved by

AJ 12-20-1990

Drawn by

Figure 4-1

Mercury Concentrations in Soil and Sediment

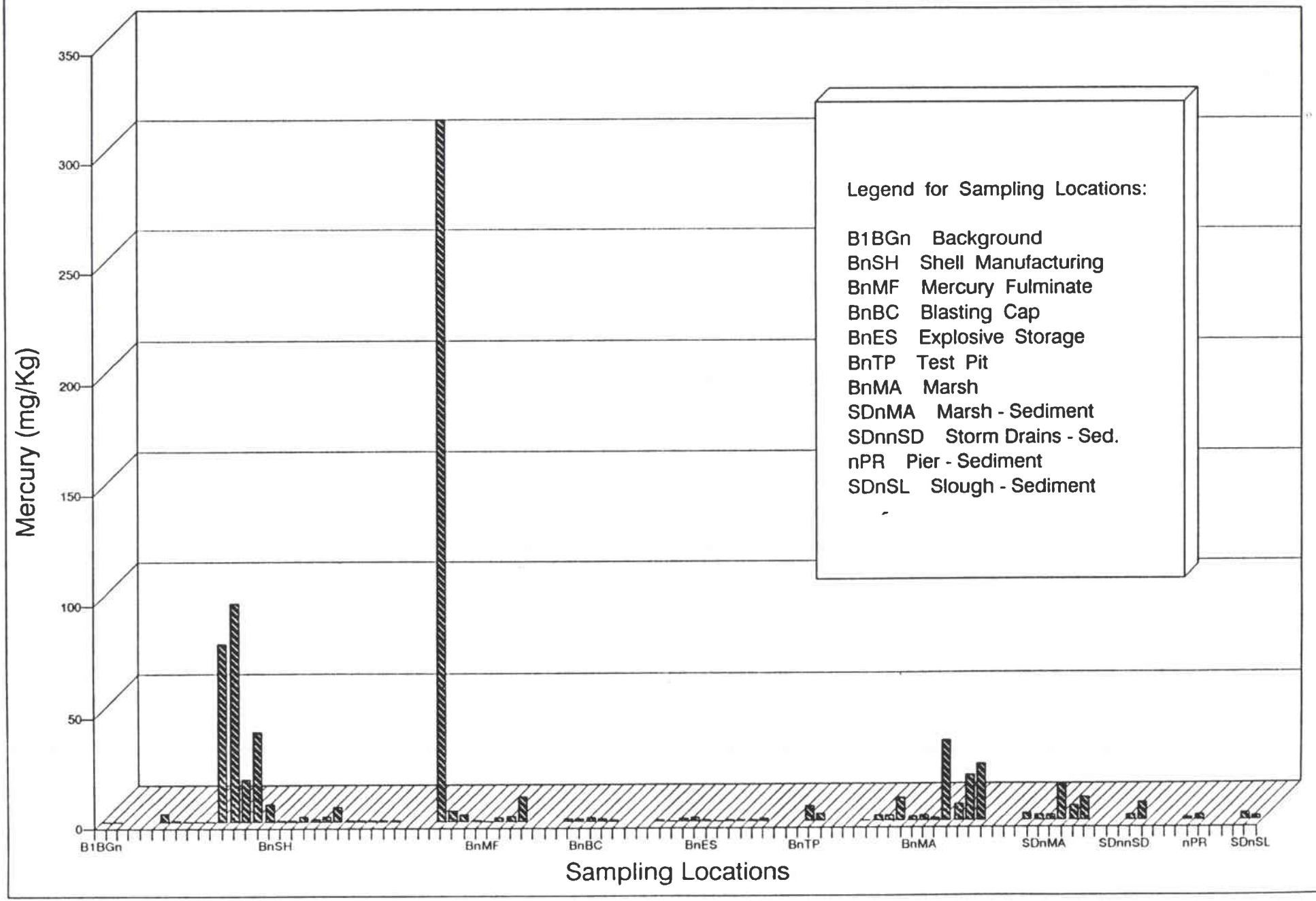


Figure 4-2

Arsenic Concentrations in Soil and Sediment

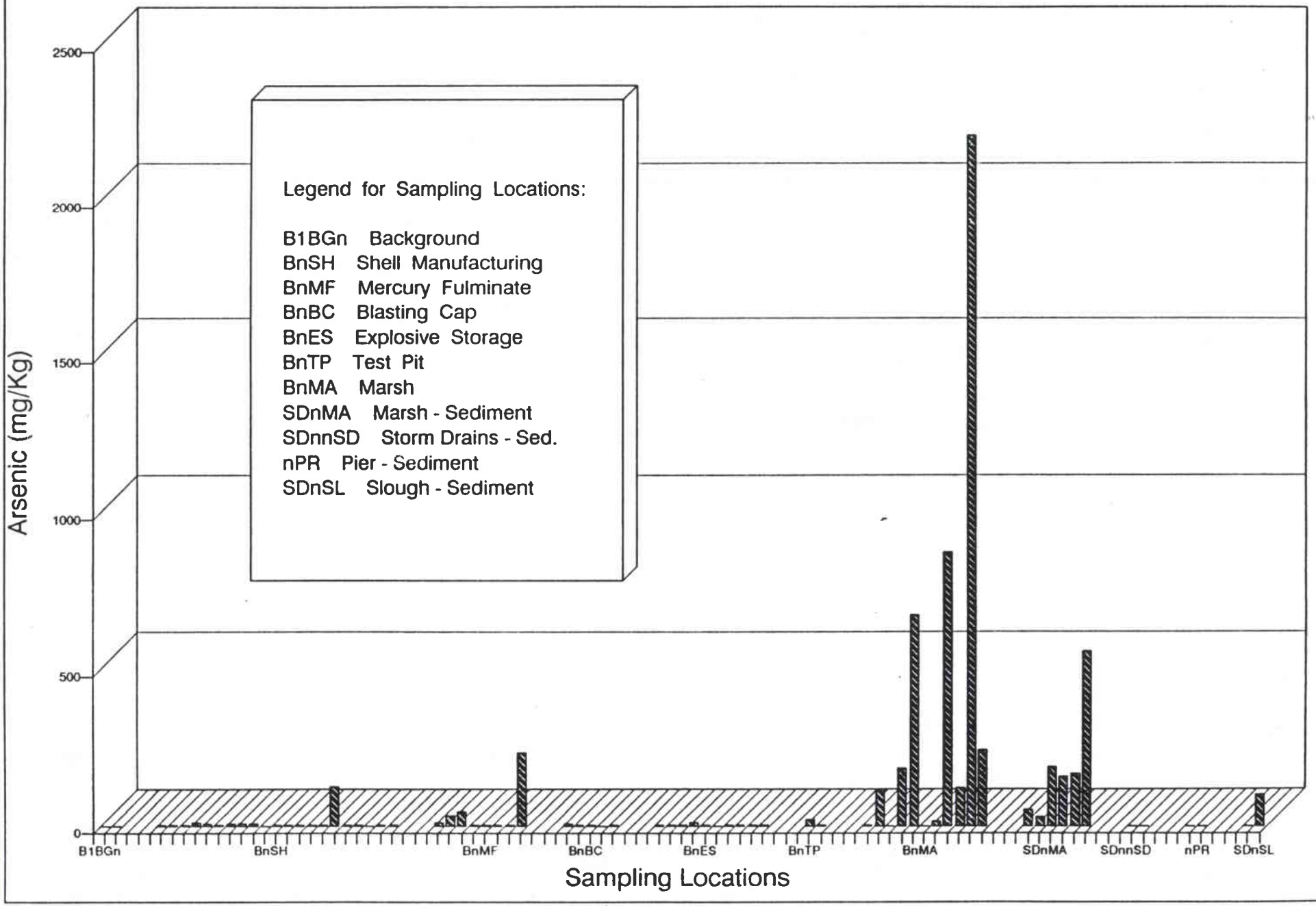


Figure 4-3 presents lead concentrations in the soils and sediments sampled at the Richmond Field Station. As identified in this figure it appears that lead is fairly ubiquitous across the facility. The exception to this are the generally low concentrations identified in the background samples and from samples collected in the former Blasting Cap, Explosive Storage and Test Pit areas. The cause of the apparent evaluated concentrations of lead is unknown. In order to understand the distribution of lead, the results were sorted into an ascending order and graphed in Figure 4-4. The rationale for this approach is to see if an inflection point can be identified which may represent "background" concentrations versus those concentration which are associated with a source on the facility. As seen on the figure, an inflection point appears to be present in the general location of 25 mg/Kg and at 125 mg/Kg lead. According to the U.S. Geological Survey, lead can naturally have concentrations up to 700 mg/Kg in soils of the western United States. Additional interpretation will need to be performed to determine actual "background" concentrations of lead at the facility, if it is determined that lead at the site is of concern.

Copper concentrations across the site are presented in Figure 4-5. As is identified in this graphical display of copper in soil and sediment, it is apparent that copper is present at various concentrations throughout the site. According to the U.S. Geological Survey, copper can be present in natural soils at concentrations up to approximately 300 mg/Kg. But as identified in Figure 4-5, many concentrations of copper are present above 300 mg/Kg. To further understand the distribution of copper, ascending results for copper were plotted on Figure 4-6. Plotting of these results indicate the presence of an inflection point at approximately 200 mg/Kg. In addition, a clear break in concentrations of copper appears to be present at 300 mg/Kg. Currently it is unknown what is the source of elevated copper concentrations found at the Richmond Field Station.

5.0 CONCLUDING STATEMENT

Soil, sediment and surface water samples were collected and analyzed from various locations across the Richmond Field Station. Most samples were tested for the Target Analyte List of 22 Metal. Some of the samples were tested for pesticides, PCBs and petroleum hydrocarbon. The results of these analyses indicated the presence of elevated concentrations of mercury, arsenic, copper, lead, and diesel in soils and sediments, at various locations.

Surface waters tested for the 22 TAL metals only found very low concentrations of mercury in the marsh and San Francisco Bay.

Figure 4-5

Copper Concentrations in Soil and Sediment

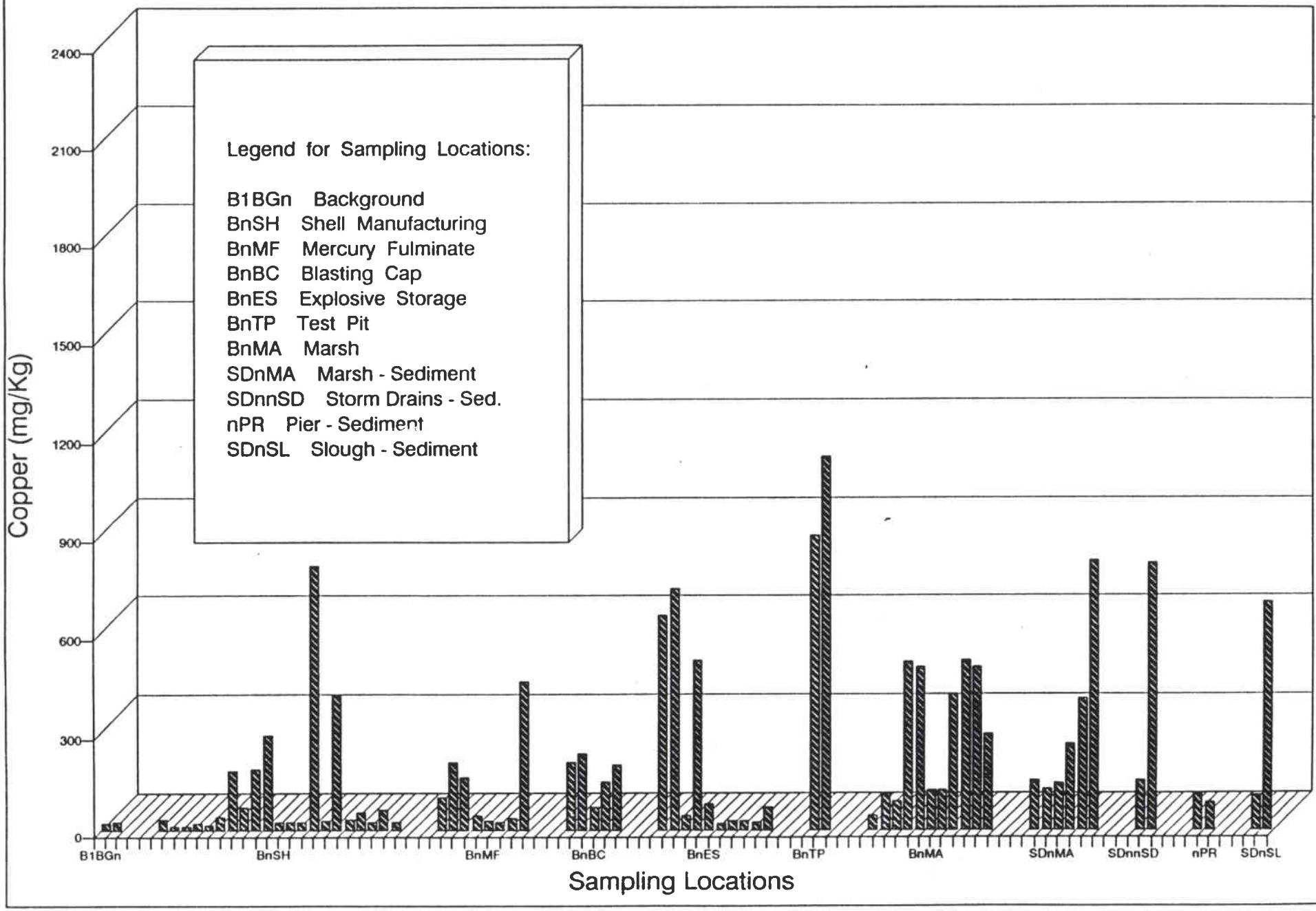
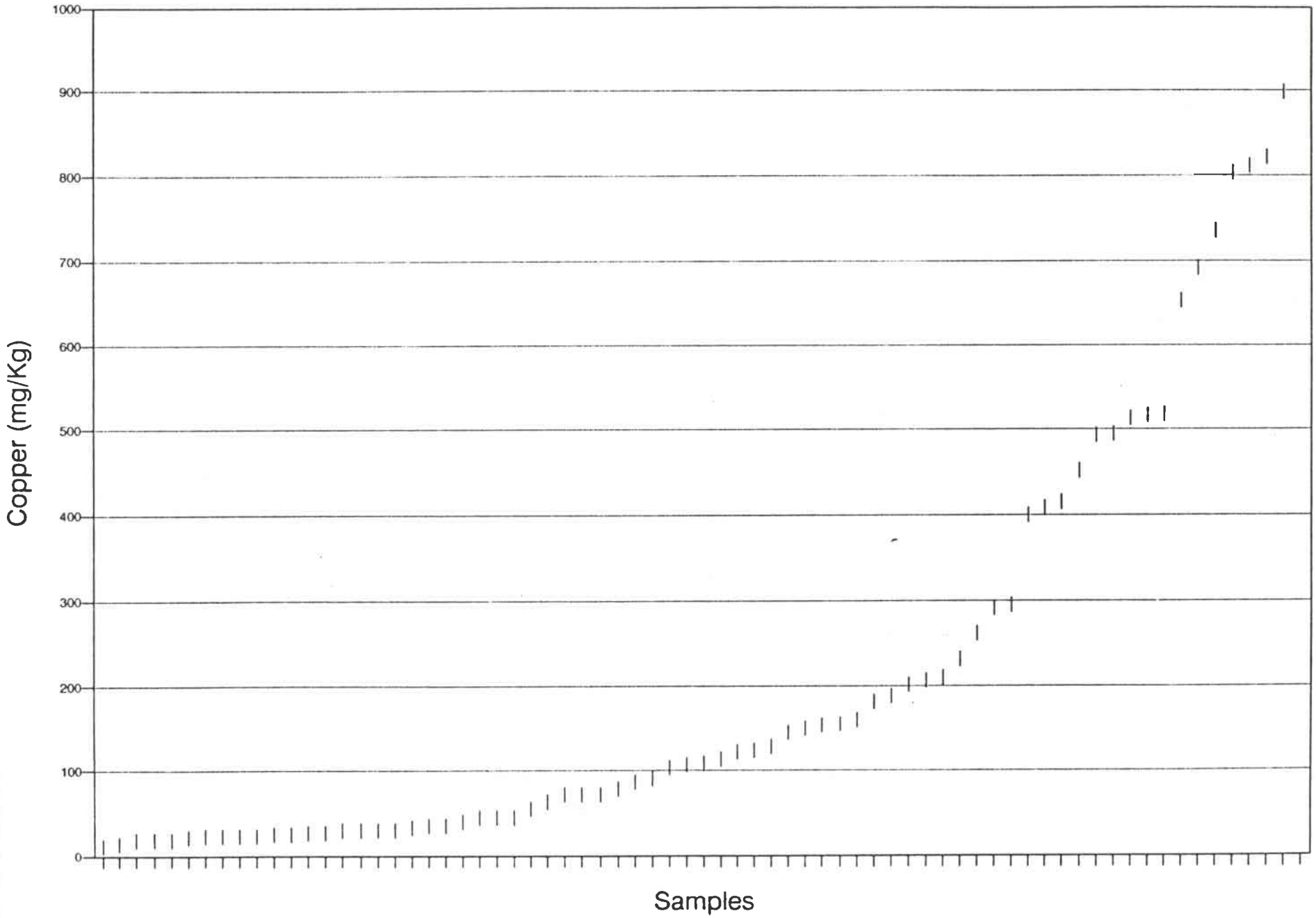


Figure 4-6

Increase Concentrations of Copper in Soil and Sediment



Appendix A: Table of Analytical Results

SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	ALUMINUM (mg/kg)	ANTIMONY (mg/kg)	ARSENIC (mg/kg)	BARIUM (mg/kg)	BERYLLIUM (mg/kg)	CADMIUM (mg/kg)	CALCIUM (mg/kg)	CHROMIUM (mg/kg)
B01SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	15500	ND(8.5)	ND(0.90)	178	0.6	2.3	8520	64.1
B02SH101890	SHELL MANUFACTURING	10/18/90	1.3	7920	ND(8.2)	3.4	208	0.43	1.2	29200	27.7
B03SH101890	SHELL MANUFACTURING	10/18/90	1.3	3920	8.9	3	695	0.45	1.6	2220	19.2
B04SH101890	SHELL MANUFACTURING	10/18/90	1.3	2990	ND(7.9)	2.4	203	0.44	0.86	1680	16.1
B05SH101890	SHELL MANUFACTURING	10/18/90	1.3	7060	ND(8.5)	9.7	57.2	0.49	1.4	7780	25.1
B06SH101890	SHELL MANUFACTURING	10/18/90	1.3	6990	ND(8.4)	7.1	62.3	ND(0.44)	1.6	7760	24.6
B07SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	4010	ND(8.3)	3	261	ND(0.44)	ND(0.76)	3960	17.8
B08SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	4490	ND(8.3)	6.5	248	0.43	1.6	3720	20.7
B09SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	4420	ND(7.9)	6.3	190	ND(0.42)	1.9	3510	14.8
B10SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	4080	ND(8.2)	7.4	214	0.45	2.2	3450	20.9
B11SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	7220	ND(8.3)	ND(8.7)	169	ND(0.44)	3	2190	28.9
B12SH101890	SHELL MANUFACTURING	10/18/90	1.3	3580	ND(8.3)	3.2	145	0.46	ND(0.77)	17770	34.2
B13SH101890	SHELL MANUFACTURING	10/18/90	1.3	7960	ND(8.5)	2.8	162	0.47	0.87	37300	28
B14SH101890	SHELL MANUFACTURING	10/18/90	1.3	3940	ND(8.1)	3.2	258	0.45	0.87	1170	22.5
B16SH101890	SHELL MANUFACTURING	10/18/90	1.3	5060	9.2	3.6	223	0.48	0.88	579	22.4
B18SH101890	SHELL MANUFACTURING	10/18/90	1.3	5690	ND(8.3)	2.8	223	ND(0.44)	0.96	1420	33.2
B15SH1.5-120190	SHELL MANUFACTURING	10/24&12/01-90	1.5	7340	8.8	126	238	ND(0.43)	4.2	2880	25.9
B15SH04-102490	SHELL MANUFACTURING	10/24/90	4	21200	ND(8.7)	1.9	200	0.55	5.1	2520	71.2
B15SH6.5-102490	SHELL MANUFACTURING	10/24/90	6.5	15900	ND(8.8)	2.7	580	ND(0.47)	2.9	3510	58
B15SH09-102490	SHELL MANUFACTURING	10/24/90	9	14600	ND(8.2)	ND(8.8)	132	ND(0.56)	2.5	3320	69.8
B15SH11.5-10249	SHELL MANUFACTURING	10/24/90	11.5	15900	ND(8.7)	3.2	198	0.57	1.7	4840	63.3
B15SH14-102490	SHELL MANUFACTURING	10/24/90	14	12600	ND(9.0)	1.7	183	ND(0.47)	1.9	4130	43.3
B1MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	10800	ND(8.3)	9.3	291	ND(0.44)	0.98	4680	32.9
B2MF1.5-120190	MERCURY FULMINATE	10/24&12/01-90	1.5	11700	12	33.7	420	0.59	4.7	6300	52.4
B2MF04-120190	MERCURY FULMINATE	10/24&12/01-90	4	11900	45.3	46.8	362	0.49	5.3	4370	36.5
B2MF6.5-102490	MERCURY FULMINATE	10/24/90	6.5	15000	ND(9.4)	3.2	143	0.67	1.6	4340	51
B2MF09-102490	MERCURY FULMINATE	10/24/90	9	11100	ND(9.3)	1.1	147	ND(0.49)	2	3970	53.7

ND(8.3) = Not Detected (Detection Limit); NA = Not Analyzed; * = Exceeded Holding time for Mercury

SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	ALUMINUM (mg/kg)	ANTIMONY (mg/kg)	ARSENIC (mg/kg)	BARIUM (mg/kg)	BERYLLIUM (mg/kg)	CADMIUM (mg/kg)	CALCIUM (mg/kg)	CHROMIUM (mg/kg)
B2MF11.5-102490	MERCURY FULMINATE	10/24/90	11.5	8350	ND(8.7)	1.3	42.5	ND(0.46)	0.82	3560	45.8
B2MF14-102490	MERCURY FULMINATE	10/24/90	14	7890	ND(8.5)	2.3	48.3	ND(0.45)	2.5	3770	35
B3MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	10300	ND(8.5)	236	432	ND(0.45)	9.2	4940	46.5
B01BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	8470	ND(1.4)	5.5	148	ND(0.45)	2.2	3620	27.1
B02BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	3630	ND(1.4)	3.5	299	ND(0.47)	2.5	960	15.8
B03BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	4940	ND(1.4)	1.2	207	0.48	2	2030	24.3
B04BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	4670	ND(1.3)	ND(0.89)	287	0.47	2.2	1730	18.7
B05BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	4050	ND(1.4)	1.1	183	ND(0.47)	2.2	946	22.2
B01ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	5550	ND(1.3)	1.3	243	ND(0.43)	3.3	2120	31.7
B03ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	7710	ND(1.4)	0.96	169	0.46	1.4	2230	28.3
B05ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	5040	ND(1.3)	2.8	214	0.42	1.3	4400	24.7
B07ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	11100	ND(1.3)	10.2	225	ND(0.43)	4.6	3860	44.4
B09ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	16100	ND(8.1)	3.6	185	0.68	3.4	18200	56.8
B11ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	11800	ND(8.3)	ND(8.7)	236	0.5	0.81	2570	42.2
B13ES120190	EXPLOSIVE STORAGE	10/17&12/01-90	0.5 - 1.5	4450	ND(1.3)	2.8	187	ND(0.42)	1.4	1810	30.5
B14ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	5060	ND(1.3)	2.8	198	0.44	1.7	2270	29.7
B15ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	4800	ND(1.3)	2.8	184	0.43	1.6	1520	27.7
B16ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	17700	ND(8.1)	2.4	205	0.66	4.1	12400	65.1
B1TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	11100	15.6	21.2	247	ND(0.44)	9.9	2790	36.1
B2TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	9000	ND(8.7)	4.3	390	ND(0.46)	2.8	2130	34
B1BG1120190	BACKGROUND	10/20&12/01-90	1.3	14300	ND(8.8)	ND(0.92)	122	0.48	1.2	3930	39.7
B1BG2120190	BACKGROUND	10/20&12/01-90	1.3	16900	ND(9.1)	ND(0.95)	142	0.65	3.1	4460	45.1
B1MA120190	MARSH	10/24&12/01-90	1	21000	ND(9.1)	3.5	195	0.74	2.2	6890	59.6
B2MA102490	MARSH	10/24/90	1	21700	ND(25.9)	119	54.9	ND(1.4)	9.8	4910	85.2

ND(8.3) = Not Detected (Detection Limit); NA = Not Analyzed; * = Exceeded Holding time for Mercury

SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	ALUMINUM (mg/kg)	ANTIMONY (mg/kg)	ARSENIC (mg/kg)	BARIUM (mg/kg)	BERYLLIUM (mg/kg)	CADMIUM (mg/kg)	CALCIUM (mg/kg)	CHROMIUM (mg/kg)
B3MA102490	MARSH	10/24/90	1	26700	ND(20.4)	ND(33.4)	61.2	ND(1.1)	3.8	3980	102
B4MA120190	MARSH	10/24&12/01-90	1	24700	ND(13.4)	186	96.1	ND(0.70)	5	3180	100
B5MA120190	MARSH	10/24&12/01-90	1	27400	ND(33.9)	674	61	ND(1.8)	8.2	4600	110
B6MA102490	MARSH	10/24/90	1	29800	ND(19.0)	ND(3.1)	62.9	ND(1.0)	5.3	3870	115
B7MA120190	MARSH	10/24&12/01-90	1	17400	13.6	15.8	189	0.99	6.9	17700	35.7
B8MA112690	MARSH	10/24&11/26-90	1	30000	ND(18.9)	875	86.9	ND(1.0)	7.7	4160	209
B9MA112690	MARSH	10/24&11/26-90	1	11600	ND(15.8)	125	164	ND(0.67)	8.7	1730	39.5
B10MA112690	MARSH	10/24&11/26-90	1	21900	47.9	2210	108	ND(0.92)	12.3	4300	185
B11MA112690	MARSH	10/24&11/26-90	1	21500	16.5	245	100	ND(0.86)	7.6	3690	143
SD1BAY102490	BAY	10/24/90	1	21000	ND(14.3)	10.5	71	ND(0.75)	3.2	5040	73.2
SD2BAY102490	BAY	10/24/90	1	6840	ND(10.3)	3.2	70.7	ND(0.54)	2	3200	26.9
SD1SL102490	SLOUGH	10/24/90	1	24800	ND(15.4)	ND(2.6)	74.2	0.89	4.8	3430	95.6
SD2SL102490	SLOUGH	10/24/90	1	23400	ND(16.3)	ND(2.7)	69.2	ND(0.86)	2	3810	89.7
SD3SL102490	SLOUGH	10/24/90	1	24200	ND(16.8)	101	105	1.1	10.8	3630	138
B1PR102490	PIER	10/24/90	1.3	7580	ND(9.9)	ND(63.4)	39.2	ND(0.52)	1.8	18400	36.8
SD1PR102490	PIER	10/24/90	1	19700	ND(14.6)	ND(24.9)	77.3	ND(0.77)	5.6	3400	83.5
SD1WSD102490	WEST STORM DRAIN	10/24/90	1	25400	ND(14.9)	ND(25.1)	73.1	0.86	5.7	3500	115
SD1ESD102490	EAST STORM DRAIN	10/24/90	1	8160	41.8	ND(348)	178	ND(1.1)	31	1890	37.6
SD1MA102490	MARSH	10/24/90	1	28400	ND(16.1)	50.6	77.2	ND(0.85)	5.9	4180	105
SD2MA102490	MARSH	10/24/90	1	31000	ND(16.1)	27.2	75.6	ND(0.85)	2.8	4110	105
SD3MA102490	MARSH	10/24/90	1	32700	ND(24.2)	190	57	1.5	5	4400	116
SD4MA120190	MARSH	10/24/90	1	9440	26	161	112	ND(0.54)	9.7	2310	32.9
SD5MA120190	MARSH	10/24/90	1	8710	30.4	167	97.1	ND(0.60)	11	2740	35.8
SD6MA120390	MARSH	10/24/90	1	13800	79	555	207	ND(0.84)	33.7	1690	33.8

ND(8.3) = Not Detected (Detection Limit); NA = Not Analyzed; * = Exceeded Holding time for Mercury

SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	COBALT (mg/kg)	COPPER (mg/kg)	CYANIDE (mg/kg)	IRON (mg/kg)	LEAD (mg/kg)	MAGNESIUM (mg/kg)	MANGANESE (mg/kg)	MERCURY (mg/kg)
B01SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	21.7	187	0.15	19500	81.3	4310	605	1.1
B02SH101890	SHELL MANUFACTURING	10/18/90	1.3	13.3	34	NA	10800	37.1	5100	518	3.31
B03SH101890	SHELL MANUFACTURING	10/18/90	1.3	51.5	12.6	NA	10300	7.4	1370	4280	0.12
B04SH101890	SHELL MANUFACTURING	10/18/90	1.3	13.2	10.5	NA	5970	6.4	1070	898	ND(0.11)
B05SH101890	SHELL MANUFACTURING	10/18/90	1.3	14.6	18.1	NA	17300	6.3	6550	353	ND(0.11)
B06SH101890	SHELL MANUFACTURING	10/18/90	1.3	15	17	NA	13200	5.4	6340	380	ND(0.11)
B07SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	27.2	38.9	NA	7520	20.6	1250	1290	80.1
B08SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	27.1	181	NA	11800	121	1960	1220	97.8
B09SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	10.8	70.5	NA	9750	187	2000	489	18.8
B10SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	16.5	188	NA	10000	87.4	1650	986	40.2
B11SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	5.5	291	NA	9460	313	1440	345	7.74
B12SH101890	SHELL MANUFACTURING	10/18/90	1.3	11.3	24.3	NA	7390	8.9	1590	508	0.57
B13SH101890	SHELL MANUFACTURING	10/18/90	1.3	11.5	24.8	NA	9960	9.2	5610	497	0.3
B14SH101890	SHELL MANUFACTURING	10/18/90	1.3	23.7	22.5	0.13	7510	12.9	1620	1100	2.48
B16SH101890	SHELL MANUFACTURING	10/18/90	1.3	16.2	804	NA	7470	9.3	1350	491	1.17
B18SH101890	SHELL MANUFACTURING	10/18/90	1.3	22.2	29.8	0.13	11000	40.1	2010	1000	2.27
B15SH1.5-120190	SHELL MANUFACTURING	10/24&12/01-90	1.5	15.4	408	ND(0.1)	45100	741	1500	579	6.42
B15SH04-102490	SHELL MANUFACTURING	10/24/90	4	19	32.3	NA	25500	6.5	5170	713	0.3
B15SH6.5-102490	SHELL MANUFACTURING	10/24/90	6.5	5.9	54.3	NA	22000	9.7	7140	130	0.26
B15SH09-102490	SHELL MANUFACTURING	10/24/90	9	14.7	25.3	NA	24900	4.2	6670	537	0.11
B15SH11.5-10249	SHELL MANUFACTURING	10/24/90	11.5	18.8	62.7	NA	31000	4.2	7330	875	0.11
B15SH14-102490	SHELL MANUFACTURING	10/24/90	14	19.6	25.5	NA	18800	3.2	6090	538	0.25
B1MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	11.8	102	0.19	16600	91.5	2760	403	317
B2MF1.5-120190	MERCURY FULMINATE	10/24&12/01-90	1.5	16.6	209	ND(0.1)	36700	388	3990	319	4.39
B2MF04-120190	MERCURY FULMINATE	10/24&12/01-90	4	15	159	NA	29200	697	3200	487	2.6
B2MF6.5-102490	MERCURY FULMINATE	10/24/90	6.5	8	44	NA	23400	7.4	9500	208	0.46
B2MF09-102490	MERCURY FULMINATE	10/24/90	9	7.9	29.2	NA	20600	5	6250	130	ND(0.12)

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TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	COBALT (mg/kg)	COPPER (mg/kg)	CYANIDE (mg/kg)	IRON (mg/kg)	LEAD (mg/kg)	MAGNESIUM (mg/kg)	MANGANESE (mg/kg)	MERCURY (mg/kg)
B2MF11.5-102490	MERCURY FULMINATE	10/24/90	11.5	9.1	22.7	NA	15500	4.3	6380	184	1.63
B2MF14-102490	MERCURY FULMINATE	10/24/90	14	8.9	34.7	NA	14800	5.6	5330	209	2.03
B3MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	13.7	451	ND(0.1)	42600	1140	2640	261	11
B01BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	14.2	207	NA	16600	19.1	3660	666	0.83
B02BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	27.2	232	NA	8660	19.8	832	1360	1.04
B03BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	16	70.8	NA	9830	69.5	1500	923	1.75
B04BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	24.6	149	NA	8520	17.1	1300	1460	1.06
B05BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	13.7	201	NA	11200	14.2	905	705	0.41
B01ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	43.1	654	NA	12800	8.5	1640	2340	0.28
B03ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	10.5	736	NA	9460	5	2160	356	ND(0.12)
B05ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	12.2	44.1	NA	10000	10.5	1640	816	0.8
B07ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	19.1	516	NA	25900	24.3	3550	702	1.37
B09ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	15.6	77.8	NA	19800	18	6930	553	0.51
B11ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	18.1	21.2	NA	15000	6.9	2780	879	ND(0.12)
B13ES120190	EXPLOSIVE STORAGE	10/17&12/01-90	0.5 - 1.5	13	29.5	NA	9480	12	1400	689	0.4
B14ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	13.4	29.3	NA	9500	15.1	1590	715	0.3
B15ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	9.2	22.6	NA	9490	17.4	1500	364	0.19
B16ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	22.2	70.7	NA	23100	15	8140	639	0.84*
B1TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	32.8	899	NA	70000	49.2	3150	842	6.66
B2TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	30.6	1140	NA	27800	46.4	1560	1630	2.91
B1BG1120190	BACKGROUND	10/20&12/01-90	1.3	4.2	17.9	ND(0.1)	12600	7.3	2930	167	ND(0.11)
B1BG2120190	BACKGROUND	10/20&12/01-90	1.3	9.5	22.4	0.25	15600	10.7	3300	360	ND(0.12)
B1MA120190	MARSH	10/24&12/01-90	1	24.9	44.4	NA	26000	7.5	5260	1030	ND(0.12)
B2MA102490	MARSH	10/24/90	1	21.6	112	NA	45700	125	13300	222	2.32

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TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	COBALT (mg/kg)	COPPER (mg/kg)	CYANIDE (mg/kg)	IRON (mg/kg)	LEAD (mg/kg)	MAGNESIUM (mg/kg)	MANGANESE (mg/kg)	MERCURY (mg/kg)
B3MA102490	MARSH	10/24/90	1	9.5	88.6	NA	37600	83.7	14100	217	1.97
B4MA120190	MARSH	10/24&12/01-90	1	15.1	514	NA	37900	122	10900	169	10.5
B5MA120190	MARSH	10/24&12/01-90	1	24.4	494	NA	67700	221	15200	238	1.74
B6MA102490	MARSH	10/24/90	1	15.9	122	NA	37200	99.6	14900	233	2.3
B7MA120190	MARSH	10/24&12/01-90	1	27	121	NA	48100	72.2	6430	586	0.72
B8MA112690	MARSH	10/24&11/26-90	1	13.6	415	NA	60900	235	13600	170	35.9
B9MA112690	MARSH	10/24&11/26-90	1	13.1	519	NA	65200	91.3	2550	31.3	7.09
B10MA112690	MARSH	10/24&11/26-90	1	17.8	495	NA	92800	357	8530	99.5	20.2
B11MA112690	MARSH	10/24&11/26-90	1	ND(6.5)	294	NA	47300	74.6	9180	120	25.1
SD1BAY102490	BAY	10/24/90	1	16.1	255	NA	32000	58.3	10700	257	1.5
SD2BAY102490	BAY	10/24/90	1	9.5	183	NA	11100	10.8	3890	126	0.14
SD1SL102490	SLOUGH	10/24/90	1	21.5	178	NA	48400	143	12500	234	1.84
SD2SL102490	SLOUGH	10/24/90	1	13.7	106	NA	33000	108	12400	198	2.87
SD3SL102490	SLOUGH	10/24/90	1	19	692	NA	42100	485	11500	249	1.37
B1PR102490	PIER	10/24/90	1.3	12	108	NA	21400	129	4980	125	0.94
SD1PR102490	PIER	10/24/90	1	10.8	85.7	NA	32600	122	11000	188	2.23
SD1WSD102490	WEST STORM DRAIN	10/24/90	1	12.5	152	NA	38900	188	12800	228	2.34
SD1ESD102490	EAST STORM DRAIN	10/24/90	1	16.8	813	NA	235000	172	3650	89.8	8
SD1MA102490	MARSH	10/24/90	1	18.1	154	NA	45200	123	13300	279	3.02
SD2MA102490	MARSH	10/24/90	1	21.5	127	NA	42500	95.4	14500	283	2.46
SD3MA102490	MARSH	10/24/90	1	12.4	145	NA	50400	153	15600	232	2.44
SD4MA120190	MARSH	10/24/90	1	16.7	262	NA	83500	293	4330	99.5	15.7
SD5MA120190	MARSH	10/24/90	1	17.5	400	NA	80600	275	3950	91.7	6.27
SD6MA120390	MARSH	10/24/90	1	30.9	823	NA	199000	814	3610	81.3	10.6

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B01SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.3)	53.4	1600	ND(9.0)	ND(1.6)	427	ND(0.90)	36.2
B02SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.2)	48.7	373	ND(3.6)	ND(1.5)	334	ND(3.4)	25.7
B03SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.2)	46.7	179	ND(0.70)	ND(1.5)	378	ND(0.34)	38.5
B04SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.1)	20.9	199	ND(0.70)	ND(1.5)	315	ND(0.34)	21.6
B05SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.4)	41.2	471	ND(0.74)	ND(1.6)	413	ND(0.36)	17.4
B06SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.3)	35.9	565	ND(0.73)	ND(1.5)	534	ND(3.6)	16.2
B07SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.3)	31.8	296	ND(0.73)	ND(1.5)	298	ND(0.35)	24.2
B08SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.3)	34.4	365	ND(0.70)	ND(1.5)	356	ND(0.34)	27.9
B09SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.1)	20.5	798	ND(0.70)	ND(1.5)	283	ND(3.4)	16.3
B10SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.2)	34	620	ND(0.72)	ND(1.5)	258	ND(3.5)	21.7
B11SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.3)	20.2	586	ND(8.7)	ND(1.5)	322	ND(0.87)	25.7
B12SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.3)	29.6	456	ND(0.72)	ND(1.5)	641	ND(0.35)	21.1
B13SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.3)	45.3	553	ND(0.76)	ND(1.6)	332	ND(1.8)	21.6
B14SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.2)	32.6	603	ND(0.71)	ND(1.5)	1440	ND(0.69)	22.3
B16SH101890 *	SHELL MANUFACTURING	10/18/90	1.3	ND(3.4)	12.6	474	ND(0.76)	ND(1.6)	787	ND(0.37)	20.8
B18SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.3)	36.1	826	ND(0.71)	ND(1.5)	1370	ND(3.4)	28.7
B15SH1.5-120190	SHELL MANUFACTURING	10/24&12/01-90	1.5	ND(3.2)	39.8	1460	ND(8.6)	ND(1.5)	544	ND(0.86)	34.1
B15SH04-102490	SHELL MANUFACTURING	10/24/90	4	ND(3.4)	60.9	592	ND(9.30	ND(1.6)	857	ND(0.93)	40.8
B15SH6.5-102490	SHELL MANUFACTURING	10/24/90	6.5	ND(3.5)	57.4	397	ND(9.2)	ND(1.6)	1020	ND(9.2)	27.6
B15SH09-102490	SHELL MANUFACTURING	10/24/90	9	ND(3.2)	53.7	739	ND(8.8)	ND(1.5)	849	ND(8.8)	37.2
B15SH11.5-10249	SHELL MANUFACTURING	10/24/90	11.5	ND(3.4)	74.4	839	ND(9.0)	ND(1.6)	867	ND(0.90)	46.3
B15SH14-102490	SHELL MANUFACTURING	10/24/90	14	ND(3.6)	49.5	779	ND(9.5)	ND(1.7)	774	ND(0.95)	35.1
B1MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	ND(3.3)	33	1310	ND(0.88)	ND(1.5)	1120	ND(0.88)	27.7
B2MF1.5-120190	MERCURY FULMINATE	10/24&12/01-90	1.5	ND(3.3)	34.6	1340	ND(8.9)	ND(1.5)	507	ND(0.89)	33.8
B2MF04-120190	MERCURY FULMINATE	10/24&12/01-90	4	ND(3.7)	34.7	738	ND(9.9)	ND(1.7)	587	ND(0.99)	30
B2MF6.5-102490	MERCURY FULMINATE	10/24/90	6.5	ND(3.7)	63.3	352	ND(10.0)	ND(1.7)	740	ND(1.00)	31.8
B2MF09-102490	MERCURY FULMINATE	10/24/90	9	ND(3.7)	50.4	437	ND(0.96)	ND(1.7)	605	ND(0.96)	43

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B2MF11.5-102490	MERCURY FULMINATE	10/24/90	11.5	ND(3.4)	40.2	327	ND(8.9)	ND(1.6)	465	ND(0.89)	23.7
B2MF14-102490	MERCURY FULMINATE	10/24/90	14	ND(3.3)	41.9	512	ND(0.88)	ND(1.6)	561	ND(0.88)	26.5
B3MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	ND(3.4)	45.7	1180	ND(0.90)	ND(1.6)	516	ND(0.90)	25.9
B01BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.4)	40	831	ND(0.92)	ND(1.6)	2680	ND(0.92)	29.8
B02BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.6)	13.1	369	ND(0.96)	ND(1.7)	315	ND(0.96)	24
B03BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.4)	23.4	444	ND(0.91)	2.1	343	ND(0.91)	24.5
B04BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.3)	26.5	424	ND(0.89)	ND(1.6)	293	ND(0.89)	25.5
B05BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.5)	13.2	460	ND(0.94)	ND(1.7)	306	ND(0.94)	28.1
B01ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.2)	47.8	481	ND(0.87)	ND(1.5)	291	ND(0.87)	34.5
B03ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.5)	19.4	359	ND(0.90)	ND(1.6)	290	ND(0.90)	27.2
B05ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.1)	29.8	458	ND(0.84)	ND(1.5)	251	ND(0.84)	25
B07ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.3)	35.9	758	ND(0.87)	1.9	401	ND(0.87)	27.9
B09ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	ND(3.2)	65.4	1220	ND(3.5)	ND(1.5)	427	ND(1.7)	32.9
B11ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	ND(3.3)	30.9	436	ND(8.7)	ND(1.5)	423	ND(0.87)	33.4
B13ES120190	EXPLOSIVE STORAGE	10/17&12/01-90	0.5 - 1.5	ND(3.2)	26.8	668	ND(0.85)	ND(1.5)	348	ND(0.85)	29.9
B14ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.3)	32.3	755	ND(0.86)	ND(1.5)	363	ND(0.86)	30.3
B15ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.2)	27.2	760	ND(0.86)	ND(1.5)	338	ND(0.86)	27.8
B16ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	ND(3.2)	79.7	1310	ND(7.2)	ND(1.5)	464	ND(1.7)	40.1
B1TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	ND(3.3)	27.1	1010	ND(0.72)	ND(1.5)	454	ND(3.5)	29.3
B2TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	ND(3.4)	33.7	551	ND(9.1)	ND(1.6)	384	ND(0.91)	36.8
B1BG1120190	BACKGROUND	10/20&12/01-90	1.3	ND(3.5)	36.8	289	ND(9.2)	ND(1.6)	607	ND(0.92)	21.6
B1BG2120190	BACKGROUND	10/20&12/01-90	1.3	ND(3.6)	38.7	342	ND(9.2)	ND(1.7)	757	ND(0.95)	25.8
B1MA120190	MARSH	10/24&12/01-90	1	ND(3.6)	61	899	ND(7.9)	ND(1.7)	507	ND(0.38)	40.8
B2MA102490	MARSH	10/24/90	1	11.2	111	5690	ND(22.2)	ND(4.8)	29700	ND(10.8)	59.8

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APPENDIX R

PRELIMINARY RISK ASSESSMENT
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

Jonas & Associates Inc.

PRELIMINARY RISK ASSESSMENT

UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

February 22, 1991

R

PRELIMINARY RISK ASSESSMENT

UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

February 22, 1991

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EXECUTIVE SUMMARY

Background

The University of California at Berkeley's Richmond Field Station (UCB-RFS) is located in Richmond, California at 1301 South 46th Street. Explosives manufacturing was conducted from the 1840s to about 1945 in an area that included the southeastern portion of the site. A major part of the operations in this area involved the production of mercury fulminate.

Investigations of the UCB-RFS facility have been conducted by the California Department of Health Services (DHS), by CH2M Hill, and by Jonas and Associates Inc. These investigations indicate that mercury is present in the areas sampled at an average concentration of 25 mg/kg and a maximum concentration of 630 mg/kg. Other metals, including arsenic, copper, and lead were also detected at the site at somewhat elevated levels.

Current land uses adjacent to UCB-RFS are primarily industrial. The U.S. Environmental Protection Agency intends to construct a laboratory on the property and is concerned about the mercury detected at the site.

Risk Assessment Results

Based on the results of this preliminary risk assessment, use of the UCB-RFS is unlikely to pose health risks, but could pose risks under the following conservative exposure scenarios:

- Daily worker exposure for an extended period of time to soil contaminated with over 600 mg/kg of mercury alone or over 1000 mg/kg of lead alone. Health risks could also be posed by soils containing slightly lower levels of both metals in combination.

- Frequent accidental or intentional ingestion exposure to soil or off-site marsh sediments containing more than background levels of arsenic.

Based on the available information and on site characteristics, soil remediation levels of around 600 mg/kg of mercury and 1,000 mg/kg of lead would probably be sufficient to protect workers. Concurrent exposure to soils containing these levels of metals might be of some concern but based on the available data, elevated levels of mercury and lead do not occur in the same areas.

Under the exposure scenarios used in the preliminary risk assessment, even background levels of arsenic pose a risk above the one in one million cancer risk commonly used as a risk goal by regulatory agencies. However, based on the expected use of the facility and the cleanup levels established for other sites, a cleanup level for arsenic in the range of 100 - 200 mg/kg seems appropriate for the UCB-RFS. It also seems unlikely that the no

action alternative would pose a substantial health risk given the presence of elevated levels of arsenic in only two isolated areas of the facility.

The cleanup levels that are provided above indicate the concentration of a material that would be unlikely to pose a health risk under the conditions of regular repeated contact for an extended period of time. If such frequent exposure is unlikely, concentrations exceeding these levels would also not pose a significant health risk. For example, only two on-site arsenic concentrations are above the 100 mg/kg value used in the risk calculations, and 34 of 37 surface soil samples analyzed were at expected background levels. Similarly, for mercury, only one on-site surface concentration exceeded 600 mg/kg and for lead only one value exceeded 1,000 mg/kg. Because frequent direct contact with these areas is unlikely, the presence of arsenic and lead at these levels is unlikely to pose a health risk.

Numerous factors influence the uptake of metals by aquatic organisms and consequently it is difficult to accurately quantify exposure via the consumption of fish or shellfish harvested from the marsh. However, elevated sediment concentrations of some of the metals were present in discrete areas in the marsh and it appears prudent to limit consumption of benthic organisms, including shellfish, from these areas. A factor mitigating the potential concern for this pathway is that arsenic is converted by aquatic organisms to an organic arsenical which is not metabolically active and is rapidly eliminated from the human body.

In order to ensure that the health of on-site and off-site workers and any nearby residents is adequately protected, conservative (health protective; unlikely to underestimate risk) assumptions were used in deriving both the exposure estimate and the toxicity values. Because of the use of these conservative (although not necessarily worst case) assumptions, it is unlikely that chemicals remaining at the site at these levels would pose an actual hazard. Any response action that would eliminate the ingestion exposure pathway for soils (such as capping, asphalting, fencing, other access restrictions, or use restrictions) would further limit the potential for exposure and protect public health and welfare.

Scale as shown Figure 2-1

TABLE 2-1

CONCENTRATIONS OF METALS IN SURFACE SOIL AT THE UCB-RFS FACILITY

CHEMICAL	NO. OF DETECTIONS/ NO. OF SAMPLES	MEAN[a] (mg/kg)	UCL[b] of MEAN (mg/kg)	MAXIMUM CONC. (mg/kg)
Antimony	5/37	6	14	45.3
Arsenic	33/37	15	99	236
Barium	37/37	235	451	95
Beryllium	21/37	.47	.59	67
Cadmium	35/37	2	6	9.2
Chromium	37/37	31	56	71.2
Cobalt	37/37	19	37	51.5
Copper	37/37	222	788	1140
Lead	37/37	100	543	1140
Mercury	80/86	25	180	630
Molybdenum	0/37	3	4	ND
Nickel	37/37	34	62	79.7
Selenium	0/37	2	9	ND
Silver	2/37	2	2	2.1
Thallium	0/37	1	3	ND
Vanadium	37/37	27	39	40.1
Zinc	37/37	249	1056	1550

ND = Not Detected

[a]Values are arithmetic means or averages of samples collected from selected areas of the site.

[b]Values are upper 95% confidence limits of the arithmetic mean

TABLE 2-2

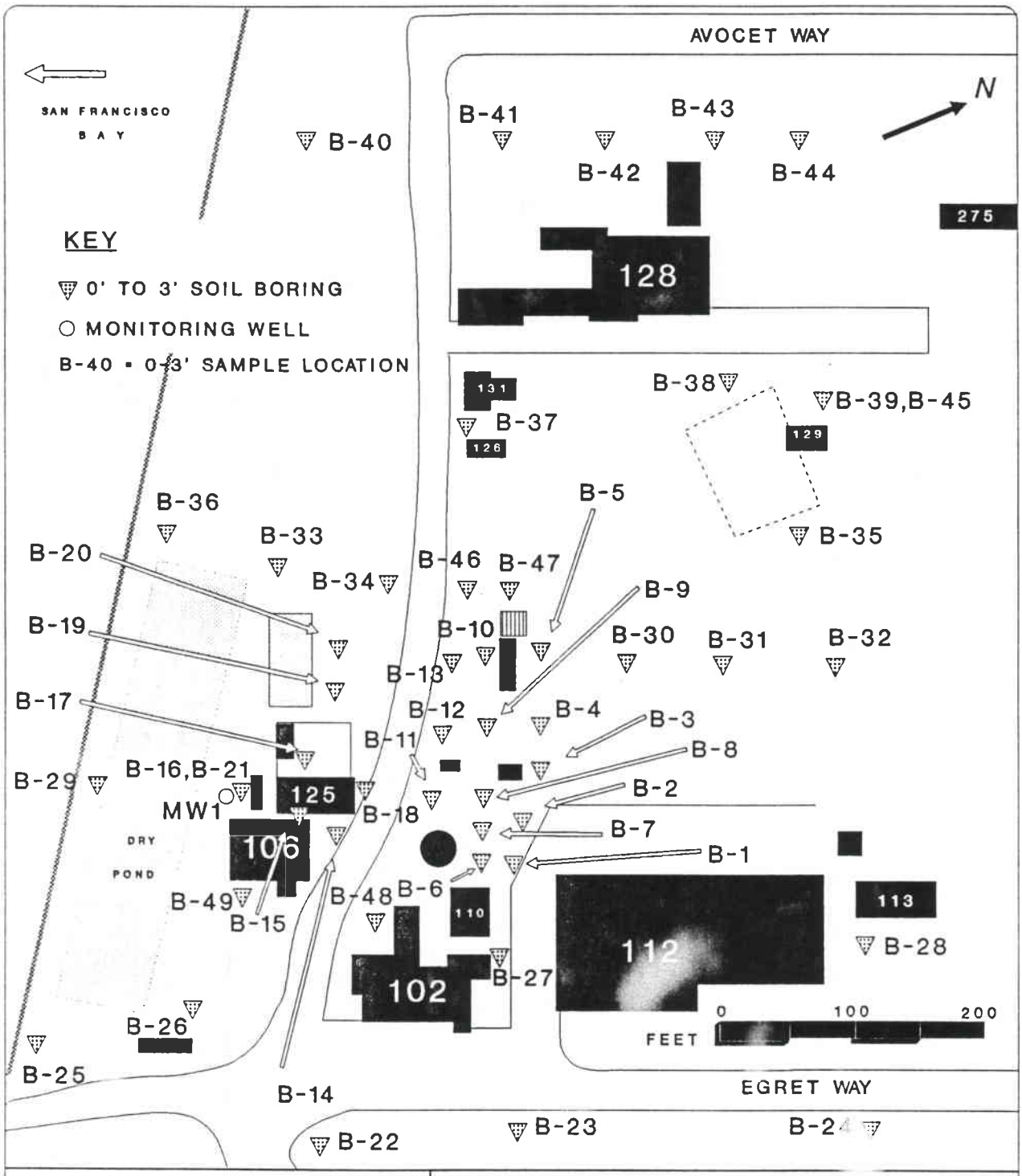
CONCENTRATIONS OF METALS IN MARSH SEDIMENTS
AND SOIL AT THE UCB-RFS SITE

CHEMICAL	NO. OF DETECTIONS/ NO. OF SAMPLES	MEAN[a] (mg/kg)	UCL[b] of MEAN (mg/kg)	MAXIMUM CONC. (mg/kg)
Antimony	3/11	21	42	47.9
Arsenic	9/11	408	700	2210
Barium	11/11	107	210	195
Beryllium	2/11	1	2	1
Cadmium	11/11	3	12	12.3
Chromium	11/11	108	210	209
Cobalt	10/11	17	30	27
Copper	11/11	293	670	519
Lead	11/11	135	320	357
Mercury	10/11	10	33	36
Molybdenum	1/11	7	13	11
Nickel	10/11	65	120	111
Selenium	2/11	10	NA	11
Silver	0/11	3	6	ND
Thallium	0/11	7	14	ND
Vanadium	11/11	67	110	109
Zinc	11/11	705	1500	1470

ND = Not Detected

[a]Values are arithmetic means or averages of samples collected from the marsh

[b]Values are upper 95% confidence limit of the arithmetic mean



Prepared for

UNIVERSITY OF CALIFORNIA
Richmond Field Station

Prepared by

JONAS & ASSOCIATES

FIGURE 2-2
LOCATION OF SOIL SAMPLES AND MONITORING WELL
(J&A, 1989-90)

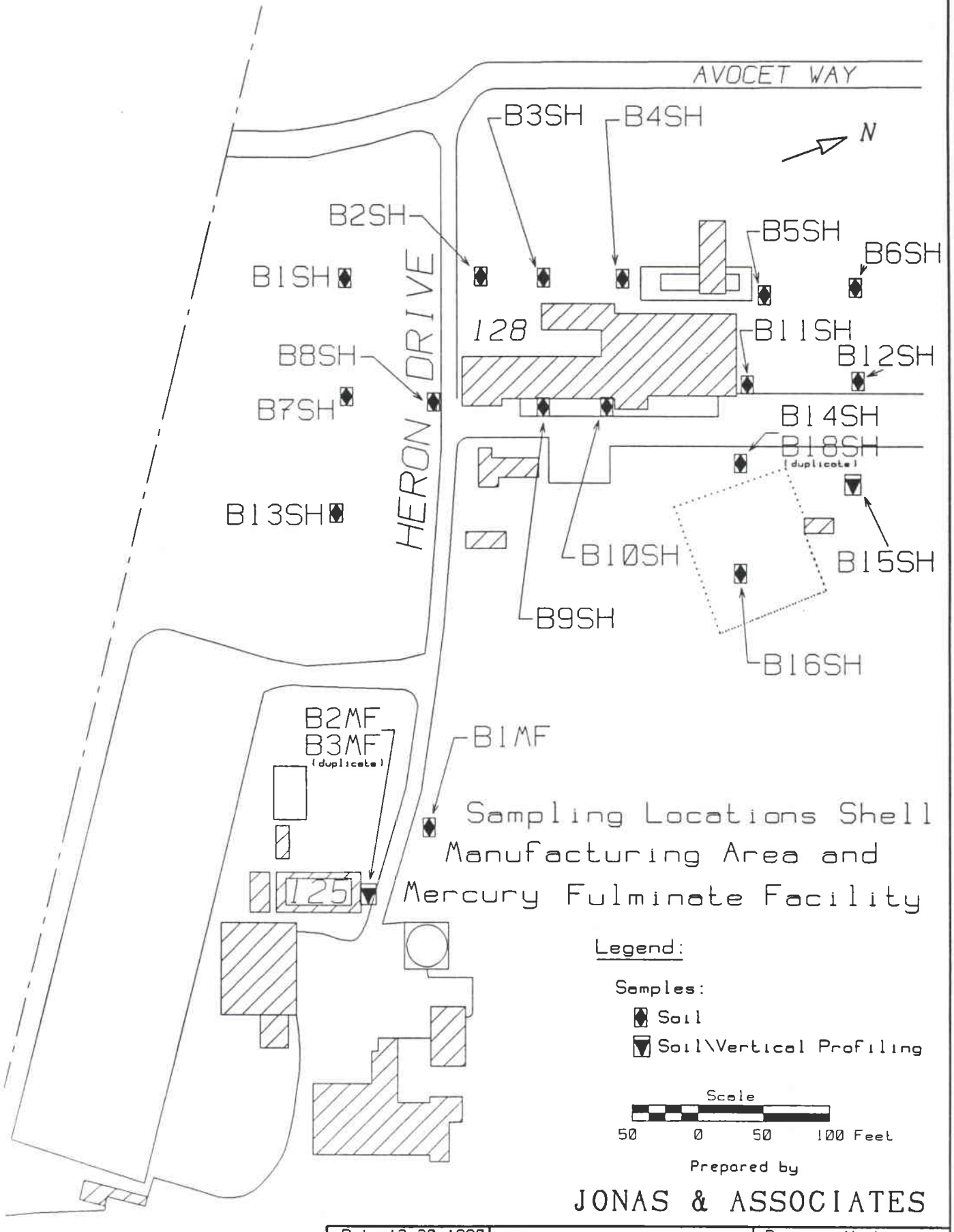


Figure 2-3

Drawing Number

Drawn by AJ 12-20-1990

Checked by

Approved by

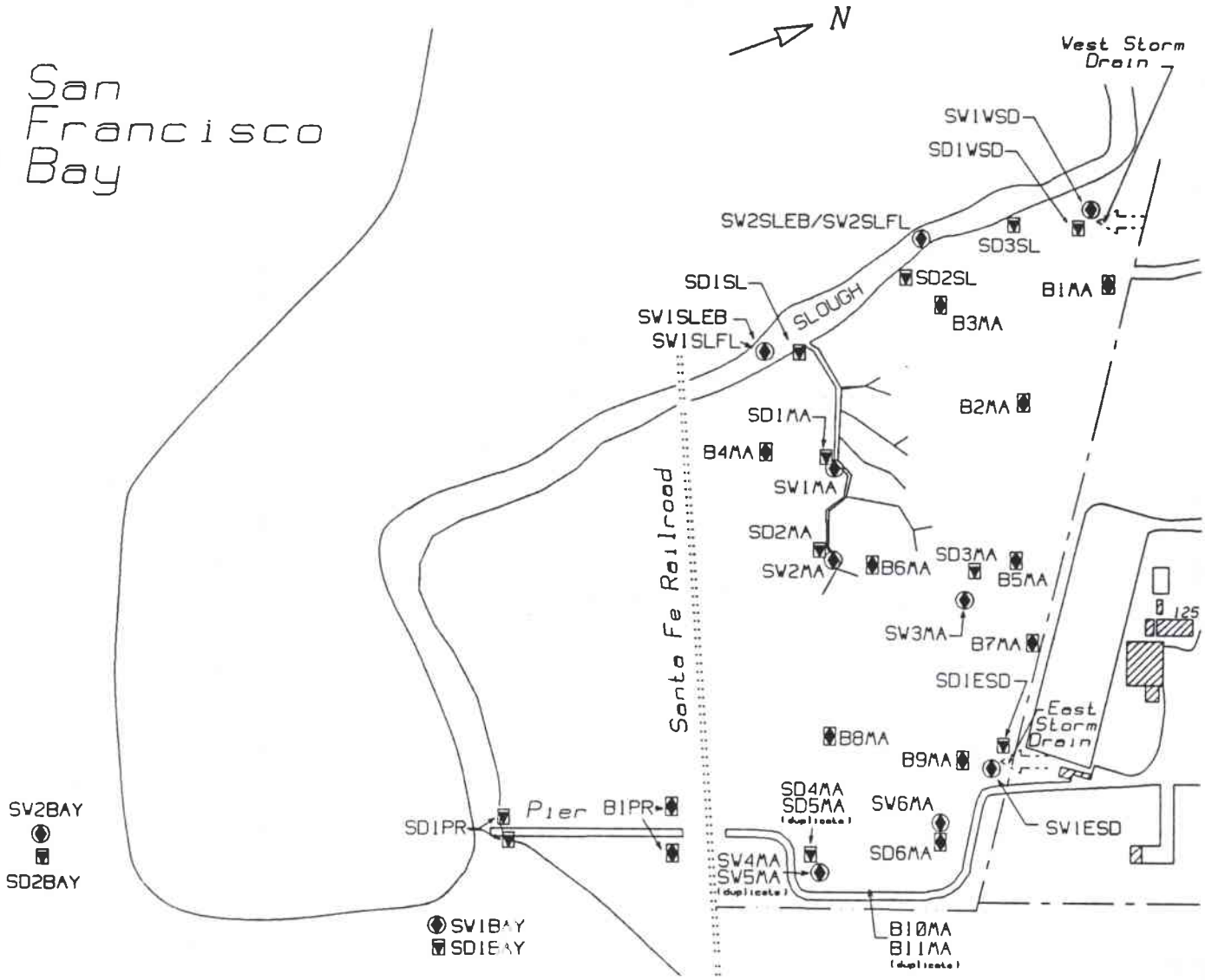
Date: 12-20-1990
Scale as shown

Figure 2-3

Drawing Number

Figure 2-4

Drawing Number



Legend:

Samples:

- Soil
- Submerged Sediment
- Surface Water

Scale

150 0 150 300 Feet

Sampling Locations Slough, East and West Storm Drains, Marsh and Bay

Prepared by

JONAS & ASSOCIATES

Drawn by: AJ 12-20-1990 | Checked by | Approved by

Date: 12-20-1990	Figure 2-4	Drawing Number
Scale as shown		

Jonas and Associates collected samples from areas of the site that past use suggested may have elevated concentrations of metals. Consequently, the average values reported in Tables 2-1 and 2-2 are not representative of the entire site, but rather only the areas sampled. The areas sampled include the former Mercury Fulminate Facility, former Shell Manufacturing Area, former Explosive Storage Area, and the Marsh.

Vertical samples were collected in the area of sampling point B-18, where the highest soil samples had been collected (Boring B2MF) and in an upgradient area near Building 129 (Boring B15SH). Figure 2-5 shows the locations of the vertical samples. Table 2-3 presents the concentrations of mercury detected at different depths. MW-1 was sampled at depths of 0-0.5, 2.5-4.5, 4.5-6.0, 6.0-7.5, and 7.5-9.0 feet. The sample at boring B-18 was sampled at 0-1, 1-2, and 2-3 feet. Six inch samples were collected in October 1990 from borings B2MF and B15SH at depths of 1.5, 4.0, 6.5, 9.0, 11.5, and 14.0 feet.

Data from boring MW-1 indicates that mercury was present on the south side of Building 125 from the surface to approximately 7.5 feet, at concentrations between 20 and 40 mg/kg. At approximately 7.5 feet below grade, the soil profile changes from silty clay to silty sand. The sample taken below this level showed a mercury concentration of 2.7 mg/kg. This data suggests that the silty clay has less of a tendency to bind the mercury than the organic-rich silty clay.

Levels reported for boring MW-1 were consistent with values detected elsewhere on the site. Higher levels were reported from the north side of Building 125, where an average of 630 mg/kg was detected in a 0-3 foot sample. Samples from 0-1, 1-2, and 2-3 foot depths in B-18 indicated that the mercury was uniformly distributed at approximately 500 mg/kg. (The slight discrepancy between the average of 500 mg/kg for the three samples and 630 mg/kg for the single composite is not inconsistent with common field sampling or laboratory error).

Samples B2MF and B15SH provide information on the vertical mercury migration. Data are slightly elevated from the 1.5 foot depth in both borings (4.4 mg/kg in B2MF and 6.4 mg/kg in B15SH) and at the 4 foot depth in B2MF (2.6 mg/kg). However, mercury concentrations below this depth are fairly uniform and appear to be close to expected background levels (0.1 - 2 mg/kg). Boring B2MF (4.4 mg/kg at 1.5 feet) was collected within one foot of B-18 (concentration of 470 mg/kg at 1-2 feet). These values differ by over two orders of magnitude (a factor of 100). Possible explanations for this difference are that the mercury contamination may be highly localized and the newer samples may have been collected from cleaner areas or that the heterogeneity of the sampling matrix may have significantly affected the sampling results.

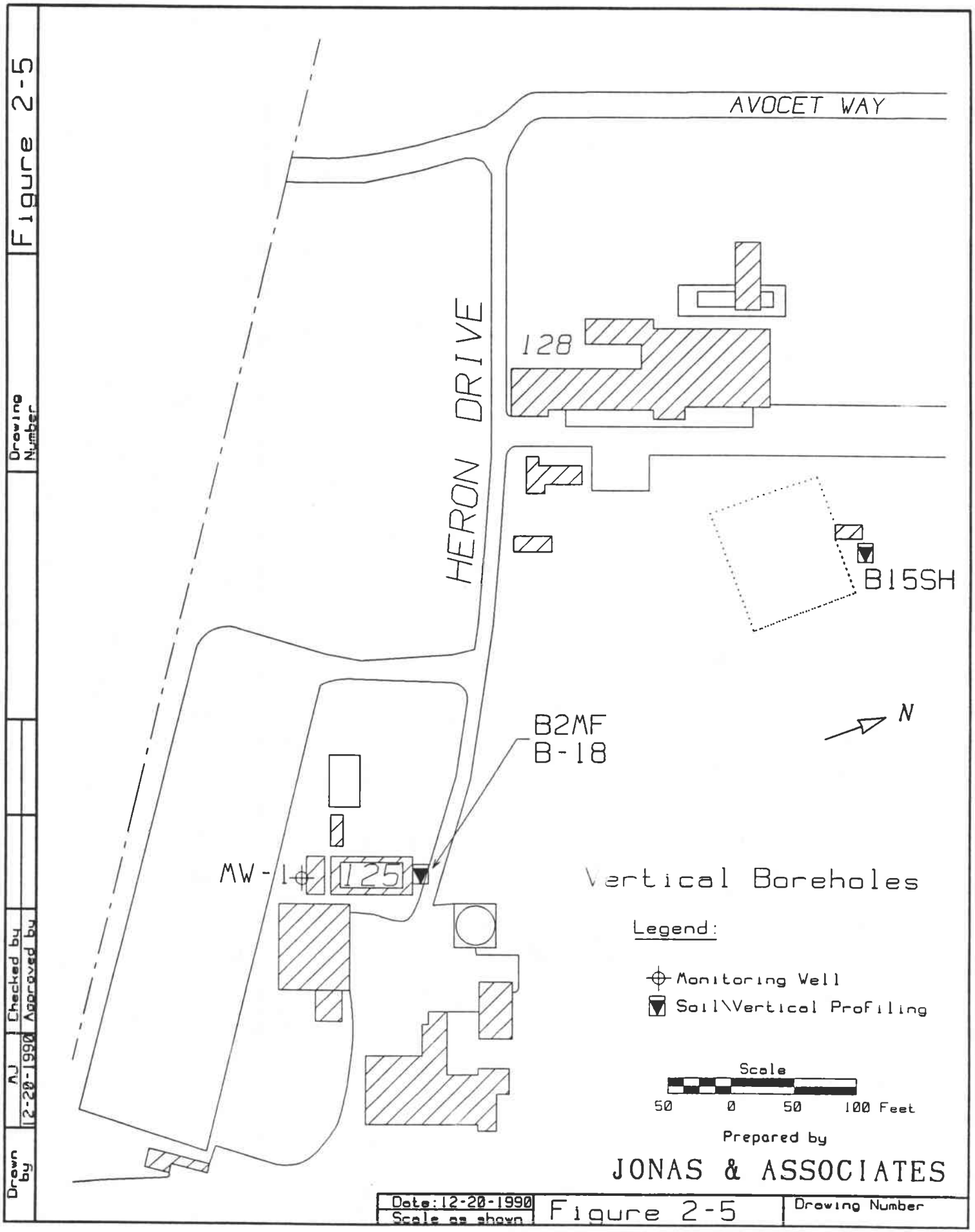

AVOCET WAY
HERON DRIVE
128
B15SH
B2MF
B-18
MW-1
125
N
Vertical Boreholes
Legend:
Monitoring Well
Soil\Vertical Profiling
Scale
50 0 50 100 Feet
Prepared by
JONAS & ASSOCIATES
Date: 12-20-1990
Scale as shown
Figure 2-5
Drawing Number
Drawn by
AJ
12-20-1990
Checked by
Approved by
Drawing Number
Figure 2-5

TABLE 2-3

CONCENTRATION OF MERCURY AT
VARYING DEPTHS

	Concentrations at Site Boring Locations (mg/kg)			
Depth (feet)[a]	MW-1	B-18	B2MF	B15SH
0 - 1.0	24	560	240[b]	5[c]
1.0 - 2.0	NA	470	4.39	6.42
2.0 - 3.0	NA	510	NA	NA
2.5 - 4.5	36		2.6	0.3
4.5 - 6.0	27		NA	NA
6.5 - 7.5	24		0.46	0.26
7.5 - 9.5	2.7		<0.12	0.11
11.5	NA		1.63	0.11
14.0	NA		2.03	0.25

[a]Samples were composited from different depths but are grouped here for purposes of comparison. For example, a 6 inch sample collected at approximately 4 feet in B15SH and B2MF is compared with the MW-1 composite for 2.5 - 4.5 feet.

[b]Value reported for a 0-3 inch surface soil sample (B-18) during previous sampling round (Jonas & Associates: December 1989 - January 1990). A concentration of 630 mg/kg mercury was reported for a 0 - 3 foot sample from the same area.

[c]Value is average of three 0-3 foot samples reported from approximately the same area (Borings B-35, B-39, and B-45).

2.4 Selection of Key Site Chemicals

When a number of chemicals is detected at a site, a subset of key site chemicals is often selected in order to focus the assessment on those contaminants that are most likely to pose risks at the site. The following criteria were used to select the chemicals of concern at the UCB-RFS site:

Past use at the site. Mercury is a key constituent of the mercury fulminate that was produced at the facility. Consequently, it will be included as a key chemical in this assessment.

Comparison with background concentrations. Concentrations of contaminants detected on the site were compared to concentrations detected in samples from off-site areas that were not contaminated by the site. For purposes of selecting the chemicals of concern, chemicals with upper confidence limit values not exceeding the expected background concentrations were considered not to be different from background.

Concentration, toxicity, and physicochemical properties. The relative concentrations and toxicity of chemicals with similar physicochemical properties were compared. Chemicals clearly posing a hazard well below (one or more orders of magnitude) that of other contaminants were removed from further consideration.

Metals are natural constituents of all soils; in order to determine if levels of metals detected in surface soils at the UCB-RFS site were site-related, concentrations detected at potentially contaminated areas of the facility were compared to levels present in clean areas and in uncontaminated soils nationwide. Site-specific background samples were taken from adjacent to Building 400 (BG1 and BG2) in locations that were considered unlikely to be affected by the site. Background levels in the conterminous United States are available for most of the metals detected on the property (Shacklette and Boerngen 1984). Table 2-4 presents a comparison of samples from the facility (within the fenced portion of the site) with background levels. The values used for the national background data are the 95% upper confidence limit on the geometric means for these metals. Geometric means are used because Shacklette and Boerngen (1984) and other researchers note that environmental data tend to be log-normally distributed. Average values or arithmetic mean values are overly influenced by high concentration values and therefore will tend to be higher than geometric means. The maximum site-specific background value was also used for comparison purposes.

TABLE 2-4

COMPARISON OF SURFACE SOIL CONCENTRATIONS
AT THE UCB-RFS SITE

	FACILITY SOIL		BACKGROUND SOIL	
CHEMICAL	UCL[a] OF MEAN (mg/kg)	MAXIMUM CONC. (mg/kg)	UCL[b] OF US DATA (mg/kg)	MAXIMUM ON-SITE (mg/kg)
Antimony	14	45.3	NA	ND
Arsenic	99	236	25	ND
Barium	451	95	1600	142
Beryllium	.59	67	3.4	0.65
Cadmium	6	9.2	NA	3.1
Chromium	56	71.2	220	45.1
Cobalt	37	51.5	40	9.5
Copper	788	1140	100	22.4
Lead	543	1140	58	10.7
Manganese	2290	4280	3700	360
Mercury	180	630	0.4	ND
Molybdenum	4	ND	4.9	ND
Nickel	62	79.7	75	38.7
Selenium	9	ND	1.7	ND
Silver	2	2.1	NA	ND
Thallium	3	ND	20	ND
Vanadium	39	40.1	290	25.8
Zinc	1056	1550	180	37.1

[a]Values are 95% upper confidence limit of the average soil concentration from selected areas within the fenced area of the UCB-RFS property.

[b]Value is the 95% upper confidence limit of the geometric mean of soil concentrations in the conterminous U.S. as reported by Shacklette and Boerngen (1984)

ND = Not Detected

Based on a comparison with background metals, antimony, arsenic, copper, lead, mercury, and zinc are present at elevated levels on the active portion of the site. Antimony was detected infrequently (5/37 samples) and compared with the other metals detected at the facility does not contribute substantially to health hazards. It is therefore not considered as a key site contaminant for the UCB-RFS. Arsenic, copper, lead, and mercury are all toxic and are selected as key site chemicals. Zinc is present on site at levels within the range of expected background levels for the western United States (<2,000 mg/kg; Shacklette and Boerngen 1984) and is not particularly toxic. It is unlikely to contribute substantially to health hazards, and consequently is not considered as a key site contaminant.

Low levels of alpha-BHC (hexachlorocyclohexane) and DDD, a breakdown product of DDT were also detected in the marsh. These compounds are persistent organochlorine pesticides that were in common use until the early 1970s. Because these compounds degrade slowly, they are commonly found in sediments as a result of non-point source releases from farming. The compounds were present at levels below the California TTLC for DDT of 1 mg/kg and 4 mg/kg for the gamma-BHC isomer (lindane). Because these compounds are not known to be site-related and may be present at area-wide background levels, they are not considered as key site contaminants at the UCB-RFS.

3.0 CHARACTERISTICS OF KEY CHEMICALS

3.1 Environmental Fate and Transport

The environmental behavior of chemicals is dependent on the physical and chemical properties of the compounds, the environmental transformation processes affecting them, and the characteristics of the media (soil, sediments, water) in which they are present and through which they may migrate. The principal environmental fate processes for metals is adsorption to soils, leaching into the underlying soils and groundwater and subsequently to off-site areas, or volatilization into the atmosphere. Because exposure of human and environmental receptors is highly dependent on the fate and transport of the chemicals of concern, these characteristics are discussed in detail as part of the risk assessment.

Most metals are not considered to be very mobile in the environment and are likely to remain bound to site soils. However, the behavior of individual metals is highly dependent on their form in the environment and infiltrating precipitation may leach the more soluble chemicals from soil and transport them into the groundwater. Soil parameters that must be considered are clay and metal oxide content, fraction of organic matter, Ph, and oxidation-reduction potential. Chemical partitioning between soil and

water can be expressed by a soil-water distribution coefficient (K_d). The K_d values may underestimate migration potential because they are based on chemical adsorption and desorption reaching equilibrium. As a rough estimate of relative mobilities, K_ds for the inorganic chemicals of concern can be compared. For example, cadmium has a low K_d of 6.5 whereas lead, with a K_d of 900, is much less mobile. However, mobility can be enhanced by the presence of other chemicals such as naturally occurring humic materials.

Mercury

Mercury exists in the environment in several forms including elemental metal, inorganic salts, organic mercury complexes and alkyl mercury (EPA 1985). The specific form depends on such factors as Ph, redox potential, the anions present (particularly chloride and sulfate), and the presence of methylating bacteria.
Elemental mercury is a silver liquid with an atomic weight of 200.59, a boiling point of 356.6°C, a melting point of -38.9°C, and a specific gravity of 13.6 at 20°C. Elemental mercury is relatively insoluble in water, with a water solubility of 0.081 mg/liter at 30°C. Mercury has a vapor pressure of 0.0012 torr, and volatilizes fairly readily from surface soils.

Mercury and certain of its compounds, including several inorganic species and dimethyl mercury, can volatilize to the atmosphere from aquatic and terrestrial sources. Volatilization is reduced by conversion of metallic mercury to complexed species and by deposition of HgS in reducing sediments, but even so, atmospheric transport is the major environmental distribution pathway for mercury. Precipitation is the primary mechanism for removal of mercury from the atmosphere. Photolysis is important in the breakdown of airborne mercurials and may be important in some aquatic systems. Adsorption onto suspended and bed sediments is probably the most important process determining the fate of mercury in the aquatic environment. Adsorption is strongest onto organic materials. Mercury in soils is generally complexed to organic compounds.

In general, the mercuric salts (Hg^{+2}) are more soluble than the mercurous salts. In addition, virtually any mercury compound can be remobilized in aquatic systems by microbial conversion to methyl and dimethyl forms. Conditions reported to enhance biomethylation include large amounts of available mercury, large numbers of bacteria, the absence of strong complexing agents, near neutral Ph, high temperatures, and moderately aerobic environments. Mercury is strongly bioaccumulated by numerous mechanisms. Methylmercury is the most readily accumulated and retained form of mercury in aquatic biota, and once it enters a biological system it is very difficult to eliminate.

Copper

Copper is not a potent toxic agent to humans (EPA 1980, 1984). The current EPA secondary drinking water standard (SMCL) is 1 mg/liter, based on the organoleptic properties (taste and odor) of copper rather than on its toxicity (EPA 1980). The EPA Office of Drinking Water has proposed a Maximum Contaminant Level Goal (MCLG) for copper of 1.3 mg/liter based on the occurrence of gastrointestinal effects in man (EPA 1985b, 1984a). EPA Region IX has determined an oral RfD for copper of 3.7×10^{-2} mg/kg/day, based on the MCLG (Hiatt 1991).

Lead

Lead, at relatively low exposure levels, has been shown to cause adverse neurological effects in humans, especially young children and fetuses. Of particular concern are the effects on learning ability that have been associated with very low (e.g., 10-20 ug/dl) blood lead levels (Bellinger et al. 1987). Oral ingestion of some lead salts has been associated with increased renal tumor frequencies in rats. EPA (1989) has classified lead as a Probable Human Carcinogen (Group B2) based on these results. EPA has also noted that the available data provide an insufficient basis on which to regulate carcinogenic lead salts and no quantitative estimate of the excess cancer risk has been provided. EPA has established an ambient air quality standard for lead of 1.5 ug/m^3 and a Maximum Contaminant Level (MCL) for drinking water of 50 ug/liter. Both of these standards are currently undergoing review by EPA. The EPA Office of Drinking Water has proposed an MCLG of zero and an MCL of 5 ug/liter for lead (EPA 1990). No reference dose has been established for lead, as most toxicity criteria are measured in terms of body burden, specifically blood lead levels. EPA is considering using 10 ug/deciliter of whole blood (ug/dl) as a blood lead level of concern for children. The potential risks associated with exposure to lead are evaluated using the Lead Biokinetic Model which allows the consideration of multiple sources of exposure. The Lead Biokinetic Model has not been formally adopted by EPA but is a useful tool in determining if observed soil concentrations may be of concern. The EPA Superfund program has also established an interim cleanup level range of 500 - 1,000 mg/kg in residential soils.

4.0 EXPOSURE ASSESSMENT

The objectives of the exposure assessment are to identify actual or potential exposure pathways, to characterize the potentially exposed populations, and to determine the extent of any exposure. An exposure route consists of four main elements: (1) a source and mechanism of chemical release to the environment; (2) an environmental transport medium for the released chemical; (3) a point of actual or potential contact by a receptor with the contaminated medium (referred to as the exposure point); and (4) a method of intake (e.g., ingestion, inhalation, dermal absorption) at the exposure point. If any one of these factors is absent, exposure cannot occur because the receptor will not be able to come in contact with the chemical. The potential for chemicals to get from the site soils to a receptor population is evaluated as the first section of an exposure assessment.

Potential receptor populations for the site include all people in the area of the site who may be exposed to chemicals either by direct contact on site or as a result of exposure to chemicals emanating from the site. However, the level of exposure experienced by different individuals is likely to vary considerably. It is standard practice in site-specific risk assessments to evaluate a reasonable maximum exposure to an individual rather than an average exposure to a population. Use of the reasonable maximum individual exposure ensures that most, if not all people in the area of a site receive actual exposures that are equal to or lower than the estimated reasonable maximum exposure levels. In many cases, actual exposure may be zero.

Once the exposure routes and potential receptors have been identified, the final step in an exposure assessment is a determination of the potential levels of exposure that are associated with the various possible exposure routes. Exposure quantification is presented in section 4.2.

4.1 Exposure Routes

The exposure assessment for the UCB-RFS needs to consider exposure both on the active facility (within the fenced areas of the property) and in areas outside of the fence, such as in the marsh. The assessment must also consider both current and potential future uses of the site. Exposure on the facility grounds is separated from exposure in areas outside the fence because of differences in the frequency of use and accessibility of the two areas. Current exposure assumes that the use of the facility does not change significantly in the future. If use of the facility changes substantially, potential exposure pathways may also change. The EPA is planning to construct a laboratory facility at the UCB-RFS site, but this use is unlikely to substantially change the potential for exposure except possibly to increase the frequency of use of the facility. Any potential increase in exposure associated with more frequent use will be somewhat balanced by a new concrete floor at be base of the building which will inhibit fugitive dust and vapor transport.

Development of a day care center for the children of workers using the site has been considered as a possible future use for a small portion of the property. Any potential health risks to children using a day care center would be highly dependent on its location, and possible locations of such a center has not been determined. Therefore, use of a portion of the property as a day care center was not evaluated in this assessment. Potential site-specific risks associated with use of a particular on-site area for such a center should be assessed prior to its development.

4.1.1 Possible Exposure Routes on the Active Facility

Possible routes of exposure inside the fenced area at the field station include direct contact with chemicals in soil and inhalation exposure to chemicals in air. Direct contact with soils may lead to exposure via dermal absorption of chemicals present in the soils or via ingestion (either inadvertent or intentional) of on-site soils. Exposure to airborne chemicals could include inhalation of mercury vapors released from facility soils or inhalation of metal-contaminated windborne particulate matter.

Routes of exposure that are often considered at sites similar to UCB-RFS include use of on-site groundwater as a source of potable water and the ingestion of vegetables grown on site. These routes are considered unlikely to occur at the UCB-RFS property and are not evaluated in detail in the assessment. Groundwater at the site is encountered at approximately 9 feet below the surface and this water appears to meet state of California criteria for water quality. However, continuous use of this water would almost certainly lead to saltwater intrusion rendering the water unusable for drinking or gardening. Consumption of homegrown vegetables from the site is considered unlikely to pose a substantial concern because the metals of concern for the site are not readily taken up from soils by plants. Lead and mercury are not readily translocated to plant foliage even when soil levels are very high, while arsenic and copper are phytotoxic to plants and this phytotoxicity will limit the potential for chronic exposure (Chaney 1984).

Direct Contact - Surface Soils

Direct contact with surface soils can lead to exposure to any contaminants in these soils through inadvertent or intentional soil ingestion or through dermal absorption. The potential ingestion of contaminated soils will be evaluated quantitatively in this assessment. Metals generally do not migrate through the skin to a substantial degree and, relative to ingestion, any exposure would almost certainly be minimal. Consequently, the potential exposure via dermal absorption will not be addressed in this assessment.

Air

Individuals on site may be exposed to mercury that volatilizes from site cover soils and to metals that are present in any dusts that are released into the air as a result of wind erosion of surface soils. Mercury can also be released into buildings constructed on contaminated soil, if cracks exist in their foundations. The potential for exposure via these pathways will be evaluated in this exposure assessment.

4.1.2 Possible Exposure Routes in Areas of Unrestricted Access

Possible routes of exposure in areas adjacent to the active research facility include direct contact with chemicals in the marsh (soils, sediments, and surface water), ingestion of fish or shellfish from this area, and inhalation exposure. Direct contact with marsh sediments or surface water can lead to exposure via dermal absorption of chemicals or via ingestion (either inadvertent or intentional). Fishermen catching fish or shellfish from the area as a source of food could be exposed to the chemicals taken up by these organisms. Finally, inhalation exposure to mercury vapors or to metals bound to windborne particulates being released from the site could occur.

Direct Contact - Marsh Sediments

Individuals wading or playing in the marsh may be exposed to surface water or sediment through dermal absorption or incidental ingestion. Local children, clam diggers, and fishermen are particularly likely to be exposed via these routes. Somewhat elevated concentrations of arsenic, copper, lead, and mercury were detected in sediments at several points in the marsh. These data are used in section 4.2 to estimate the potential exposure associated with the marsh.

Ingestion of Contaminated Fish or Shellfish

Fish or shellfish spending substantial portions of their life in a marsh area can take up chemicals present in the marsh water or in exposed sediments. Fishermen or their families who eat these fish or shellfish can then be exposed to these chemicals. The potential for exposure to metals in sediments and water in the marsh through the ingestion of contaminated fish or shellfish will be addressed qualitatively in section 4.2.2.

Air

Nearby residences could be exposed to mercury that volatilizes from cover soils from the active facility or to metals that are present in any dusts that are released into the air as a result of wind erosion of surface soils. The marsh is vegetated and marsh sediments

tend to be moist, and for these reasons, fugitive dust release is unlikely to be a significant exposure pathway. The potential for exposure to airborne chemicals will be addressed for residents living off-site in the vicinity of the UCB-RFS property.

4.2 Quantitative Exposure Assessment

Individuals are exposed to materials released into the environment in varying quantities and proportions, via a wide variety of exposure routes. The actual amount of material an individual is exposed to depends on the individual's frequency, extent, and duration of exposure which in turn depends on many factors, including location of residence, age, body weight, sex, and activity patterns. Patterns of exposure are highly variable among individuals. For example, the amount of soil ingested by a child may vary from less than 10 mg for a child playing only on a grassy area or indoors in a very clean house, to relatively large amounts (1,000 mg or more) in children who are intentionally eating soil. This large potential variation in exposure to environmental contaminants implies that a certain amount of uncertainty is inherent in risk assessment. This exposure assessment uses standard approaches and assumptions to estimate exposure to the key site constituents: mercury, arsenic, and copper. A somewhat different approach, the Lead Biokinetic Model, is used by EPA to assess exposure to lead. In addition, the EPA Superfund office has developed interim cleanup criteria for lead in residential soils of 500 - 1,000 mg/kg. For this preliminary risk assessment, soil levels will be compared with the interim EPA guidance and a detailed evaluation of potential lead exposure will not be conducted.

The exposure assessment approaches and assumptions are designed to be health protective, that is, they are designed to produce estimates of exposure that overestimate rather than underestimate exposure and risk. A more detailed discussion of the uncertainty in the risk assessment is presented in section 5.3.

4.2.1 Exposure in the Area of the Active Facility

<u>Soil Ingestion</u>

Exposure via direct ingestion of soils is of greatest concern if the soils are in an area that is frequently used (as in a backyard) and if the soils are not covered by grass, pavement, or buildings. Workers engaged in digging, gardening, or earth moving activities are most likely to contact soils. The active portion of UCB-RFS is patrolled and is surrounded by a fence, which should serve to limit (although not prevent) access to site soils. In addition, the facility has at least some vegetative cover (primarily short grasses) and direct contact with soils will be decreased by this cover material.

In order to establish likely maximum exposure levels for workers, it is assumed that a worker is exposed every workday (250 days/365 days) to facility soils, works for 25 years, and ingests 50 mg/day of facility soil. It is further assumed that the worker weighs 70 kg and has an average lifespan of 70 years.

For noncarcinogens, exposure is averaged over the duration of exposure. For carcinogens, cancer potency factors are developed based on a full lifetime exposure and therefore the averaging time is also expressed in terms of a full lifetime of 70 years (EPA 1989). Using these assumptions, exposure can be estimated using the formula:

$$CDI = \frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

where:

CDI = Average daily intake of the chemical (mg/kg/day),
CS = Chemical concentration in soil (mg/kg),
IR = Soil ingestion rate (50 mg/day),
CF = Conversion factor (10^{-6}kg/mg),
FI = Relative fraction absorbed from soil (100%),
EF = Frequency of site contact (250 days/365 days),
ED = Exposure duration (25 years),
BW = Body weight (70 kg), and
AT = Averaging time (25 or 70 years).

Using this equation and the 95% upper confidence limit on the average soil concentration for the active facility from Table 2-1, chronic daily intake levels can be calculated and are presented in Table 4-1.

Inhalation Exposure

Exposure to site-related chemicals may occur as a result of inhalation of fugitive dust or volatile emissions. Exposure can occur within the fenced area or chemicals may be transported by the wind or by diffusion to other locations outside of the active facility. Inhalation exposure could also occur as a result of volatilization of mercury upward through the vadose zone and into buildings on the facility through any cracks in their foundation.

No ambient or indoor air monitoring has been conducted at the facility and therefore, reconnaissance-level air modelling was used to estimate air concentrations. Exposure was calculated for three scenarios: exposure on the active facility from fugitive dust

AT = Averaging time (25 or 70 years).

The soil concentrations used in the equation are the upper 95% confidence limit of the average soil values for the active facility. These values are presented in Table 2-1. The inhalation doses calculated using this equation are presented in Table 4-2.

TABLE 4-1

EXPOSURE FROM SOIL INGESTION AT
THE UCB-RFS FACILITY IN RICHMOND, CALIFORNIA

Jonas & Associates Inc.

TABLE 4-2

OUTDOOR EXPOSURE TO AIRBORNE CONTAMINANTS
AT THE UCB-RFS IN RICHMOND, CALIFORNIA

COMPOUND	CHRONIC DAILY INTAKE
Arsenic:	4.9×10^{-7} mg/kg/day
Copper:	1.1×10^{-5} mg/kg/day
Mercury:	1.2×10^{-5} mg/kg/day[a]

[a]The chronic daily intake value for mercury is the sum of the estimated exposure from mercury-contaminated fugative dust (9×10^{-7} mg/kg/day) and volatile mercury (4.2×10^{-6} mg/kg/day).

Volatilization of Mercury

Contaminant release and reconnaissance-level air dispersion modelling was used to estimate exposure to mercury volatilizing from facility soils (EPA 1988; 1990). Emission from soils was estimated using an equation developed by Farmer et al (1978) as modified by Shen (1981). Dispersion and airborne concentrations were then estimated using a simple box model. Finally, inhalation doses were calculated using the estimated exposure point concentrations and standard exposure assumptions.

Farmer et al. (1978) developed an equation to estimate volatilization through landfill covers. This equation was modified by Shen (1981). The equation as modified is:

$$ER = (D \times SC \times A \times P^{4/3})\ W/L$$

where,

ER = Emission rate (g/sec),
D = Diffusivity of the chemical (cm^2/sec),
SC = Saturation vapor concentration (g/cm^3),
A = Exposed surface area (cm^2),
P = Soil porosity (unitless),
W = Weight fraction of the chemical (g/g), and
L = Effective depth of soil cover (cm).

The model assumes that migration through the soil is a steady state process and that soil concentrations remain constant over time.

Shen (1982; as cited in EPA 1988) determined the diffusivities for a large number of organic compounds. Values reported by Shen (1982) range from 0.05 to 1.2. A value of 0.05 was derived for mercury based on the similarity of its chemical properties and those of PCBs with a single chloride atom (mercury: MW = 200 and vapor pressure = 0.0012; PCBs: MW = 189 and vapor pressure = 0.001). Exposed surface area was assumed to be equal to 10 acres (4×10^8 cm^2) for outdoor exposure and 2×10^3 cm^2 (approximately equal to the area of a 0.5 -1 inch crack running the width of a 50 foot wide building) for the indoor air release scenario. Soil porosity was assumed to be 0.5 based on the assumption that the soil would be generally dry and somewhat compacted (EPA 1988). Finally, a minimum soil cover depth of 1 cm (worst case) was assumed.

$$EXP = \frac{AC \times BR \times EF \times ED}{BW \times AT}$$

where:

EXP = Inhalation intake (mg/kg/day)
AC = Concentration of chemical in air (mg/m^3)
BR = Breathing rate (20 m^3/day)
EF = Exposure frequency (250 days/365 days)
ED = Exposure duration (25 years)
BW = Body weight (70 kg) and
AT = Averaging time (25 years).

Using this equation and the assumptions noted above, the estimated chronic daily intake level for indoor inhalation exposure to
mercury is 8×10^{-10}mg/kg/day for workers.

4.2.2 Exposure in Areas with Unrestricted Access

Routes of exposure in areas adjacent to the active field station facility include inadvertent ingestion of metals in the marsh (soils, sediments, and surface water), ingestion of fish or shellfish that has become contaminated by metals in this area, and inhalation exposure to metal-contaminated fugitive dusts or mercury that is transported from the facility by the wind.

Sediment Ingestion

Fishermen and people harvesting shellfish from the area of the marsh are likely to get marsh sediments on their hands and may inadvertently ingest this material. In addition, contaminants present in these sediments may be absorbed through the skin. Metals are generally not absorbed to a great degree from the skin and direct dermal absorption is not considered quantitatively in this assessment. The amount of sediment that a individual using the marsh could ingest will vary with individual behavior, with frequency of use of the marsh, and with the person's activity. Children tend to ingest larger amounts of soil than adults, however, they are also less likely to be engaged on a regular basis in activities such as fishing or collecting shellfish. For purposes of this assessment, it is assumed that an adult or older child is the target population of concern but the exposure scenario should also be protective for a child using the site less frequently. Assuming that an individual uses the marsh 52 days/year for 30 years, ingests 50 mg/day of sediments, and weighs 70 kg, exposure can be estimated using the equation:

$$CDI = \frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

where:

CDI = Average daily intake of the chemical (mg/kg/day),
CS = Chemical concentration in sediment (mg/kg),
IR = Sediment ingestion rate (50 mg/day),
CF = Conversion factor (10^{-6}kg/mg),
FI = Relative fraction absorbed from sediment (100%),
EF = Frequency of site contact (52 days/365 days),
ED = Exposure duration (30 years),
BW = Body weight (70 kg), and
AT = Averaging time (30 or 70 years).

Chronic daily intake levels developed using this equation and the 95% upper confidence limit on the average sediment concentration are presented in Table 4-3.

Ingestion of Fish or Shellfish

Metals from the site may have entered the marsh as a result of past fill activities or as a result of transport by surface water runoff. Metals in marsh sediments can be taken up by benthic organisms living in the sediment, such as shellfish. In addition, if these metals enter the water or are taken up by benthic prey species they may ultimately be taken up by fish. People eating these fish or shellfish could be exposed to the metals. Frequent consumption of shellfish from areas of the marsh with elevated metal levels poses the greatest potential risk, as fish are more mobile and will feed in many locations, thereby diluting metal exposure. The uptake of metals by aquatic organisms varies considerably depending on a large number of factors including actual location of the organism relative to the contamination, amount of time the organism spends in the area, the depth in the sediment of the metals, form of the metals in the environment, size and age of the organism, and species difference in absorption. Similarly, the consumption of fish or shellfish from a particular area will vary considerably among individuals. Because of the difficulties in accurately quantifying exposure via this pathway, it will not be quantitatively evaluated in this assessment. The effects of dilution, depth to the actual contamination, and the relatively small amount of the area actually containing high levels of metals should serve to prevent significant exposure under most scenarios. However, it appears prudent to avoid frequent consumption of shellfish from areas of the marsh containing high metal levels.

TABLE 4-3

EXPOSURE FROM SEDIMENT INGESTION
IN THE MARSH AT THE
UCB-RFS IN RICHMOND, CALIFORNIA

Metal	Sediment Conc.	Chronic Daily Intake
Arsenic:	1700 mg/kg	7.4×10^{-5} mg/kg/day
Copper:	670 mg/kg	6.8×10^{-5}mg/kg/day
Lead:	320 mg/kg	
Mercury:	33 mg/kg	1.3×10^{-5}mg/kg/day

A general principle of exposure assessment is that conservative assumptions (i.e., assumptions that tend to overestimate exposure and therefore risk) are made at each step, so that the final estimates of exposure will be higher than (often much higher than) the upper end of the likely range of actual exposures. Estimates of exposure developed in this chapter are conservative, in this sense, in two independent ways. First, for each exposure scenario, the assessment is focused on the locations where exposure is expected to be greatest, and on the subpopulations likely to be most exposed (for example, on-site workers in the most contaminated areas of the facility). For this reason, the estimates of exposure are really only valid for the most highly exposed persons, referred to as the maximally exposed individual (MEI) and will overestimate exposure for most people. Second, exposure assessments for these persons incorporate health protective assumptions about many factors that influence exposure, including emission rates, deposition rates, environmental persistence, bio-uptake, bioavailability, and human activity. For this reason, the exposure estimates are intended to overestimate exposures even for the MEI.

5.0 RISK EVALUATION

In this section, information on the potential levels of exposure to contaminants (presented in Section 4) is combined with information on the toxicity of the contaminants (presented in Section 3) in order to determine the potential health risks to individuals living near the site under current conditions. The cancer risk is obtained by multiplying the chronic daily intake of the contaminant under consideration (from the exposure assessment) by its cancer potency factor or slope factor (from the toxicity section). EPA typically expresses cancer risk in terms of an upper-bound excess lifetime cancer risk level. EPA and DHS use an upper-bound excess lifetime cancer risk level of a one in one million (10^{-6}) as a risk level goal for carcinogens and EPA generally sets regulatory criteria within a risk range of between one in ten thousand and one in one million (10^{-4} and 10^{-6}).

To evaluate possible risk from exposure to noncarcinogenic contaminants other than lead, the chronic daily intake (CDI; the average daily exposure dose) is divided by the health criterion value [the reference dose (RfD), formerly referred to as the allowable daily intake (ADI)]. If the CDI:RfD ratio is less than one (i.e., if the daily intake is below the health criterion) the contaminant is considered unlikely to pose a health hazard to individuals exposed under the given scenario. As suggested in the EPA (1986) guidelines for Health Risk Assessment of Chemical Mixtures, the CDI:RfD ratios are summed to determine if combined exposure may pose a health concern (EPA 1986). It should be noted that the summed CDI/RfD ratio (termed the hazard index or HI) is used only as an indication of possible hazard, as summation is only valid if there are no synergistic or

antagonistic interactions among the summed compounds and if they have the same mechanism and site of action.

Neither a cancer slope factor nor an RfD is currently available for lead. EPA assesses risk to this metal by assuming that 10 ug of lead/deciliter (ug/dl) of blood is a level of concern in children and uses the Lead Biokinetic Model to determine if potential exposure would be likely to produce blood lead levels exceeding 10 ug/dl in a significant portion of a potential exposed population. As an interim measure, the EPA Superfund office has adopted cleanup levels for lead in residential soils of 500 - 1,000 mg/kg, based on the CDC (1985) statement that these levels are unlikely to lead to an increase in blood lead levels in children. Adults absorb less lead from the gastrointestinal tract and also are less susceptible to the adverse effects of lead than children. Further considering that the population of concern for this assessment is workers and that exposure to lead-containing soils will likely be the lower than for children, the upper value of 1,000 mg/kg will be used as a point of comparison in this assessment.

In addition to summing the risks posed by different chemicals, individuals may be exposed to more than one media by more than one route. For example, a worker could receive exposure to metals in soils via ingestion and could also be exposed to any airborne contaminants.

A number of assumptions were used in deriving both the CDI and the RfD or slope factor. Therefore, there is some uncertainty in interpreting the implications that the cancer risk levels and noncarcinogen CDI:RfD ratios have for risk. However, in the estimation of these factors, conservative (health protective) assumptions were made so that it is improbable that the cancer risks would be higher or the CDI:RfD ratio would be less than one if there were any actual hazard at the site. A further discussion of the uncertainties in risk assessment is presented in Section 5.3.

5.1 Risks at the Active Facility

Risks associated with ingestion of chemicals present in soils within the fenced area of the UCB-RFS property are presented in Table 5-1. For worker exposure, the hazard index for the noncarcinogens was less than one, indicating that it is unlikely that exposure to chemicals via this scenario poses a risk of systemic toxicity. The cancer risk for arsenic exposure was 3×10^{-5}. This value is above the upper bound excess lifetime cancer risk of 1×10^{-6} commonly used as a target risk level by EPA and other regulatory agencies but is within the risk range of most EPA regulatory decisions of 10^{-4} to 10^{-6}.

TABLE 5-1

HEALTH RISK FROM SOIL INGESTION
AT THE UCB-RFS, RICHMOND, CALIFORNIA

Metal	Chronic Daily Intake	Risk	CDI:RfD
Arsenic:	1.7×10^{-5}mg/kg/day	3×10^{-5}	
Copper:	3.9×10^{-4}mg/kg/day		0.01
Mercury:	8.8×10^{-5}mg/kg/day		0.3
		Hazard Index:	0.3

A reconnaissance- or screening-level analysis of the risks associated with inhalation exposure in outdoor locations at the facility either to fugitive dust emissions or to volatilizing mercury was conducted. Table 5-2 presents the results of this evaluation. The hazard index for the noncarcinogens was less than one, indicating that it is unlikely that exposure to chemicals via inhalation poses a risk of systemic toxicity. Under the conditions presented in the exposure assessment for inhalation exposure, an upper bound excess lifetime cancer risk for exposure to arsenic of 7×10^{-6} was estimated. Under the conditions presented in the exposure assessment for the scenario involving direct release of mercury into a building, a CDI:RfD ratio of <0.0001 was estimated. This CDI:RfD level is well below one, indicating that it is unlikely that a risk is posed by this pathway.

The major purpose of a screening-level exposure analysis is to determine the exposure pathways that may pose health risks. Accordingly, assumptions are designed to represent maximum exposure conditions. If no risk is associated with exposure under these conditions, it is improbable that exposure poses a risk and no further analysis is required. In this case, the CDI:RfD ratios were all less than one, indicating that the noncarcinogenic metals are unlikely to pose a health hazard at the facility. The cancer risk level associated with exposure to arsenic was equal to or slightly above the target risk level of 1×10^{-6}. However, considering the very conservative (health protective) assumptions that were used to derive the exposure estimates in the screening analysis, it is unlikely that actual risks exceed the 1×10^{-6} regulatory criterion level.

5.2 Risks in Areas with Unrestricted Access

Risks associated with ingestion of metals in the marsh area sediments are presented in Table 5-3. The hazard index for the noncarcinogens was less than one for the metals, indicating that it is unlikely that exposure poses a risk of systemic toxicity. The total risk of cancer was 1×10^{-4} for ingestion exposure based on potential exposure to arsenic. This value is above the upper bound excess cancer risk level of 1×10^{-6} used as a target risk level goal for this site. It is at the upper end of the risk range of 10^{-4} - 10^{-6} that EPA uses to set regulatory standards.

Inhalation at on-site locations did not pose a significant health risk. Considering the industrial nature of the area, it is likely that off-site exposure scenarios would be similar to on-site exposure (i.e., primarily worker exposure) but the concentrations of metals in the air would be lower as a result of dilution. Consequently, this pathway is unlikely to pose a substantial risk to nearby potentially exposed populations, even under the worst-case analysis used in this preliminary screening level risk assessment.

TABLE 5-2

HEALTH RISK FROM EXPOSURE TO AIRBORNE CONTAMINANTS
AT THE UCB-RFS IN RICHMOND, CALIFORNIA

Metal	Chronic Daily Intake	Risk	CDI:RfD
Arsenic:	4.9×10^{-7}mg/kg/day	7×10^{-6}	
Copper:	1.1×10^{-5}mg/kg/day		<0.001
Mercury:	1.2×10^{-5}mg/kg/day		0.1
		Hazard Index	0.1

TABLE 5-3

HEALTH RISK FROM SEDIMENT INGESTION
IN THE MARSH AT THE
UCB-RFS IN RICHMOND, CALIFORNIA

Metal	Chronic Daily Intake	Risk	CDI:RfD
Arsenic:	7.4×10^{-5}mg/kg/day	1×10^{-4}	
Copper:	6.8×10^{-5}mg/kg/day		0.002
Mercury:	3.3×10^{-6}mg/kg/day		0.01
		Hazard Index	0.01

5.3 Uncertainties in the Risk Assessment

The procedures and inputs used to assess potential human health risks in this and most such evaluations are subject to a wide variety of uncertainties. In general, there are five main sources of uncertainty in the risk assessment of a reasonably well characterized site:

- Environmental chemistry sampling and analysis,
- Environmental parameter measurements,
- Fate and transport modeling,
- Toxicological data and dose-response extrapolations, and
- Errors through combinations of the above.

These sources of uncertainty as they pertain to this preliminary risk assessment are discussed below.

Environmental chemistry sampling and analysis error can stem from the error inherent in the procedures, from a failure to take an adequate number of samples to arrive at sufficient areal resolution, from mistakes on the part of the sampler, or from the heterogeneity of the matrix being sampled. Some small sampling and analytical error is almost certainly present, but overall, sampling and analysis error probably only increases the uncertainty in the assessment to a small degree. A possible exception is the potential that some elevated areas of mercury were missed because of the small sample analyzed under the CLP procedures. Some additional soil samples are being collected to further define the vertical extent of the key site contaminants.

Exposure estimation is another potentially large source of error in this risk assessment. The use of the 95% upper confidence limit of the average concentration of the metals at the active facility and in the marsh is likely to lead to overestimating the actual concentrations that individuals could contact. The site investigation focused on areas considered likely to have been impacted by past industrial activities and metal concentrations in soils at other areas of the site are likely to be lower than those used in this assessment. It is unlikely that points of exposure will always be the most contaminated areas. In addition, exposure estimates in many cases are highly dependent on the prediction of intake values, exposure frequency, exposure duration, and other exposure assumptions used in the assessment. The exposure parameters used in this exposure assessment such as a worker working outdoor at the site for 250 days/year and ingesting 50 mg/day of soils were selected to ensure that exposure was overestimated rather than underestimated. The extent of the overestimation will vary among individual workers and is unknown, but it is probably substantial.

The results of animal studies are often used to predict the potential health effects of a chemical in humans. Extrapolation of toxicological data from animal tests is probably one of the largest sources of uncertainty in any risk assessment. There may be important but unidentified differences in uptake, metabolism, and distribution in the body between the test species and man. Typically, the animals are administered high doses of a chemical in a standard diet while humans are generally exposed to much lower doses in a highly variable diet. Because of these differences, it is not surprising that extrapolation error is a large source of uncertainty in risk assessment. Even if studies in humans are available, uncertainties can be large because the diet, activity patterns, exposure duration and frequency, and individual susceptibility may not be the same in the study populations as in the individuals exposed at the site.

Uncertainties from different sources will be compounded in the risk assessment. For example, if a CDI for a contaminant measured in the environment is compared to an RfD to determine potential health hazard, the uncertainties in the concentration measurement, exposure assumptions and the toxicology are all expressed in the result. In order to ensure that human health is adequately protected, the public health assessment incorporates conservative (unlikely to underestimate risk) approaches and uncertainty factors. Therefore, the actual risk associated with the exposure routes considered in this assessment is unlikely to be larger, but may be lower than that predicted.

5.4 Cleanup Level Determination

5.4.1 Mercury

Mercury is present on the portion of the active facility that was sampled at an average concentration of 25 mg/kg, a maximum concentration of 630 mg/kg, and a 95% upper bound concentration of 180 mg/kg. The average concentration for these soils of 25 mg/kg is well above the range of expected background levels of this metal. Most of the mercury contamination was located in the area of the former Mercury Fulminate Facility. Expected background levels for the western United States are in the range of 0.1 mg/kg to 0.4 mg/kg but levels in the San Francisco Bay area may be somewhat higher, in the range of 1 mg/kg.

Direct ingestion of mercury within the fenced portion of the property was estimated to pose the greatest health hazard. However, even exposure to mercury levels of 180 mg/kg alone did not pose a substantial health hazard for workers. As outlined in the DHS manual on Scientific and Technical Standards for Hazardous Waste Sites (DHS 1990), allowable soil remediation levels can be back-calculated by setting the chronic daily intake value equal to an allowable intake level (the RfD), keeping all exposure

assumptions constant, and solving for concentration. A mathematically equivalent approach is given by the equation:

$$\frac{\text{Concentration}_i}{\text{Concentration}_x} = \frac{\text{CDI:RfD}_i}{\text{CDI:RfD}_x}$$

where:

The concentration and CDI:RfD of i are the known values, the CDI:RfD_x is the allowable ratio of one (1) and concentration_x is the desired concentration.

Solving this equation, with a known mercury level of 180 mg/kg giving a CDI:RfD ratio of 0.3 for workers, an allowable concentration is 600 mg/kg. Only a single value on site (630 mg/kg) is even slightly above this level and it is highly unlikely that any individual would be exposed to this particular area for a sufficient length of time to be placed at risk by this concentration. Consequently, it is unlikely that the site would pose a health risk to workers as a result of the on-site mercury levels.

Both lead and mercury adversely affect the nervous system, and if these metals can act concurrently on nerve cells and if lead occurs in areas of high mercury concentrations, somewhat lower levels would be necessary to ensure that concurrent exposure does not pose a health risk. A review of the data for the UCB-RFS site indicates that elevated lead levels are generally not found in the same locations as elevated mercury levels. Therefore, based on the available information, a mercury level of around 600 mg/kg of mercury would appear to be sufficient to protect workers.

5.4.2 Arsenic

Arsenic is present in the sampled areas on site at an average concentration of 15 mg/kg and a 95% UCL concentration of 100 mg/kg. The average concentration of 15 mg/kg is in the range of expected background levels of this metalloid. Review of the data indicates that only 3 of 37 surface soil (0-1.5 feet) samples had arsenic levels above 25 mg/kg, the 95% confidence limit of the geometric mean and the upper end of the expected background range (Table 2-4). Based on these values, elevated levels of arsenic at the site appear to occur infrequently and in isolated areas.

Direct ingestion of arsenic was estimated to pose the greatest risk, with cancer risk levels in the range of 6×10^{-5}. As outlined in the DHS manual on Scientific and Technical Standards for Hazardous Waste Sites (DHS 1990), allowable soil remediation levels can be back-calculated by setting the chronic daily intake value equal to an allowable intake

level, keeping all exposure assumptions constant, and solving for concentration. A mathematically equivalent approach for carcinogens is given by the equation:

$$\frac{\text{Concentration}_i}{\text{Concentration}_x} = \frac{\text{Risk}_i}{\text{Risk}_x}$$

where:

The concentration and risk of i are the known values, the risk_x is the allowable risk level and concentration_x is the desired concentration, the concentration associated with the allowable risk level.

Solving this equation for arsenic with a known arsenic level of 100 mg/kg posing a risk of 6×10^{-5} and an allowable risk level of 1×10^{-6}, the EPA target risk level, an allowable concentration is 3 mg/kg, a level that is below expected background concentrations for this area. Because risk-based cleanup levels at arsenic sites are often below expected background levels, EPA has developed soil remediation levels for arsenic at other sites based on a consideration of both technical feasibility and less conservative health risk assessments. At the Whitewood Creek Superfund Site in South Dakota, EPA used a soil level of 100 mg/kg of arsenic as a soil remediation objective, with soil exceeding 100 mg/kg of arsenic in residential areas either being removed or covered with at least 12 inches of clean fill. At another site, the Silver Mountain Superfund Site in Okanogan County, Washington, EPA established a cleanup standard of 200 mg/kg for arsenic.

Based on the expected use of the facility and the cleanup levels established for other sites, a cleanup level for arsenic in the range of 100 - 200 mg/kg seems appropriate. It also seems unlikely that the no action alternative would pose a substantial health risk given the presence of elevated levels of arsenic only in isolated areas.

5.4.3 Copper

The levels of copper present at the facility or in the marsh do not pose a public health risk under any of the scenarios presented. Consequently, a risk-based cleanup level is not established for copper. The California TTLC for copper is 2,500 mg/kg. Based on calculations in this risk assessment, soil containing 2,500 mg/kg of copper would not pose a health risk at the UCB-RFS.

5.4.4 Lead

Lead is present within the fenced portion of the property at an average concentration of 100 mg/kg and a 95% UCL concentration of 540 mg/kg. The average concentration of 100 mg/kg is above the range of expected background levels of this metal presented in Shacklette and Boerngen (1984). However, lead was a very commonly used metal and is often present in urban or industrial areas or along roadways at concentrations well above 100 mg/kg (EPA 1989). Only 2 of 37 surface soil samples from the area of the active facility had lead levels above 500 mg/kg.

CDC (1985) noted that levels of lead in soil of from 500-1000 mg/kg may lead to increases in blood lead levels in children. These soil levels have been adopted by the EPA (1989) as an interim soil cleanup level for residential soils to protect children. EPA (1989) noted that site-specific factors should be considered in determining actual site cleanup levels. Because the UCB-RFS will not be used for residential purposes and because of the differences between adult workers and children regarding exposure potential, absorption, and susceptibility, a lead level of 1,000 mg/kg should be sufficient to protect workers. Only a single value (1140 mg/kg) on site slightly exceeded 1,000 mg/kg, and it is highly unlikely that any individual would frequently contact this area. Consequently, it is unlikely that the site would pose a health risk to workers as a result of the on-site lead.

As noted above, both lead and mercury adversely affect the nervous system, and if these metals can act concurrently on nerve cells and if lead occurs in areas of high mercury concentrations, somewhat lower levels would be necessary to ensure that concurrent exposure does not pose a health risk. Because elevated mercury levels are generally not found in the same locations as elevated lead levels, a lead level of around 1,000 mg/kg would appear to be sufficient to protect workers.

6.0 CONCLUSIONS

Based on the results of this preliminary risk assessment, use of the UCB-RFS is unlikely to pose a substantial health risk, but could pose risks under the following conservative exposure scenarios:

- Daily worker exposure for an extended period of time to soil contaminated with over 600 mg/kg of mercury alone or over 1000 mg/kg of lead alone. Health risks could also be posed by soils containing slightly lower levels of both metals in combination.

- Frequent accidental or intentional ingestion exposure to soil or off-site marsh sediments containing more than background levels of arsenic.

Based on the available information and on site characteristics, soil remediation levels of around 600 mg/kg of mercury and 1,000 mg/kg of lead would probably be sufficient to protect workers. Concurrent exposure to soils containing these levels of metals might be of some concern but based on the available data, elevated levels of mercury and lead do not occur in the same areas.

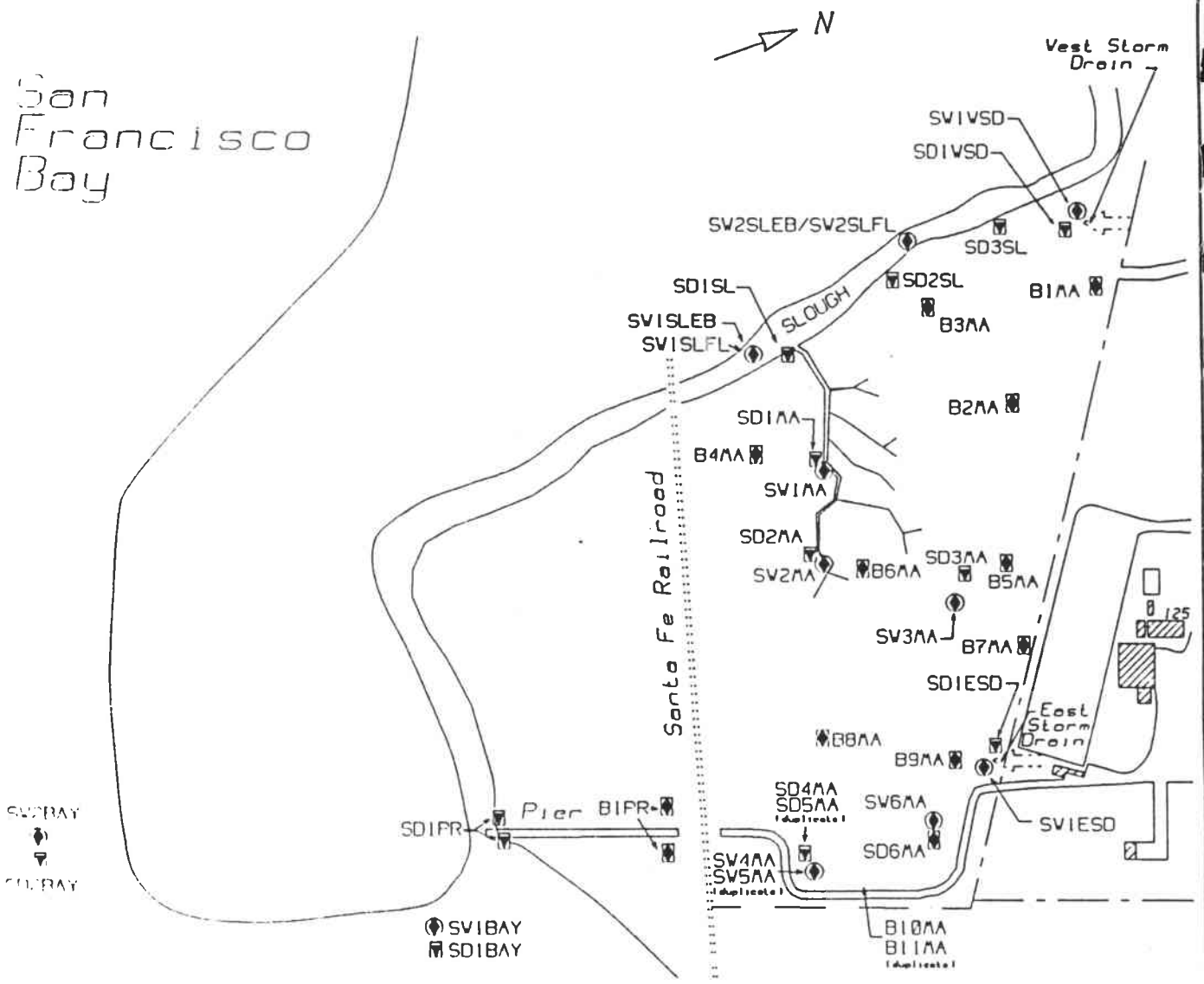
Under the exposure scenarios used in the preliminary risk assessment, even background levels of arsenic pose a risk above the one in one million cancer risk commonly used as a risk goal by regulatory agencies. However, based on the expected use of the facility and the cleanup levels established for other sites, a cleanup level for arsenic in the range of 100 - 200 mg/kg seems appropriate for the UCB-RFS. It also seems unlikely that the no action alternative would pose a substantial health risk given the presence of elevated levels of arsenic only in two isolated areas.

The cleanup levels that are developed indicate the concentration of a material that would be unlikely to pose a health risk under the conditions of regular repeated contact for an extended period of time. If such frequent exposure is unlikely, concentrations exceeding these levels would also not pose a significant health risk. For example, only two on-site arsenic concentrations are above the 100 mg/kg value used in the risk calculations and 34 of 37 surface soil samples were at expected background levels. Similarly, for lead, only one on-site surface concentrations exceeded 1,000 mg/kg, while for mercury only one sample exceeded 600 mg/kg. Because frequent direct contact with these areas is unlikely, the presence of these levels is unlikely to pose a health risk.

Numerous factors influence the uptake of metals by aquatic organisms and consequently it is difficult to accurately quantify exposure via the consumption of fish or shellfish harvested from the marsh. However, elevated concentrations of some of the metals were present in hotspots in the marsh sediments and it appears prudent to limit consumption of benthic organisms including shellfish from these areas. A factor mitigating the potential concern for this pathway is that arsenic is converted by aquatic organisms to an organic arsenical which is metabolically inactive and rapidly eliminated from the human body.

In order to ensure that the health of on-site and off-site workers and any nearby residents is adequately protected, conservative (unlikely to underestimate risk) assumptions were used in deriving both the exposure estimate and the toxicity values. Because of the use of these conservative (although not necessarily worst case) assumptions, it is unlikely that chemicals remaining at the site at these levels would pose an actual hazard. Any response action that would eliminate the ingestion exposure pathway for soils (such as

capping, asphalting, fencing, other access restrictions, or use restrictions) would further limit the potential for exposure and protect public health and welfare.



Legend:

Samples:

- Soil
- Submerged Sediment
- Surface Water

Scale

150 0 150 300 Feet

Sampling Locations Slough, East and West Storm Drains, Marsh and Bay

Prepared by

JONAS & ASSOCIATES

Date: 12-20-1990	Figure 2-3	Drawing Number
Scale as shown		

Figure 2-3

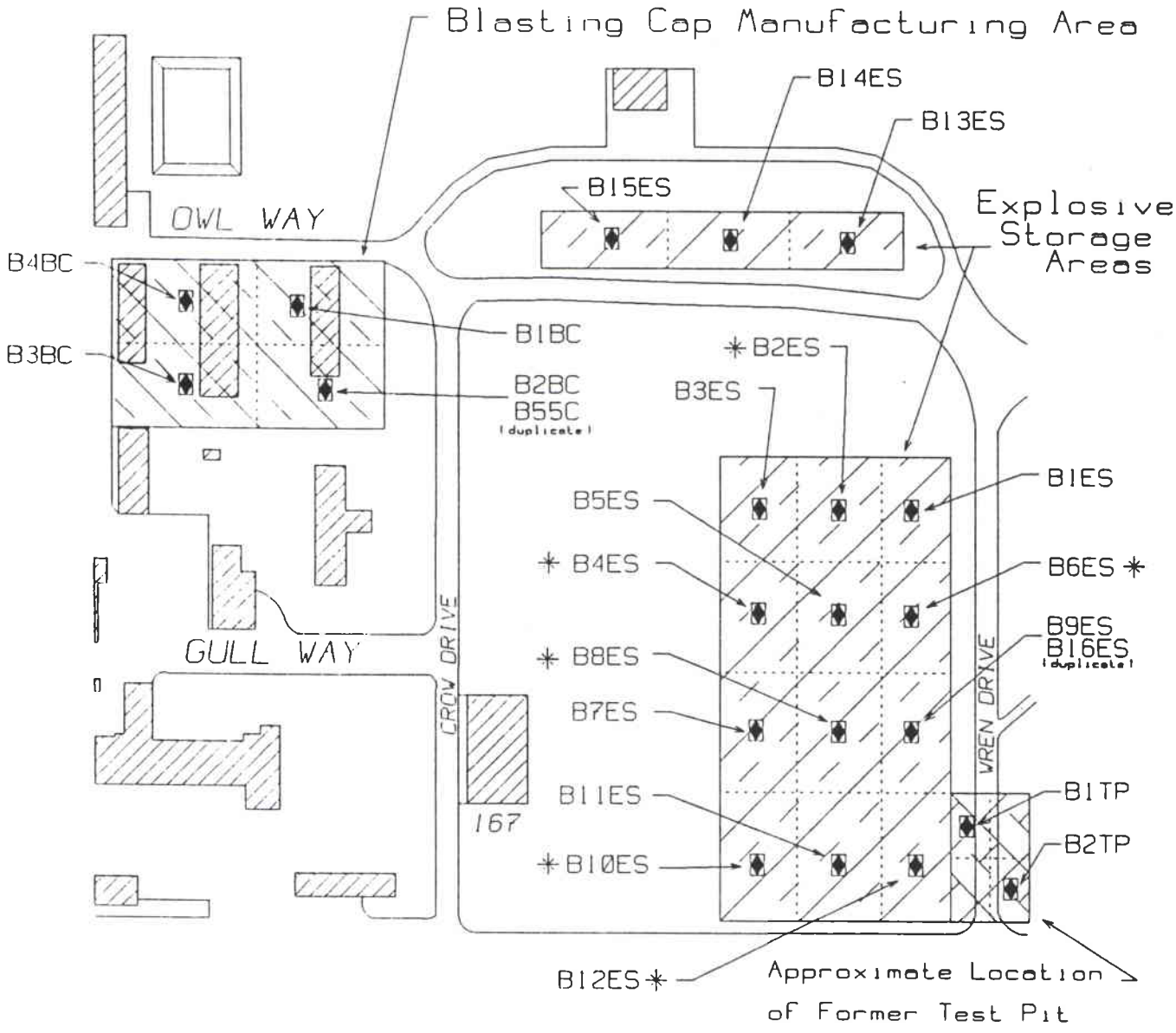
Drawing Number

Drawn by

Checked by

Approved by

12-20-1990



Legend:

Samples:

Soil

* These samples will be analyzed only if other concentrations in the area are significant.

Scale

75 0 75 150 Feet

N

Sampling Locations - Former Explosive Storage and Blasting Cap Areas and Test Pit

Prepared by

JONAS & ASSOCIATES

Date: 12-20-1990	Figure 2-4	Drawing Number
Scale as shown		

Figure 2-4

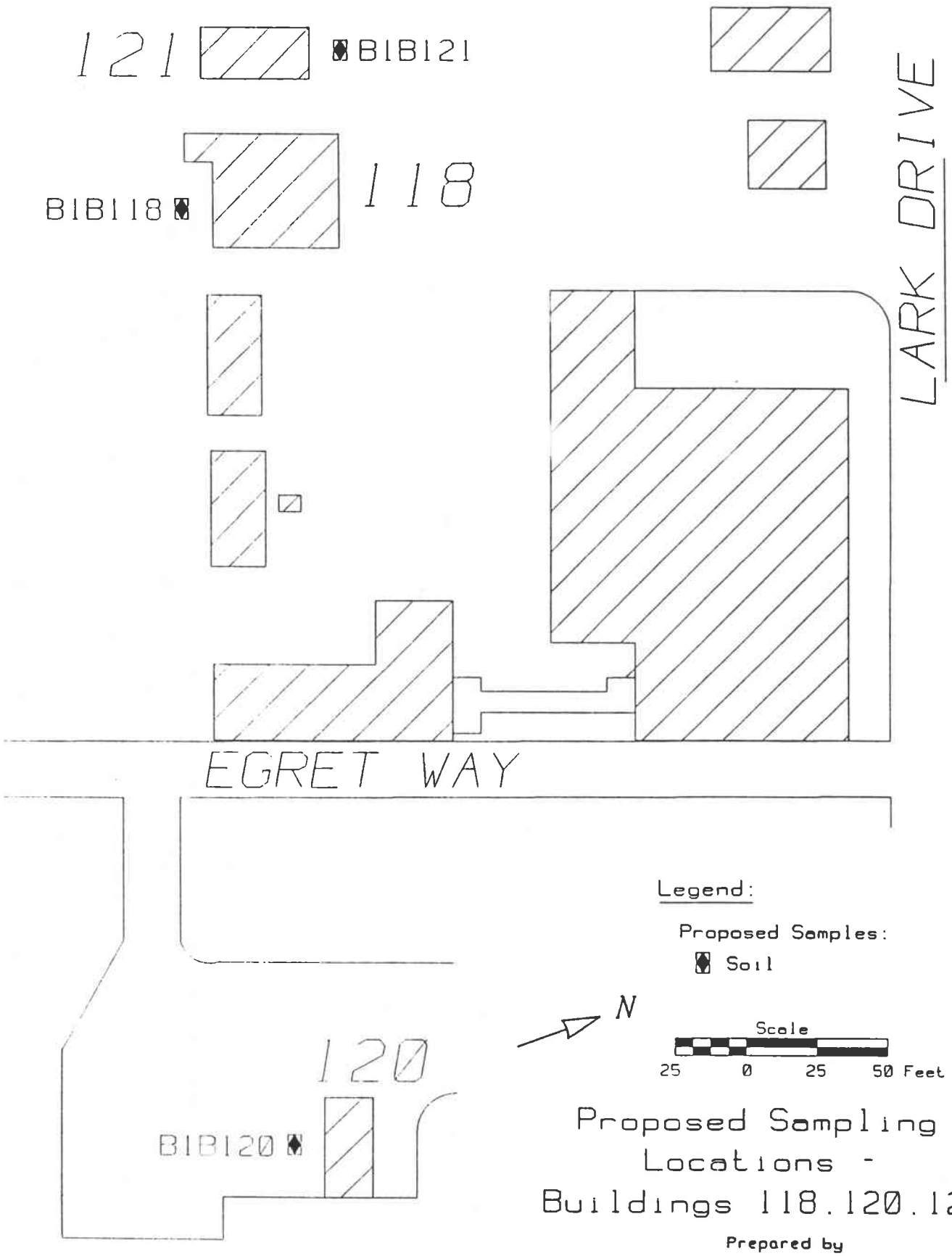
Drawing Number

Checked by

Approved by

AJ 12-20-1990

Drawn by



Proposed Sampling Locations - Buildings 118.120.121

Prepared by

JONAS & ASSOCIATES

Date: 9-30-1990	Figure 2-5	Drawing Number 90-101-S4424
Scale as shown		

Figure 2-5

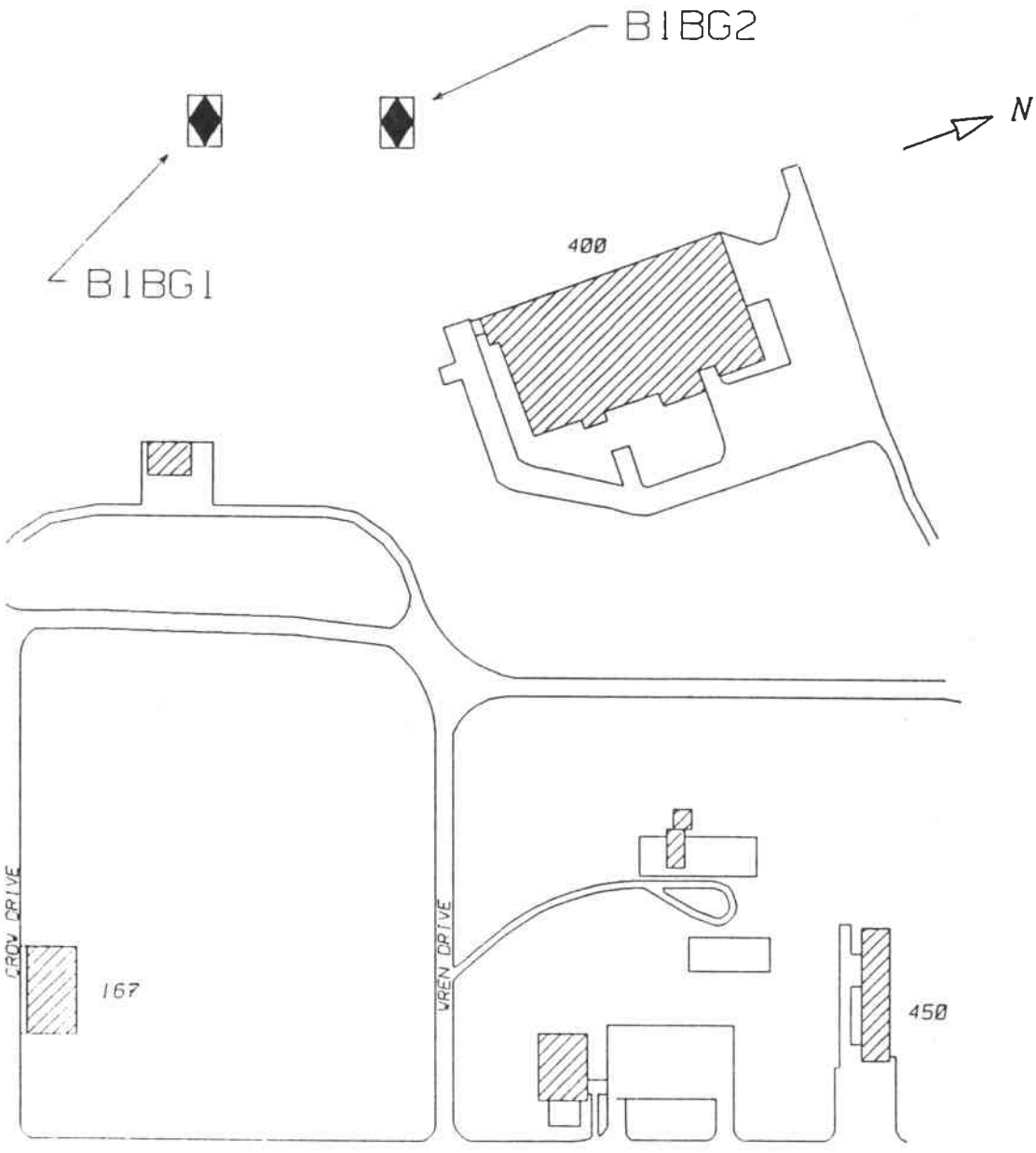
Drawing Number 90-101-S4424

Checked by

Approved by

9-30-1990

Drawn by



Scale

100 0 100 200 Feet

Legend:

Samples:

Soil/Background

Locations of Background Samples

Prepared by

JONAS & ASSOCIATES

Date: 12-20-1990	Figure 2-6	Drawing Number
Scale as shown		

Figure 2-6

Drawing Number

Checked by

Approved by

AJ 12-20-1990

Drawn by

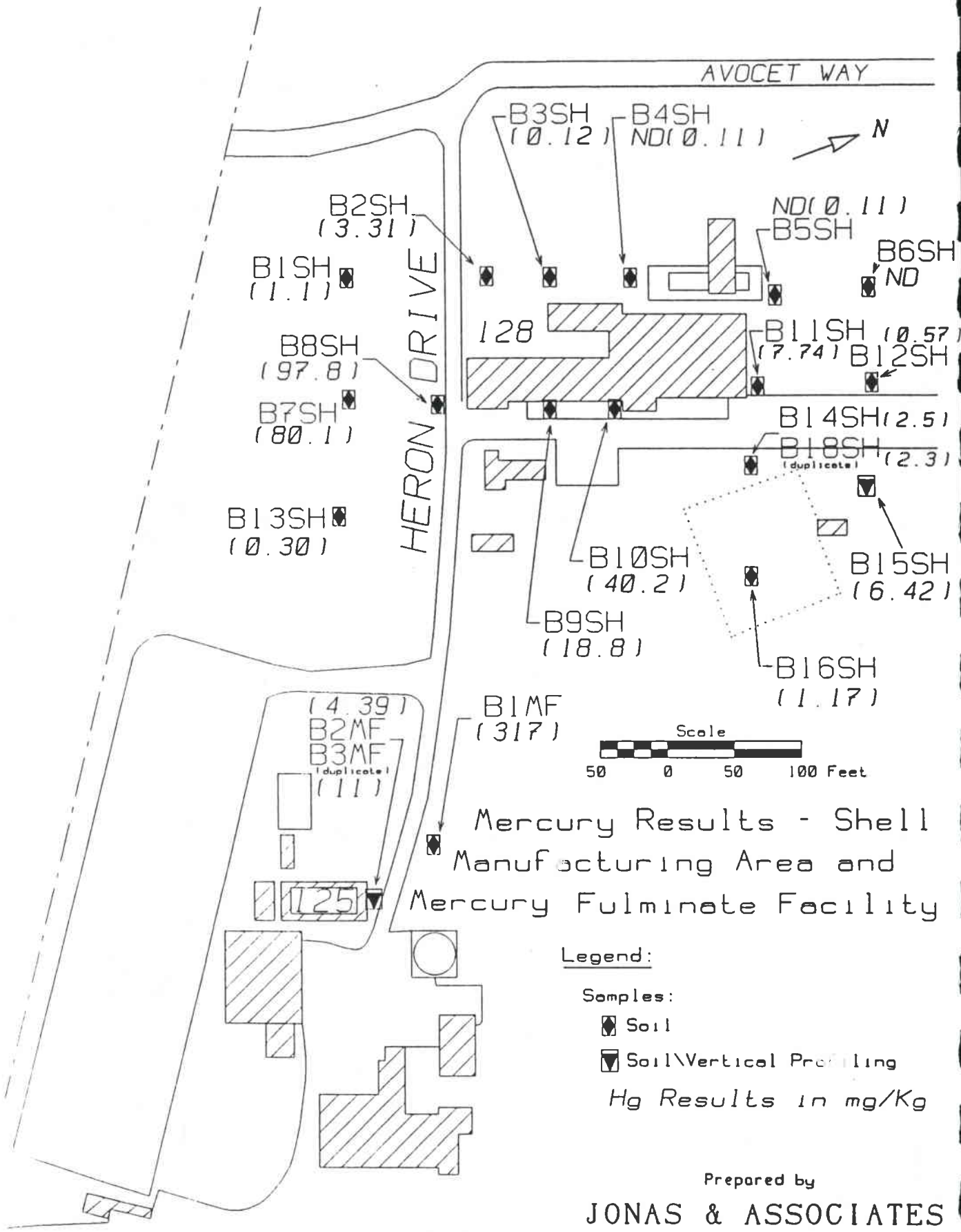


Figure 3-1

Drawing Number

Checked by

Approved by

AJ 12-20-1990

Drawn by

Date:12-20-1990	Figure 3-1	Drawing Number
Scale as shown		

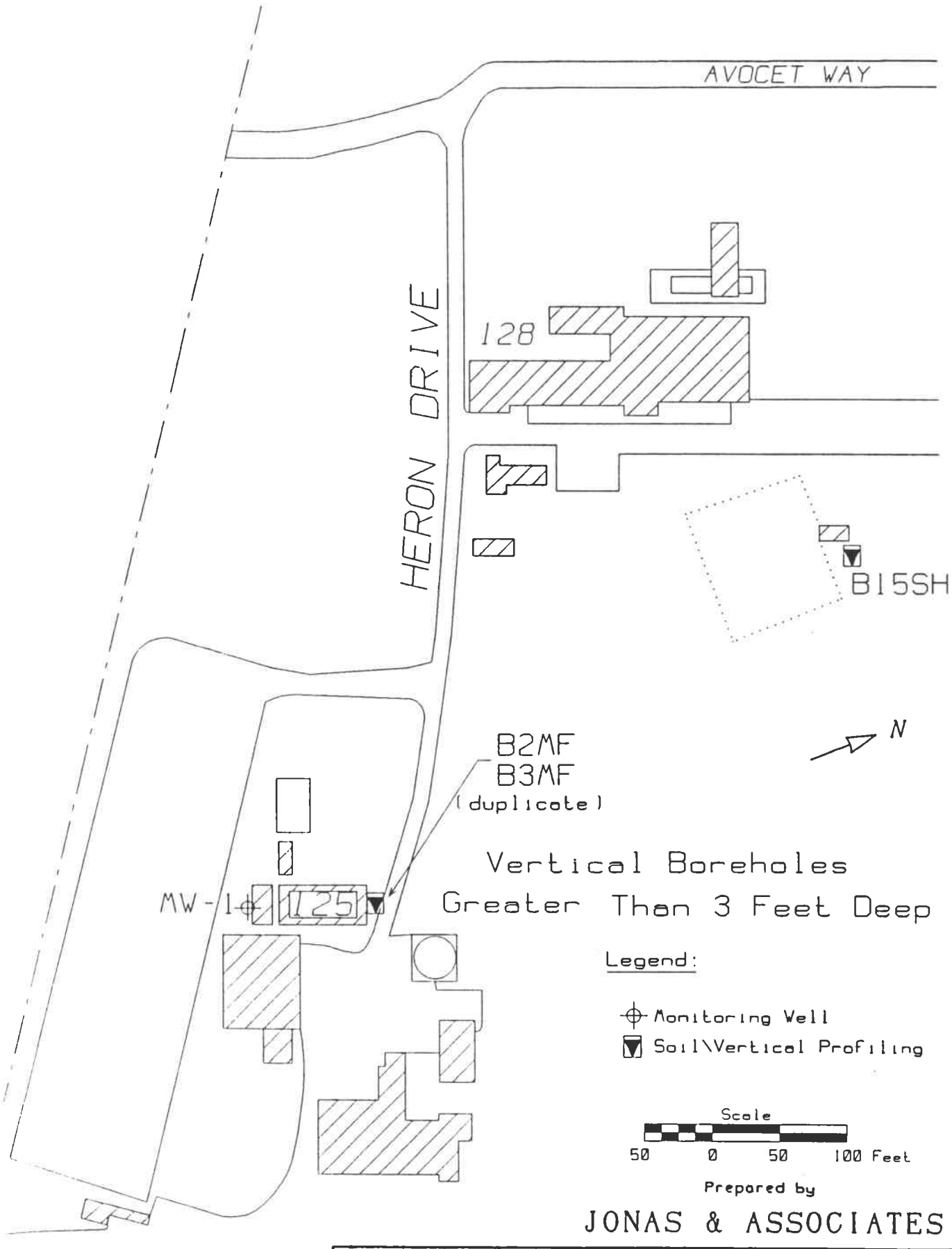


Figure 3-2

Drawing Number

Drawn by AJ 12-20-1990

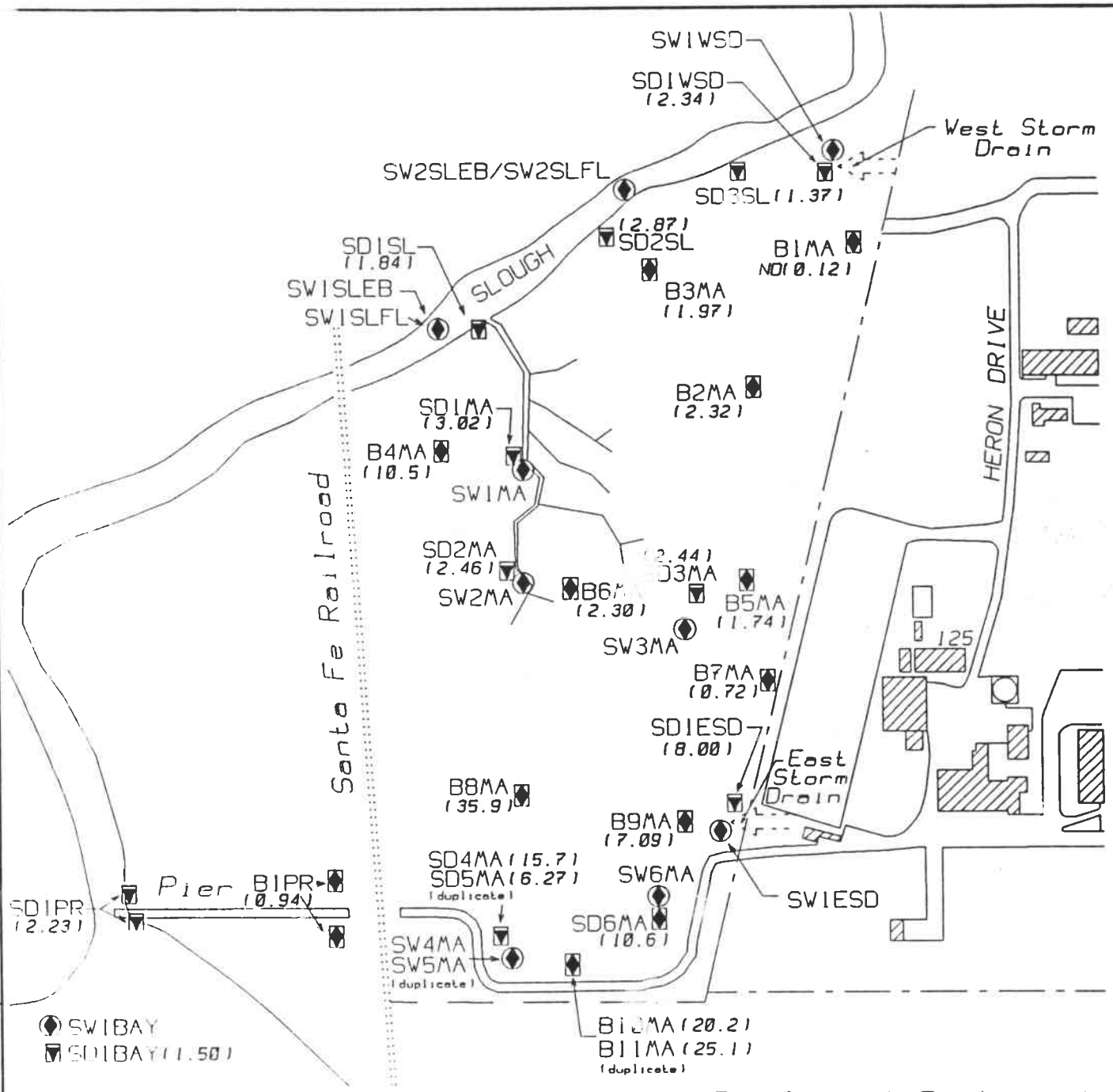
Checked by

Approved by

Date: 12-20-1990
Scale as shown

Figure 3-2

Drawing Number



Legend:

Samples:

Soil

Submerged Sediment

Hg Results in mg/Kg

Surface Water

Soil and Sediment Results for Mercury Slough, East and West Storm Drains, Marsh and Bay

Prepared by

JONAS & ASSOCIATES

Date: 12-20-1990	Figure 3-3	Drawing Number
Scale as shown		

Figure 3-3

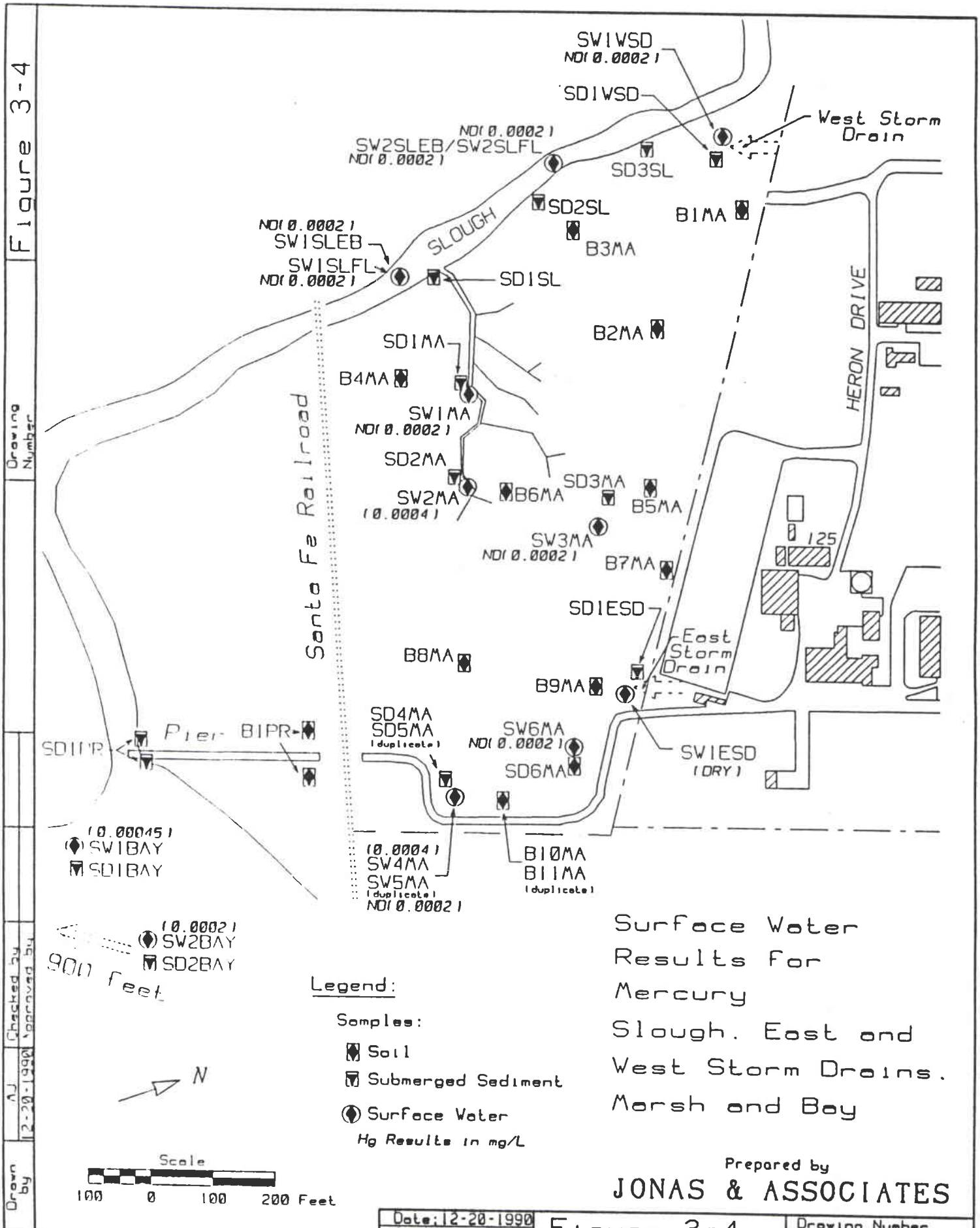
Drawing Number

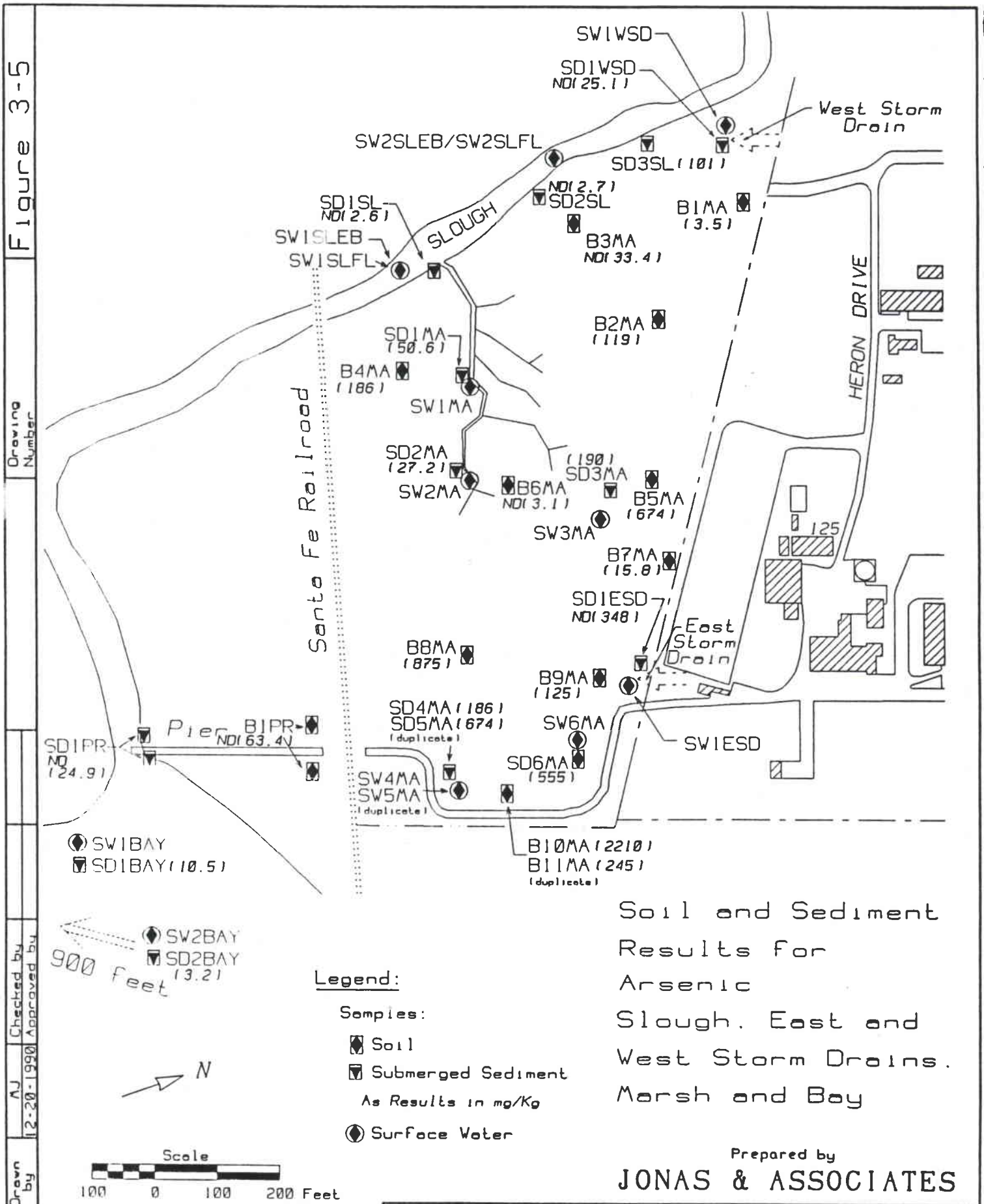
Drawn by

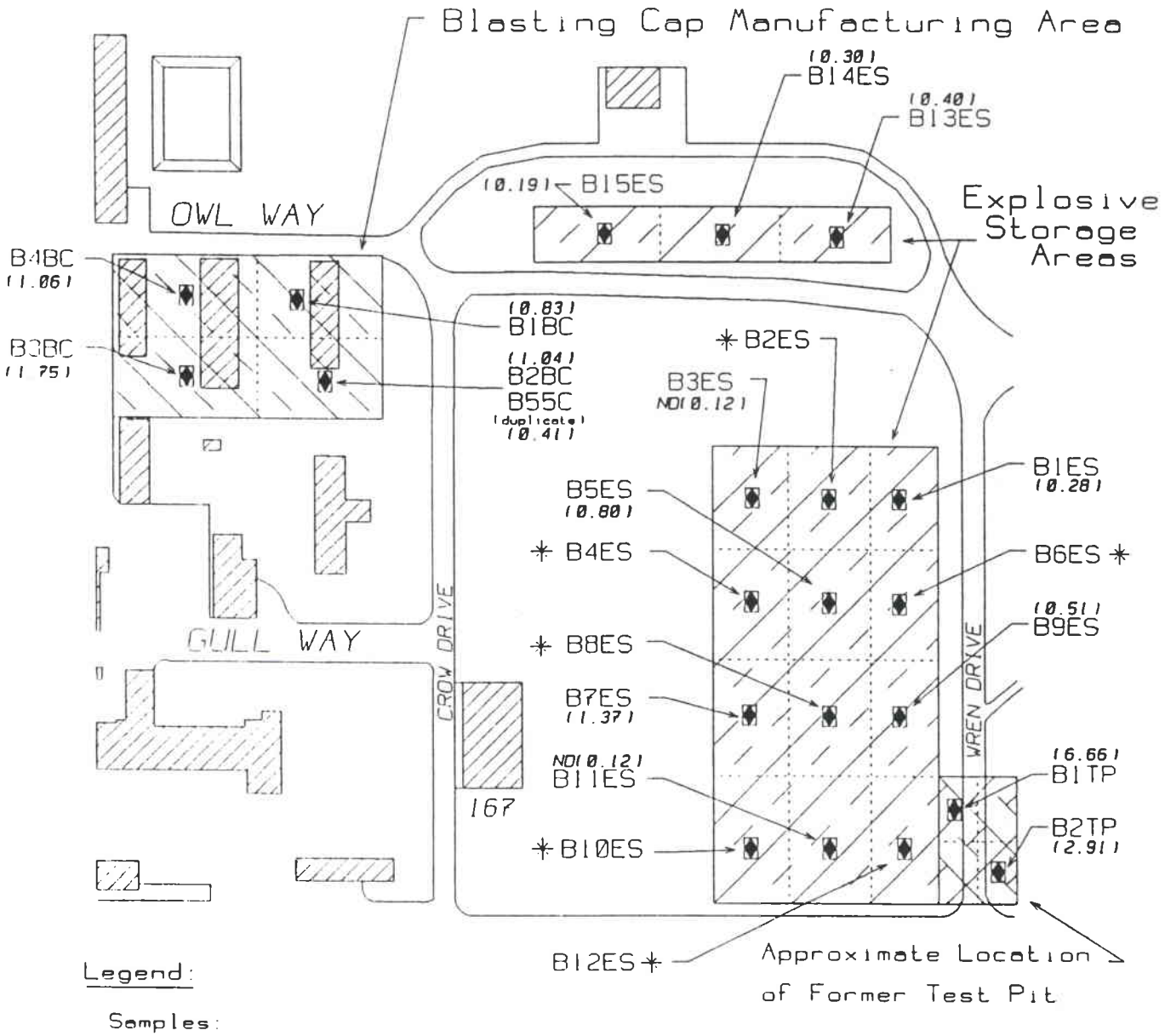
AJ 12-20-1990

Checked by

Approved by


SW1WSD
ND(0.0002)
SD1WSD
West Storm Drain
ND(0.0002)
SW2SLEB/SW2SLFL
ND(0.0002)
SD3SL
SD2SL
B1MA
B3MA
SLOUGH
ND(0.0002)
SW1SLEB
SW1SLFL
ND(0.0002)
SD1SL
B2MA
HERON DRIVE
SD1MA
B4MA
SW1MA
ND(0.0002)
Santa Fe Railroad
SD2MA
SW2MA
(0.0004)
B6MA
SD3MA
B5MA
SW3MA
ND(0.0002)
B7MA
0 125
SD1ESD
East Storm Drain
B8MA
B9MA
SD4MA
SD5MA
(duplicate)
SW6MA
ND(0.0002)
SD6MA
SW1ESD
(DRY)
Pier
B1PR
SD1PR
(0.00045)
SW1BAY
SD1BAY
(0.0004)
SW4MA
SW5MA
(duplicate)
ND(0.0002)
B10MA
B11MA
(duplicate)
(0.0002)
SW2BAY
SD2BAY
900 Feet
Legend:
Samples:
Soil
Submerged Sediment
Surface Water
Hg Results in mg/L
N
Scale
100 0 100 200 Feet
Surface Water Results For Mercury Slough. East and West Storm Drains. Marsh and Bay
Prepared by
JONAS & ASSOCIATES
Figure 3-4
Drawing Number
Drawn by
AJ
12-20-1990
Checked by
Approved by
Date: 12-20-1990
Scale as shown
Figure 3-4
Drawing Number


SW1WSD
SD1WSD
ND(25.1)
West Storm Drain
SW2SLEB/SW2SLFL
SD3SL(101)
ND(2.7)
SD2SL
B1MA
(3.5)
SD1SL
ND(2.6)
SW1SLEB
SW1SLFL
SLOUGH
B3MA
ND(33.4)
HERON DRIVE
B2MA
(119)
SD1MA
(50.6)
B4MA
(186)
SW1MA
Santa Fe Railroad
SD2MA
(27.2)
(190)
SD3MA
SW2MA
B6MA
ND(3.1)
B5MA
(674)
SW3MA
125
B7MA
(15.8)
SD1ESD
ND(348)
East Storm Drain
B8MA
(875)
B9MA
(125)
SD4MA(186)
SD5MA(674)
(duplicate)
SW6MA
SW1ESD
Pier
B1PR
ND(63.4)
SD1PR
ND
(24.9)
SD6MA
(555)
SW4MA
SW5MA
(duplicate)
SW1BAY
SD1BAY(10.5)
B10MA(2210)
B11MA(245)
(duplicate)
SW2BAY
SD2BAY
(3.2)
900 Feet
Legend:
Samples:
Soil
Submerged Sediment
As Results in mg/Kg
Surface Water
N
Scale
100 0 100 200 Feet
Soil and Sediment Results for Arsenic Slough, East and West Storm Drains, Marsh and Bay
Prepared by
JONAS & ASSOCIATES
Figure 3-5
Drawing Number
Checked by
Approved by
AJ
12-20-1990
Drawn by
Date: 12-20-1990
Scale as shown
Figure 3-5
Drawing Number



Legend:

Samples:

Soil

Hg Results in mg/Kg

* These samples will be analyzed only if other concentrations in the area are significant.

Scale

75 0 75 150 Feet

N

Mercury Sampling Results - Former Explosive Storage and Blasting Cap Areas and Test Pit

Prepared by

JONAS & ASSOCIATES

Date: 12-20-1990	Figure 3-6	Drawing Number
Scale as shown		

Figure 3-6

Drawing Number

Checked by

Approved by

AJ 12-20-1990

Drawn by

SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	ALUMINUM (mg/kg)	ANTIMONY (mg/kg)	ARSENIC (mg/kg)	BARIUM (mg/kg)	BERYLLIUM (mg/kg)	CADMIUM (mg/kg)	CALCIUM (mg/kg)	CHROMIUM (mg/kg)
B01SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	15500	ND(8.5)	ND(0.90)	178	0.6	2.3	8520	64.1
B02SH101890	SHELL MANUFACTURING	10/18/90	1.3	7920	ND(8.2)	3.4	208	0.43	1.2	29200	27.7
B03SH101890	SHELL MANUFACTURING	10/18/90	1.3	3920	8.9	3	695	0.45	1.6	2220	19.2
B04SH101890	SHELL MANUFACTURING	10/18/90	1.3	2990	ND(7.9)	2.4	203	0.44	0.86	1680	16.1
B05SH101890	SHELL MANUFACTURING	10/18/90	1.3	7060	ND(8.5)	9.7	57.2	0.49	1.4	7780	25.1
B06SH101890	SHELL MANUFACTURING	10/18/90	1.3	6990	ND(8.4)	7.1	62.3	ND(0.44)	1.6	7760	24.6
B07SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	4010	ND(8.3)	3	261	ND(0.44)	ND(0.76)	3960	17.8
B08SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	4490	ND(8.3)	6.5	248	0.43	1.6	3720	20.7
B09SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	4420	ND(7.9)	6.3	190	ND(0.42)	1.9	3510	14.8
B10SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	4080	ND(8.2)	7.4	214	0.45	2.2	3450	20.9
B11SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	7220	ND(8.3)	ND(8.7)	169	ND(0.44)	3	2190	28.9
B12SH101890	SHELL MANUFACTURING	10/18/90	1.3	3580	ND(8.3)	3.2	145	0.46	ND(0.77)	17770	34.2
B13SH101890	SHELL MANUFACTURING	10/18/90	1.3	7960	ND(8.5)	2.8	162	0.47	0.87	37300	28
B14SH101890	SHELL MANUFACTURING	10/18/90	1.3	3940	ND(8.1)	3.2	258	0.45	0.87	1170	22.5
B16SH101890	SHELL MANUFACTURING	10/18/90	1.3	5060	9.2	3.6	223	0.48	0.88	579	22.4
B18SH101890	SHELL MANUFACTURING	10/18/90	1.3	5690	ND(8.3)	2.8	223	ND(0.44)	0.96	1420	33.2
B15SH1.5-120190	SHELL MANUFACTURING	10/24&12/01-90	1.5	7340	8.8	126	238	ND(0.43)	4.2	2880	25.9
B15SH04-102490	SHELL MANUFACTURING	10/24/90	4	21200	ND(8.7)	1.9	200	0.55	5.1	2520	71.2
B15SH6.5-102490	SHELL MANUFACTURING	10/24/90	6.5	15900	ND(8.8)	2.7	580	ND(0.47)	2.9	3510	58
B15SH09-102490	SHELL MANUFACTURING	10/24/90	9	14600	ND(8.2)	ND(8.8)	132	ND(0.56)	2.5	3320	69.8
B15SH11.5-10249	SHELL MANUFACTURING	10/24/90	11.5	15900	ND(8.7)	3.2	198	0.57	1.7	4840	63.3
B15SH14-102490	SHELL MANUFACTURING	10/24/90	14	12600	ND(9.0)	1.7	183	ND(0.47)	1.9	4130	43.3
B1MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	10800	ND(8.3)	9.3	291	ND(0.44)	0.98	4680	32.9
B2MF1.5-120190	MERCURY FULMINATE	10/24&12/01-90	1.5	11700	12	33.7	420	0.59	4.7	6300	52.4
B2MF04-120190	MERCURY FULMINATE	10/24&12/01-90	4	11900	45.3	46.8	362	0.49	5.3	4370	36.5
B2MF6.5-102490	MERCURY FULMINATE	10/24/90	6.5	15000	ND(9.4)	3.2	143	0.67	1.6	4340	51
B2MF09-102490	MERCURY FULMINATE	10/24/90	9	11100	ND(9.3)	1.1	147	ND(0.49)	2	3970	53.7

ND(8.3) = Not Detected (Detection Limit); NA = Not Analyzed; * = Exceeded Holding time for Mercury

SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	ALUMINUM (mg/kg)	ANTIMONY (mg/kg)	ARSENIC (mg/kg)	BARIUM (mg/kg)	BERYLLIUM (mg/kg)	CADMIUM (mg/kg)	CALCIUM (mg/kg)	CHROMIUM (mg/kg)
B2MF11.5-102490	MERCURY FULMINATE	10/24/90	11.5	8350	ND(8.7)	1.3	42.5	ND(0.46)	0.82	3560	45.8
B2MF14-102490	MERCURY FULMINATE	10/24/90	14	7890	ND(8.5)	2.3	48.3	ND(0.45)	2.5	3770	35
B3MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	10300	ND(8.5)	236	432	ND(0.45)	9.2	4940	46.5
B01BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	8470	ND(1.4)	5.5	148	ND(0.45)	2.2	3620	27.1
B02BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	3630	ND(1.4)	3.5	299	ND(0.47)	2.5	960	15.8
B03BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	4940	ND(1.4)	1.2	207	0.48	2	2030	24.3
B04BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	4670	ND(1.3)	ND(0.89)	287	0.47	2.2	1730	18.7
B05BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	4050	ND(1.4)	1.1	183	ND(0.47)	2.2	946	22.2
B01ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	5550	ND(1.3)	1.3	243	ND(0.43)	3.3	2120	31.7
B03ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	7710	ND(1.4)	0.96	169	0.46	1.4	2230	28.3
B05ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	5040	ND(1.3)	2.8	214	0.42	1.3	4400	24.7
B07ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	11100	ND(1.3)	10.2	225	ND(0.43)	4.6	3860	44.4
B09ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	16100	ND(8.1)	3.6	185	0.68	3.4	18200	56.8
B11ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	11800	ND(8.3)	ND(8.7)	236	0.5	0.81	2570	42.2
B13ES120190	EXPLOSIVE STORAGE	10/17&12/01-90	0.5 - 1.5	4450	ND(1.3)	2.8	187	ND(0.42)	1.4	1810	30.5
B14ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	5060	ND(1.3)	2.8	198	0.44	1.7	2270	29.7
B15ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	4800	ND(1.3)	2.8	184	0.43	1.6	1520	27.7
B16ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	17700	ND(8.1)	2.4	205	0.66	4.1	12400	65.1
B1TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	11100	15.6	21.2	247	ND(0.44)	9.9	2790	36.1
B2TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	9000	ND(8.7)	4.3	390	ND(0.46)	2.8	2130	34
B1BG1120190	BACKGROUND	10/20&12/01-90	1.3	14300	ND(8.8)	ND(0.92)	122	0.48	1.2	3930	39.7
B1BG2120190	BACKGROUND	10/20&12/01-90	1.3	16900	ND(9.1)	ND(0.95)	142	0.65	3.1	4460	45.1
B1MA120190	MARSH	10/24&12/01-90	1	21000	ND(9.1)	3.5	195	0.74	2.2	6890	59.6
B2MA102490	MARSH	10/24/90	1	21700	ND(25.9)	119	54.9	ND(1.4)	9.8	4910	85.2

ND(8.3) = Not Detected (Detection Limit); NA = Not Analyzed; * = Exceeded Holding time for Mercury

SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	ALUMINUM (mg/kg)	ANTIMONY (mg/kg)	ARSENIC (mg/kg)	BARIUM (mg/kg)	BERYLLIUM (mg/kg)	CADMIUM (mg/kg)	CALCIUM (mg/kg)	CHROMIUM (mg/kg)
B3MA102490	MARSH	10/24/90	1	26700	ND(20.4)	ND(33.4)	61.2	ND(1.1)	3.8	3980	102
B4MA120190	MARSH	10/24&12/01-90	1	24700	ND(13.4)	186	96.1	ND(0.70)	5	3180	100
B5MA120190	MARSH	10/24&12/01-90	1	27400	ND(33.9)	674	61	ND(1.8)	8.2	4600	110
B6MA102490	MARSH	10/24/90	1	29800	ND(19.0)	ND(3.1)	62.9	ND(1.0)	5.3	3870	115
B7MA120190	MARSH	10/24&12/01-90	1	17400	13.6	15.8	189	0.99	6.9	17700	35.7
B8MA112690	MARSH	10/24&11/26-90	1	30000	ND(18.9)	875	86.9	ND(1.0)	7.7	4160	209
B9MA112690	MARSH	10/24&11/26-90	1	11600	ND(15.8)	125	164	ND(0.67)	8.7	1730	39.5
B10MA112690	MARSH	10/24&11/26-90	1	21900	47.9	2210	108	ND(0.92)	12.3	4300	185
B11MA112690	MARSH	10/24&11/26-90	1	21500	16.5	245	100	ND(0.86)	7.6	3690	143
SD1BAY102490	BAY	10/24/90	1	21000	ND(14.3)	10.5	71	ND(0.75)	3.2	5040	73.2
SD2BAY102490	BAY	10/24/90	1	6840	ND(10.3)	3.2	70.7	ND(0.54)	2	3200	26.9
SD1SL102490	SLOUGH	10/24/90	1	24800	ND(15.4)	ND(2.6)	74.2	0.89	4.8	3430	95.6
SD2SL102490	SLOUGH	10/24/90	1	23400	ND(16.3)	ND(2.7)	69.2	ND(0.86)	2	3810	89.7
SD3SL102490	SLOUGH	10/24/90	1	24200	ND(16.8)	101	105	1.1	10.8	3630	138
B1PR102490	PIER	10/24/90	1.3	7580	ND(9.9)	ND(63.4)	39.2	ND(0.52)	1.8	18400	36.8
SD1PR102490	PIER	10/24/90	1	19700	ND(14.6)	ND(24.9)	77.3	ND(0.77)	5.6	3400	83.5
SD1WSD102490	WEST STORM DRAIN	10/24/90	1	25400	ND(14.9)	ND(25.1)	73.1	0.86	5.7	3500	115
SD1ESD102490	EAST STORM DRAIN	10/24/90	1	8160	41.8	ND(348)	178	ND(1.1)	31	1890	37.6
SD1MA102490	MARSH	10/24/90	1	28400	ND(16.1)	50.6	77.2	ND(0.85)	5.9	4180	105
SD2MA102490	MARSH	10/24/90	1	31000	ND(16.1)	27.2	75.6	ND(0.85)	2.8	4110	105
SD3MA102490	MARSH	10/24/90	1	32700	ND(24.2)	190	57	1.5	5	4400	116
SD4MA120190	MARSH	10/24/90	1	9440	26	161	112	ND(0.54)	9.7	2310	32.9
SD5MA120190	MARSH	10/24/90	1	8710	30.4	167	97.1	ND(0.60)	11	2740	35.8
SD6MA120390	MARSH	10/24/90	1	13800	79	555	207	ND(0.84)	33.7	1690	33.8

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SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	COBALT (mg/kg)	COPPER (mg/kg)	CYANIDE (mg/kg)	IRON (mg/kg)	LEAD (mg/kg)	MAGNESIUM (mg/kg)	MANGANESE (mg/kg)	MERCURY (mg/kg)
B01SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	21.7	187	0.15	19500	81.3	4310	605	1.1
B02SH101890	SHELL MANUFACTURING	10/18/90	1.3	13.3	34	NA	10800	37.1	5100	518	3.31
B03SH101890	SHELL MANUFACTURING	10/18/90	1.3	51.5	12.6	NA	10300	7.4	1370	4280	0.12
B04SH101890	SHELL MANUFACTURING	10/18/90	1.3	13.2	10.5	NA	5970	6.4	1070	898	ND(0.11)
B05SH101890	SHELL MANUFACTURING	10/18/90	1.3	14.6	18.1	NA	17300	6.3	6550	353	ND(0.11)
B06SH101890	SHELL MANUFACTURING	10/18/90	1.3	15	17	NA	13200	5.4	6340	380	ND(0.11)
B07SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	27.2	38.9	NA	7520	20.6	1250	1290	80.1
B08SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	27.1	181	NA	11800	121	1960	1220	97.8
B09SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	10.8	70.5	NA	9750	187	2000	489	18.8
B10SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	16.5	188	NA	10000	87.4	1650	986	40.2
B11SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	5.5	291	NA	9460	313	1440	345	7.74
B12SH101890	SHELL MANUFACTURING	10/18/90	1.3	11.3	24.3	NA	7390	8.9	1590	508	0.57
B13SH101890	SHELL MANUFACTURING	10/18/90	1.3	11.5	24.8	NA	9960	9.2	5610	497	0.3
B14SH101890	SHELL MANUFACTURING	10/18/90	1.3	23.7	22.5	0.13	7510	12.9	1620	1100	2.48
B16SH101890	SHELL MANUFACTURING	10/18/90	1.3	16.2	804	NA	7470	9.3	1350	491	1.17
B18SH101890	SHELL MANUFACTURING	10/18/90	1.3	22.2	29.8	0.13	11000	40.1	2010	1000	2.27
B15SH1.5-120190	SHELL MANUFACTURING	10/24&12/01-90	1.5	15.4	408	ND(0.1)	45100	741	1500	579	6.42
B15SH04-102490	SHELL MANUFACTURING	10/24/90	4	19	32.3	NA	25500	6.5	5170	713	0.3
B15SH6.5-102490	SHELL MANUFACTURING	10/24/90	6.5	5.9	54.3	NA	22000	9.7	7140	130	0.26
B15SH09-102490	SHELL MANUFACTURING	10/24/90	9	14.7	25.3	NA	24900	4.2	6670	537	0.11
B15SH11.5-10249	SHELL MANUFACTURING	10/24/90	11.5	18.8	62.7	NA	31000	4.2	7330	875	0.11
B15SH14-102490	SHELL MANUFACTURING	10/24/90	14	19.6	25.5	NA	18800	3.2	6090	538	0.25
B1MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	11.8	102	0.19	16600	91.5	2760	403	317
B2MF1.5-120190	MERCURY FULMINATE	10/24&12/01-90	1.5	16.6	209	ND(0.1)	36700	388	3990	319	4.39
B2MF04-120190	MERCURY FULMINATE	10/24&12/01-90	4	15	159	NA	29200	697	3200	487	2.6
B2MF6.5-102490	MERCURY FULMINATE	10/24/90	6.5	8	44	NA	23400	7.4	9500	208	0.46
B2MF09-102490	MERCURY FULMINATE	10/24/90	9	7.9	29.2	NA	20600	5	6250	130	ND(0.12)

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SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	COBALT (mg/kg)	COPPER (mg/kg)	CYANIDE (mg/kg)	IRON (mg/kg)	LEAD (mg/kg)	MAGNESIUM (mg/kg)	MANGANESE (mg/kg)	MERCURY (mg/kg)
B2MF11.5-102490	MERCURY FULMINATE	10/24/90	11.5	9.1	22.7	NA	15500	4.3	6380	184	1.63
B2MF14-102490	MERCURY FULMINATE	10/24/90	14	8.9	34.7	NA	14800	5.6	5330	209	2.03
B3MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	13.7	451	ND(0.1)	42600	1140	2640	261	11
B01BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	14.2	207	NA	16600	19.1	3660	666	0.83
B02BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	27.2	232	NA	8660	19.8	832	1360	1.04
B03BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	16	70.8	NA	9830	69.5	1500	923	1.75
B04BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	24.6	149	NA	8520	17.1	1300	1460	1.06
B05BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	13.7	201	NA	11200	14.2	905	705	0.41
B01ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	43.1	654	NA	12800	8.5	1640	2340	0.28
B03ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	10.5	736	NA	9460	5	2160	356	ND(0.12)
B05ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	12.2	44.1	NA	10000	10.5	1640	816	0.8
B07ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	19.1	516	NA	25900	24.3	3550	702	1.37
B09ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	15.6	77.8	NA	19800	18	6930	553	0.51
B11ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	18.1	21.2	NA	15000	6.9	2780	879	ND(0.12)
B13ES120190	EXPLOSIVE STORAGE	10/17&12/01-90	0.5 - 1.5	13	29.5	NA	9480	12	1400	689	0.4
B14ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	13.4	29.3	NA	9500	15.1	1590	715	0.3
B15ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	9.2	22.6	NA	9490	17.4	1500	364	0.19
B16ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	22.2	70.7	NA	23100	15	8140	639	0.84*
B1TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	32.8	899	NA	70000	49.2	3150	842	6.66
B2TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	30.6	1140	NA	27800	46.4	1560	1630	2.91
B1BG1120190	BACKGROUND	10/20&12/01-90	1.3	4.2	17.9	ND(0.1)	12600	7.3	2930	167	ND(0.11)
B1BG2120190	BACKGROUND	10/20&12/01-90	1.3	9.5	22.4	0.25	15600	10.7	3300	360	ND(0.12)
B1MA120190	MARSH	10/24&12/01-90	1	24.9	44.4	NA	26000	7.5	5260	1030	ND(0.12)
B2MA102490	MARSH	10/24/90	1	21.6	112	NA	45700	125	13300	222	2.32

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SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	COBALT (mg/kg)	COPPER (mg/kg)	CYANIDE (mg/kg)	IRON (mg/kg)	LEAD (mg/kg)	MAGNESIUM (mg/kg)	MANGANESE (mg/kg)	MERCURY (mg/kg)
B3MA102490	MARSH	10/24/90	1	9.5	88.6	NA	37600	83.7	14100	217	1.97
B4MA120190	MARSH	10/24&12/01-90	1	15.1	514	NA	37900	122	10900	169	10.5
B5MA120190	MARSH	10/24&12/01-90	1	24.4	494	NA	67700	221	15200	238	1.74
B6MA102490	MARSH	10/24/90	1	15.9	122	NA	37200	99.6	14900	233	2.3
B7MA120190	MARSH	10/24&12/01-90	1	27	121	NA	48100	72.2	6430	586	0.72
B8MA112690	MARSH	10/24&11/26-90	1	13.6	415	NA	60900	235	13600	170	35.9
B9MA112690	MARSH	10/24&11/26-90	1	13.1	519	NA	65200	91.3	2550	31.3	7.09
B10MA112690	MARSH	10/24&11/26-90	1	17.8	495	NA	92800	357	8530	99.5	20.2
B11MA112690	MARSH	10/24&11/26-90	1	ND(6.5)	294	NA	47300	74.6	9180	120	25.1
SD1BAY102490	BAY	10/24/90	1	16.1	255	NA	32000	58.3	10700	257	1.5
SD2BAY102490	BAY	10/24/90	1	9.5	183	NA	11100	10.8	3890	126	0.14
SD1SL102490	SLOUGH	10/24/90	1	21.5	178	NA	48400	143	12500	234	1.84
SD2SL102490	SLOUGH	10/24/90	1	13.7	106	NA	33000	108	12400	198	2.87
SD3SL102490	SLOUGH	10/24/90	1	19	692	NA	42100	485	11500	249	1.37
B1PR102490	PIER	10/24/90	1.3	12	108	NA	21400	129	4980	125	0.94
SD1PR102490	PIER	10/24/90	1	10.8	85.7	NA	32600	122	11000	188	2.23
SD1WSD102490	WEST STORM DRAIN	10/24/90	1	12.5	152	NA	38900	188	12800	228	2.34
SD1ESD102490	EAST STORM DRAIN	10/24/90	1	16.8	813	NA	235000	172	3650	89.8	8
SD1MA102490	MARSH	10/24/90	1	18.1	154	NA	45200	123	13300	279	3.02
SD2MA102490	MARSH	10/24/90	1	21.5	127	NA	42500	95.4	14500	283	2.46
SD3MA102490	MARSH	10/24/90	1	12.4	145	NA	50400	153	15600	232	2.44
SD4MA120190	MARSH	10/24/90	1	16.7	262	NA	83500	293	4330	99.5	15.7
SD5MA120190	MARSH	10/24/90	1	17.5	400	NA	80600	275	3950	91.7	6.27
SD6MA120390	MARSH	10/24/90	1	30.9	823	NA	199000	814	3610	81.3	10.6

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SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	MOLYBDENUM (mg/kg)	NICKEL (mg/kg)	POTASSIUM (mg/kg)	SELENIUM (mg/kg)	SILVER (mg/kg)	SODIUM (mg/kg)	THALLIUM (mg/kg)	VANADIUM (mg/kg)
B01SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.3)	53.4	1600	ND(9.0)	ND(1.6)	427	ND(0.90)	36.2
B02SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.2)	48.7	373	ND(3.6)	ND(1.5)	334	ND(3.4)	25.7
B03SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.2)	46.7	179	ND(0.70)	ND(1.5)	378	ND(0.34)	38.5
B04SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.1)	20.9	199	ND(0.70)	ND(1.5)	315	ND(0.34)	21.6
B05SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.4)	41.2	471	ND(0.74)	ND(1.6)	413	ND(0.36)	17.4
B06SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.3)	35.9	565	ND(0.73)	ND(1.5)	534	ND(3.6)	16.2
B07SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.3)	31.8	296	ND(0.73)	ND(1.5)	298	ND(0.35)	24.2
B08SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.3)	34.4	365	ND(0.70)	ND(1.5)	356	ND(0.34)	27.9
B09SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.1)	20.5	798	ND(0.70)	ND(1.5)	283	ND(3.4)	16.3
B10SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.2)	34	620	ND(0.72)	ND(1.5)	258	ND(3.5)	21.7
B11SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	ND(3.3)	20.2	586	ND(8.7)	ND(1.5)	322	ND(0.87)	25.7
B12SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.3)	29.6	456	ND(0.72)	ND(1.5)	641	ND(0.35)	21.1
B13SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.3)	45.3	553	ND(0.76)	ND(1.6)	332	ND(1.8)	21.6
B14SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.2)	32.6	603	ND(0.71)	ND(1.5)	1440	ND(0.69)	22.3
B16SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.4)	12.6	474	ND(0.76)	ND(1.6)	787	ND(0.37)	20.8
B18SH101890	SHELL MANUFACTURING	10/18/90	1.3	ND(3.3)	36.1	826	ND(0.71)	ND(1.5)	1370	ND(3.4)	28.7
B15SH1.5-120190	SHELL MANUFACTURING	10/24&12/01-90	1.5	ND(3.2)	39.8	1460	ND(8.6)	ND(1.5)	544	ND(0.86)	34.1
B15SH04-102490	SHELL MANUFACTURING	10/24/90	4	ND(3.4)	60.9	592	ND(9.30	ND(1.6)	857	ND(0.93)	40.8
B15SH6.5-102490	SHELL MANUFACTURING	10/24/90	6.5	ND(3.5)	57.4	397	ND(9.2)	ND(1.6)	1020	ND(9.2)	27.6
B15SH09-102490	SHELL MANUFACTURING	10/24/90	9	ND(3.2)	53.7	739	ND(8.8)	ND(1.5)	849	ND(8.8)	37.2
B15SH11.5-10249	SHELL MANUFACTURING	10/24/90	11.5	ND(3.4)	74.4	839	ND(9.0)	ND(1.6)	867	ND(0.90)	46.3
B15SH14-102490	SHELL MANUFACTURING	10/24/90	14	ND(3.6)	49.5	779	ND(9.5)	ND(1.7)	774	ND(0.95)	35.1
B1MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	ND(3.3)	33	1310	ND(0.88)	ND(1.5)	1120	ND(0.88)	27.7
B2MF1.5-120190	MERCURY FULMINATE	10/24&12/01-90	1.5	ND(3.3)	34.6	1340	ND(8.9)	ND(1.5)	507	ND(0.89)	33.8
B2MF04-120190	MERCURY FULMINATE	10/24&12/01-90	4	ND(3.7)	34.7	738	ND(9.9)	ND(1.7)	587	ND(0.99)	30
B2MF6.5-102490	MERCURY FULMINATE	10/24/90	6.5	ND(3.7)	63.3	352	ND(10.0)	ND(1.7)	740	ND(1.00)	31.8
B2MF09-102490	MERCURY FULMINATE	10/24/90	9	ND(3.7)	50.4	437	ND(0.96)	ND(1.7)	605	ND(0.96)	43

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B2MF11.5-102490	MERCURY FULMINATE	10/24/90	11.5	ND(3.4)	40.2	327	ND(8.9)	ND(1.6)	465	ND(0.89)	23.7
B2MF14-102490	MERCURY FULMINATE	10/24/90	14	ND(3.3)	41.9	512	ND(0.88)	ND(1.6)	561	ND(0.88)	26.5
B3MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	ND(3.4)	45.7	1180	ND(0.90)	ND(1.6)	516	ND(0.90)	25.9
B01BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.4)	40	831	ND(0.92)	ND(1.6)	2680	ND(0.92)	29.8
B02BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.6)	13.1	369	ND(0.96)	ND(1.7)	315	ND(0.96)	24
B03BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.4)	23.4	444	ND(0.91)	2.1	343	ND(0.91)	24.5
B04BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.3)	26.5	424	ND(0.89)	ND(1.6)	293	ND(0.89)	25.5
B05BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	ND(3.5)	13.2	460	ND(0.94)	ND(1.7)	306	ND(0.94)	28.1
B01ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.2)	47.8	481	ND(0.87)	ND(1.5)	291	ND(0.87)	34.5
B03ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.5)	19.4	359	ND(0.90)	ND(1.6)	290	ND(0.90)	27.2
B05ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.1)	29.8	458	ND(0.84)	ND(1.5)	251	ND(0.84)	25
B07ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.3)	35.9	758	ND(0.87)	1.9	401	ND(0.87)	27.9
B09ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	ND(3.2)	65.4	1220	ND(3.5)	ND(1.5)	427	ND(1.7)	32.9
B11ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	ND(3.3)	30.9	436	ND(8.7)	ND(1.5)	423	ND(0.87)	33.4
B13ES120190	EXPLOSIVE STORAGE	10/17&12/01-90	0.5 - 1.5	ND(3.2)	26.8	668	ND(0.85)	ND(1.5)	348	ND(0.85)	29.9
B14ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.3)	32.3	755	ND(0.86)	ND(1.5)	363	ND(0.86)	30.3
B15ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	ND(3.2)	27.2	760	ND(0.86)	ND(1.5)	338	ND(0.86)	27.8
B16ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	ND(3.2)	79.7	1310	ND(7.2)	ND(1.5)	464	ND(1.7)	40.1
B1TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	ND(3.3)	27.1	1010	ND(0.72)	ND(1.5)	454	ND(3.5)	29.3
B2TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	ND(3.4)	33.7	551	ND(9.1)	ND(1.6)	384	ND(0.91)	36.8
B1BG1120190	BACKGROUND	10/20&12/01-90	1.3	ND(3.5)	36.8	289	ND(9.2)	ND(1.6)	607	ND(0.92)	21.6
B1BG2120190	BACKGROUND	10/20&12/01-90	1.3	ND(3.6)	38.7	342	ND(9.2)	ND(1.7)	757	ND(0.95)	25.8
B1MA120190	MARSH	10/24&12/01-90	1	ND(3.6)	61	899	ND(7.9)	ND(1.7)	507	ND(0.38)	40.8
B2MA102490	MARSH	10/24/90	1	11.2	111	5690	ND(22.2)	ND(4.8)	29700	ND(10.8)	59.8

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SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	ZINC (mg/kg)
B01SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	125
B02SH101890	SHELL MANUFACTURING	10/18/90	1.3	40.8
B03SH101890	SHELL MANUFACTURING	10/18/90	1.3	10.9
B04SH101890	SHELL MANUFACTURING	10/18/90	1.3	10.2
B05SH101890	SHELL MANUFACTURING	10/18/90	1.3	43.8
B06SH101890	SHELL MANUFACTURING	10/18/90	1.3	42.6
B07SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	47.6
B08SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	114
B09SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	132
B10SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	260
B11SH120190	SHELL MANUFACTURING	10/18&12/01-90	1.3	437
B12SH101890	SHELL MANUFACTURING	10/18/90	1.3	35.7
B13SH101890	SHELL MANUFACTURING	10/18/90	1.3	43.2
B14SH101890	SHELL MANUFACTURING	10/18/90	1.3	54.7
B16SH101890	SHELL MANUFACTURING	10/18/90	1.3	71.4
B18SH101890	SHELL MANUFACTURING	10/18/90	1.3	66.7
B15SH1.5-120190	SHELL MANUFACTURING	10/24&12/01-90	1.5	366
B15SH04-102490	SHELL MANUFACTURING	10/24/90	4	48.4
B15SH6.5-102490	SHELL MANUFACTURING	10/24/90	6.5	65.7
B15SH09-102490	SHELL MANUFACTURING	10/24/90	9	58.7
B15SH11.5-10249	SHELL MANUFACTURING	10/24/90	11.5	89.3
B15SH14-102490	SHELL MANUFACTURING	10/24/90	14	48.5
B1MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	214
B2MF1.5-120190	MERCURY FULMINATE	10/24&12/01-90	1.5	2150
B2MF04-120190	MERCURY FULMINATE	10/24&12/01-90	4	676
B2MF6.5-102490	MERCURY FULMINATE	10/24/90	6.5	68.8
B2MF09-102490	MERCURY FULMINATE	10/24/90	9	57.4

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SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	ZINC (mg/kg)
B2MF11.5-102490	MERCURY FULMINATE	10/24/90	11.5	63.9
B2MF14-102490	MERCURY FULMINATE	10/24/90	14	53.2
B3MF-120190	MERCURY FULMINATE	10/24&12/01-90	1.3	1550
B01BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	135
B02BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	171
B03BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	392
B04BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	223
B05BC101690	BLASTING CAP	10/16/90	0.5 - 1.5	267
B01ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	260
B03ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	266
B05ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	177
B07ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	138
B09ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	222
B11ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	24.4
B13ES120190	EXPLOSIVE STORAGE	10/17&12/01-90	0.5 - 1.5	154
B14ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	161
B15ES101790	EXPLOSIVE STORAGE	10/17/90	0.5 - 1.5	270
B16ES120190	EXPLOSIVE STORAGE	10/20&12/01-90	0.5 - 1.5	178
B1TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	227
B2TP120190	TEST PIT	10/20&12/01-90	0.5 - 1.5	142
B1BG1120190	BACKGROUND	10/20&12/01-90	1.3	27.6
B1BG2120190	BACKGROUND	10/20&12/01-90	1.3	37.1
B1MA120190	MARSH	10/24&12/01-90	1	95.9
B2MA102490	MARSH	10/24/90	1	622

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SOIL SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	ZINC (mg/kg)
B3MA102490	MARSH	10/24/90	1	325
B4MA120190	MARSH	10/24&12/01-90	1	906
B5MA120190	MARSH	10/24&12/01-90	1	1470
B6MA102490	MARSH	10/24/90	1	446
B7MA120190	MARSH	10/24&12/01-90	1	930
B8MA112690	MARSH	10/24&11/26-90	1	517
B9MA112690	MARSH	10/24&11/26-90	1	1270
B10MA112690	MARSH	10/24&11/26-90	1	694
B11MA112690	MARSH	10/24&11/26-90	1	489
SD1BAY102490	BAY	10/24/90	1	283
SD2BAY102490	BAY	10/24/90	1	134
SD1SL102490	SLOUGH	10/24/90	1	661
SD2SL102490	SLOUGH	10/24/90	1	317
SD3SL102490	SLOUGH	10/24/90	1	1060
B1PR102490	PIER	10/24/90	1.3	353
SD1PR102490	PIER	10/24/90	1	259
SD1WSD102490	WEST STORM DRAIN	10/24/90	1	612
SD1ESD102490	EAST STORM DRAIN	10/24/90	1	305
SD1MA102490	MARSH	10/24/90	1	356
SD2MA102490	MARSH	10/24/90	1	343
SD3MA102490	MARSH	10/24/90	1	501
SD4MA120190	MARSH	10/24/90	1	697
SD5MA120190	MARSH	10/24/90	1	752
SD6MA120390	MARSH	10/24/90	1	2840

ND(8.3) = Not Detected (Detection Limit); NA = Not Analyzed; * = Exceeded Holding time for Mercury

SOIL SAMPLE RESULTS
PESTICIDES AND PCBs
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	alpha-BHC (mg/kg)	beta-BHC (mg/kg)	delta-BHC (mg/kg)	gamma-BHC (mg/kg)	Heptachlor (mg/kg)	Aldrin (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Dieldrin (mg/kg)
B8MA112690	MARSH	11/26/90	1	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.082)
B9MA112690	MARSH	11/26/90	1	0.0418	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.041)	ND(0.082)
B10MA11269	MARSH	11/26/90	1	ND(0.052)	ND(0.052)	ND(0.052)	ND(0.052)	ND(0.052)	ND(0.052)	ND(0.052)	ND(0.052)	ND(0.103)
B11MA11269	MARSH	11/26/90	1	ND(0.042)	ND(0.042)	ND(0.042)	ND(0.042)	ND(0.042)	ND(0.042)	ND(0.042)	ND(0.042)	ND(0.084)

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	4,4'-DDE (mg/kg)	Endrin (mg/kg)	Endosulfan II (mg/kg)	4,4'-DDD (mg/kg)	Endosulfan Sulfate (mg/kg)	4,4'-DDT (mg/kg)	Methoxylchlor (mg/kg)	Endrin Ketone (mg/kg)	Chlordane (mg/kg)
B8MA112690	MARSH	11/26/90	1	ND(0.082)	ND(0.082)	ND(0.082)	0.178	ND(0.082)	ND(0.082)	ND(0.410)	ND(0.082)	ND(0.410)
B9MA112690	MARSH	11/26/90	1	ND(0.082)	ND(0.082)	ND(0.082)	ND(0.082)	ND(0.082)	ND(0.082)	ND(0.410)	ND(0.082)	ND(0.410)
B10MA11269	MARSH	11/26/90	1	ND(0.103)	ND(0.103)	ND(0.103)	0.336	ND(0.103)	0.129	ND(0.516)	ND(0.103)	ND(0.516)
B11MA11269	MARSH	11/26/90	1	ND(0.084)	ND(0.084)	ND(0.084)	0.282	ND(0.084)	ND(0.084)	ND(0.421)	ND(0.084)	ND(0.421)

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (FEET)	Toxaphene (mg/kg)	Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)
B8MA112690	MARSH	11/26/90	1	ND(0.820)	ND(0.410)	ND(0.410)	ND(0.410)	ND(0.410)	ND(0.410)	ND(0.820)	ND(0.820)
B9MA112690	MARSH	11/26/90	1	ND(0.820)	ND(0.410)	ND(0.410)	ND(0.410)	ND(0.410)	ND(0.410)	ND(0.820)	ND(0.820)
B10MA11269	MARSH	11/26/90	1	ND(1.032)	ND(0.516)	ND(0.516)	ND(0.516)	ND(0.516)	ND(0.516)	ND(1.032)	ND(1.032)
B11MA11269	MARSH	11/26/90	1	ND(0.842)	ND(0.421)	ND(0.421)	ND(0.421)	ND(0.421)	ND(0.421)	ND(0.842)	ND(0.842)

SOIL SAMPLE RESULTS
TOTAL VOLATILE HYDROCARBONS WITH BTX&E (EPA METHOD 50 /8020)
EXTRACTABLE PETOLEUM HYDROCARBONS IN SOILS, CALIFORNI DOHS METHOD, LUFT MANUAL OCTOBER 1989
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE DEPTH (INCHES)	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)	KEROSEN RANGE (mg/kg)	DIESEL RANGE (mg/kg)
B1B118102090	BUILDING 118	10/20/90	0 - 6	6.8	ND (0.005)	ND (0.005)	ND (0.005)	0.039	ND (100)	1550
B1B120102090	BUILDING 120	10/20/90	0 - 6	ND (1.0)	ND (0.005)	0.012	0.008	0.044	ND (10)	187
B1B121102090	BUILDING 121	10/20/90	0 - 6	ND (1.0)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.015)	ND (10)	105

SURFACE WATER SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	ALUMINUM (ug/L)	ANTIMONY (ug/L)	ARSENIC (ug/L)	BARIUM (ug/L)	BERYLLIUM (ug/L)	CADMIUM (ug/L)	CALCIUM (ug/L)	CHROMIUM (ug/L)	COBALT (ug/L)	COPPER (ug/L)
SW1MA102490	MARSH	10/24/90	2060	ND(38.0)	ND(2560)	19.6	ND(2.0)	ND(3.5)	398000	ND(7.0)	ND(15.0)	44.5
SW2MA102490	MARSH	10/24/90	2090	ND(38.0)	ND(2560)	23.3	ND(2.0)	ND(3.5)	394000	7.7	ND(15.0)	44.6
SW3MA102490	MARSH	10/24/90	1560	ND(38.0)	ND(2560)	28	ND(2.0)	ND(3.5)	377000	ND(7.0)	ND(15.0)	50.6
SW4MA102490	MARSH	10/24/90	895	ND(38.0)	ND(2560)	49	ND(2.0)	ND(3.5)	624000	ND(7.0)	ND(15.0)	92.3
SW5MA102490	MARSH	10/24/90	930	ND(38.0)	ND(640)	22.9	ND(2.0)	ND(3.5)	638000	ND(7.0)	ND(15.0)	96.1
SW6MA102490	MARSH	10/24/90	126000	87.2	1570	147	ND(2.0)	53.8	575000	132	61.6	2360
SW1WSD102490	WEST STORM DRAIN	10/24/90	1250	ND(38.0)	ND(640)	30.8	ND(2.0)	ND(3.5)	341000	ND(7.0)	ND(15.0)	36.7
							ND	ND				
SW1BAY102490	BAY	10/24/90	1830	ND(38.0)	ND(640)	18.7	ND(2.0)	ND(3.5)	409000	7.7	ND(15.0)	41.2
SW2BAY102490	BAY	10/24/90	1080	ND(38.0)	ND(640)	14.9	ND(2.0)	ND(3.5)	401000	ND(7.0)	ND(15.0)	41.9
SW1SLEB102490	SLOUGH EBB	10/24/90	2520	ND(38.0)	ND(640)	60.7	ND(2.0)	ND(3.5)	371000	8.9	ND(15.0)	46.6
SW2SLEB102490	SLOUGH EBB	10/24/90	1490	ND(38.0)	ND(2560)	36.4	ND(2.0)	ND(3.5)	343000	ND(7.0)	ND(15.0)	37.7
SW1SLFL102490	SLOUGH FLOOD	10/24/90	1650	39.5	ND(640)	17.3	ND(2.0)	ND(3.5)	405000	7.4	ND(15.0)	42
SW2SLFL102490	SLOUGH FLOOD	10/24/90	1610	ND(38.0)	ND(640)	18.2	ND(2.0)	ND(3.5)	392000	ND(7.0)	ND(15.0)	41
SW1FB102490	FIELD BLANK	10/24/90	42.5	ND(38.0)	ND(6.4)	ND(1.0)	ND(2.0)	ND(3.5)	987	ND(7.0)	ND(15.0)	10.4

SURFACE WATER SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	CYANIDE (ug/L)	IRON (ug/L)	LEAD (ug/L)	MAGNESIUM (ug/L)	MANGANESE (ug/L)	MERCURY (ug/L)	MOLYBDENUM (ug/L)	NICKEL (ug/L)	POTASSIUM (ug/L)
SW1MA102490	MARSH	10/24/90	NA	1610	ND(120)	1200000	39.9	ND(0.20)	ND(15.0)	ND(27.0)	333000
SW2MA102490	MARSH	10/24/90	NA	1740	ND(120)	1200000	65.5	0.4	ND(15.0)	ND(27.0)	323000
SW3MA102490	MARSH	10/24/90	NA	1380	ND(120)	1130000	157	ND(0.20)	ND(15.0)	44.5	313000
SW4MA102490	MARSH	10/24/90	NA	580	ND(120)	1870000	233	0.4	ND(15.0)	50.4	515000
SW5MA102490	MARSH	10/24/90	NA	1120	ND(120)	1920000	234	ND(0.20)	ND(15.0)	ND(27.0)	517000
SW6MA102490	MARSH	10/24/90	NA	333000	ND(120)	1720000	306	ND(0.20)	ND(15.0)	ND(27.0)	477000
SW1WSD102490	WEST STORM DRAIN	10/24/90	NA	759	ND(120)	1010000	88.2	ND(0.20)	ND(15.0)	41.2	271000
SW1BAY102490	BAY	10/24/90	NA	1330	ND(120)	1250000	35.7	0.45	ND(15.0)	32	344000
SW2BAY102490	BAY	10/24/90	NA	460	ND(120)	1220000	19.7	0.2	ND(15.0)	ND(27.0)	337000
SW1SLEB102490	SLOUGH EBB	10/24/90	NA	2190	ND(120)	1100000	92.9	ND(0.20)	ND(15.0)	30.8	296000
SW2SLEB102490	SLOUGH EBB	10/24/90	NA	1020	ND(120)	1000000	79.2	ND(0.20)	ND(15.0)	ND(27.0)	261000
SW1SLFL102490	SLOUGH FLOOD	10/24/90	NA	1160	ND(120)	1240000	38.3	ND(0.20)	17.3	ND(27.0)	343000
SW2SLFL102490	SLOUGH FLOOD	10/24/90	NA	1070	ND(120)	1200000	54.2	ND(0.20)	ND(15.0)	ND(27.0)	325000
SW1FB102490	FIELD BLANK	10/24/90	NA	69.8	1.5	109	3	ND(0.20)	ND(15.0)	ND(27.0)	ND(442)

SURFACE WATER SAMPLE RESULTS
TARGET ANALYTE LIST OF 22 METALS
UNIVERSITY OF CALIFORNIA
RICHMOND FIELD STATION

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DATE	SELENIUM (ug/L)	SILVER (ug/L)	SODIUM (ug/L)	THALLIUM (ug/L)	VANADIUM (ug/L)	ZINC (ug/L)
SW1MA102490	MARSH	10/24/90	ND(33.0)	ND(7.0)	9050000	ND(160)	ND(9.0)	30.7
SW2MA102490	MARSH	10/24/90	ND(33.0)	ND(7.0)	9140000	ND(160)	ND(9.0)	30.6
SW3MA102490	MARSH	10/24/90	ND(33.0)	ND(7.0)	8550000	ND(160)	ND(9.0)	94.3
SW4MA102490	MARSH	10/24/90	ND(33.0)	ND(7.0)	14700000	ND(160)	ND(9.0)	854
SW5MA102490	MARSH	10/24/90	ND(33.0)	ND(7.0)	14900000	ND(800)	ND(9.0)	877
SW6MA102490	MARSH	10/24/90	ND(33.0)	7.5	12700000	ND(800)	74.8	7900
SW1WSD102490	WEST STORM DRAIN	10/24/90	ND(33.0)	ND(7.0)	7630000	ND(160)	ND(9.0)	50.1
SW1BAY102490	BAY	10/24/90	ND(33.0)	ND(7.0)	9530000	ND(800)	ND(9.0)	73.2
SW2BAY102490	BAY	10/24/90	ND(33.0)	ND(7.0)	9290000	1210	ND(9.0)	11.5
SW1SLEB102490	SLOUGH EBB	10/24/90	ND(3.3)	ND(7.0)	8240000	ND(800)	ND(9.0)	116
SW2SLEB102490	SLOUGH EBB	10/24/90	ND(3.3)	ND(7.0)	7580000	ND(160)	ND(9.0)	38.5
SW1SLFL102490	SLOUGH FLOOD	10/24/90	ND(33.0)	ND(7.0)	9450000	ND(160)	ND(9.0)	23.1
SW2SLFL102490	SLOUGH FLOOD	10/24/90	ND(33.0)	ND(7.0)	8940000	ND(800)	ND(9.0)	30.8
SW1FB102490	FIELD BLANK	10/24/90	ND(3.3)	ND(7.0)	2640	1.9	ND(9.0)	38.6