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Arsenal-Wide

General Site Safety & Health Plan

FOR THE BENICIA ARSENAL

January, 1999

BENICIA ARSENAL

GENERAL SITE SAFETY AND HEALTH PLAN

Prepared by: _____ Date: 01/22/99

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LIST OF ACRONYMS

BC	Brown and Caldwell
CIH	Certified Industrial Hygienist
CFR	Code of Federal Regulations
CGI	Combustible gas indicator
CPR	Cardio pulmonary resuscitation
CPT	Cone penetrometer
CWM	Chemical Warfare Materials
DBA	Decibels
DPT	Direct Push Technology
DT	Dräger detectortube
EOD	Explosive ordnance disposal
FSIP	Field Site Investigation Plan
FUDS	Formerly Used Defense Site
HSD	Health and Safety Director
IDLH	Immediately dangerous to life or health
IP	Iomzation potential
JD	Juris Doctor
OSHA	Occupational Safety and Health Administration
OVA	Organic vapor analyzer
PG	Project Geologist
PjM	Project Manager
PM	Program Manager
PPE	Personal Protective Equipment
PT	Project Technician
SSHP	Site Safety and Health Plan
SSO	Site Safety Officer
TLV	Threshold limit value
TM	Technical Manager
USACE	United States Army Corps of Engineers
UXO	Unexploded Ordnance
VOCs	Volatile Organic Compound
WIRMS	Warehouse, Industrial, Revetment, Motor Pool, and Storage (Areas)

Executive Summary

EXECUTIVE SUMMARY

The Benicia Arsenal General Site Safety and Health Plan (Benicia Arsenal General SSHP) has been prepared by Brown and Caldwell (BC) for the Benicia Arsenal (Arsenal) Formerly Used Defense Site (FUDS). This Benicia Arsenal General SSHP is to be used in conjunction with Forsgren Associates/Brown and Caldwell Health and Safety Program Manual (Forsgren/BC H&S Program Manual) and Site Specific Arsenal Site Safety and Health Plans (SSHPs). A copy of this Benicia Arsenal General SSHP and the appropriate SSHP(s) will be kept on site during any field work activities. Forsgren/BC H&S Program Manual will be readily available in BC's Sacramento office and at the Sacramento District office of the United States Army Corps of Engineers (USACE).

Each facility or site will have its own FSIP/SSHP, which will be specific to the site. The chemicals of potential concern (COPC), site geology, site hazards, etc. will be evaluated for each individual facility. Each SSHP will reference Forsgren/BC H&S Program Manual, or this Benicia Arsenal General SSHP. Each SSHP will provide specific details on the site safety requirements and for the COPC.

Subcontractors are responsible for their own health and safety program and the health and safety of their own employees. A copy of their written program must be submitted for review to BC, if requested. In an effort to assist the subcontractors, and to comply with hazard communication requirements, BC will provide a copy of the site safety and health plan for this project to each subcontractor.

All BC staff working on-site will have completed training in hazard recognition and basic health and safety issues as required by the occupational safety and health regulations contained in 29 CFR 1910.120. The SSO will have completed the 8-hour Site Supervisor course, have current training in first aid and CPR, and any additional training appropriate to the level of site hazards. Before fieldwork begins, all field personnel, including subcontractor employees, must be briefed on their work assignments and safety procedures contained in this document. Each person must be provided with and read a copy of this Benicia Arsenal General SSHP. No person shall be allowed to enter the work area until they have signed a Site Safety & Health Plan Employee Acknowledgement provided as Attachment A. If site specific training is required, it will be addressed in the site-specific SSHP.

The potential hazards to personnel working at the Arsenal have been classified as chemical hazards, physical safety hazards,

noise, heat stress, cold stress, biological, and radiological hazards. Each potential hazard relative to the potential for exposure is described below and are summarized in Table 2-1. On the basis of the hazard analysis for this project, the minimum required level of personal protection on the site at all times is level D. Level D consists of hard hat, safety glasses, steel-toed boots. If level C protection is required, it will consist of Level D protection listed above, plus nitrile gloves and liners, chemical-resistant safety boots, and half or full face respirator with cartridges that are appropriate for the COPC. Changes to these specified items of Personal Protective Equipment (PPE) for each Level of Protection will not be made without the approval of the SSO.

The direct-reading instrument that will be used to monitor air quality in and around the work area is the Organic Vapor Monitor (OVM). Explosive concentrations of air contaminants will be monitored using an OVM/combustible gas indicator. A Dräger detector tube (DT) kit shall be available to determine airborne concentrations of specific contaminants during work activities where the OVM/combustible gas indicator (CGI) is used. Heat or cold stress will be monitored as necessary as described in the hazard analysis portion of this Benicia Arsenal General SSHP.

Medical surveillance is conducted as a routine program for BC field staff in accordance with the requirements of 29 CFR 1910.120(f). If special medical tests or examinations are required for staff involved with a specific site, those tests will be discussed in the Site Specific SSHP. All subcontractor personnel directly involved with the field activities must also meet the medical surveillance requirements of 29 CFR 1910.120(f).

In general, work zones will be delineated using traffic cones and, if necessary, caution tape in a 25-foot radius around the work area. Since most of the sampling activities will be conducted in Level D PPE, and in generally public areas, specific exclusion zones, decontamination zones and support zones will not be established. Site control such as caution tape etc. will still be used when appropriate for protection of the public.

Safe work practices are part of ensuring a safe and healthful working environment. These practices are standardized for all field activities, and it is the responsibility of BC employees to follow safe work practices when conducting field activities. Safe work practices to be employed during the entire progress of field work. All workers, PPE, sampling equipment, and heavy equipment leaving the work zone will be decontaminated, as necessary, to prevent the spread of hazardous materials

In the event of an emergency on-site, the Site Safety Officer (SSO) will direct the course of action. It may be necessary for the SSO to depend on the other on-site personnel for assistance. The SSO will call for emergency assistance if needed. As soon as practical, the SSO will contact the Project Manager (PjM) and the Health and Safety Director (HSD). All staff assigned to this project will be briefed on the procedures and responsibilities for implementation.

The nearest medical assistance center is **Kaiser Permanente Hospital** located at **975 Sereno Dr., Vallejo, CA** , telephone number: **(707)-651-1000.** General directions from the Arsenal to the nearest hospital are shown on the route to hospital map included in this document as Figure 10-1. Site-specific routes will be included in each FSIP.

The nearest telephone is located in the support vehicle. The emergency telephone numbers to be used to call for assistance are listed in the section on Key Personnel and Responsibilities at the beginning of this document. **In the event of a medical emergency, dial 911 first.**

The implementation of the SSHP must be documented to ensure employee participation and protection. In addition, the regulatory requirements must be met for recordkeeping on training, medical surveillance, injuries and illnesses, exposure monitoring, health risk information, and respirator fit-tests. Documentation of each employee's activities is maintained by the HSD in Pleasant Hill, California.

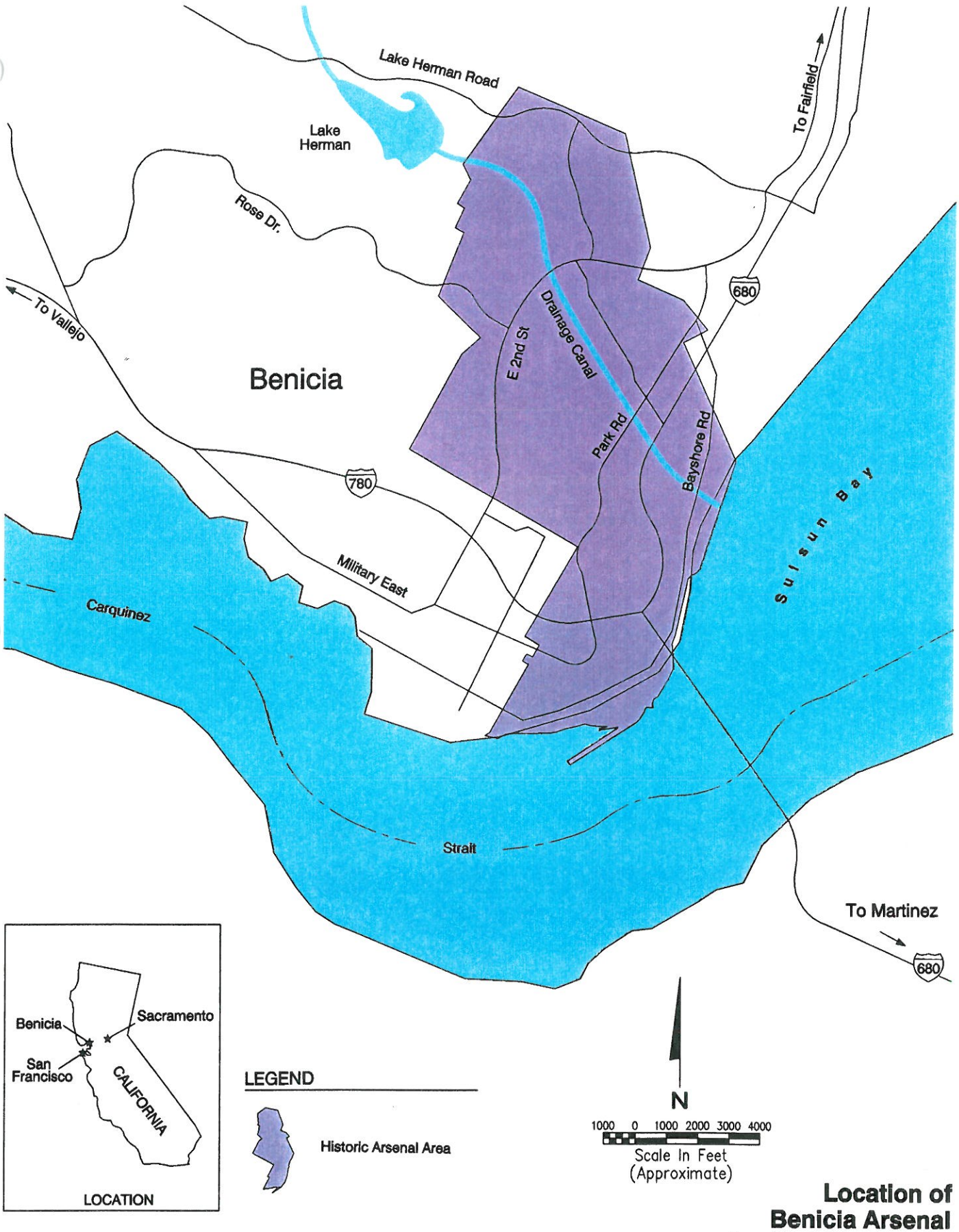
1.0 Introduction

1.0 INTRODUCTION

This Benicia Arsenal General Site Safety and Health Plan (Benicia Arsenal General SSHP) has been prepared by Brown and Caldwell (BC) for the Benicia Arsenal (Arsenal) Formerly Used Defense Site (FUDS). This Benicia Arsenal General SSHP is to be used in conjunction with Forsgren Associates/Brown and Caldwell Health and Safety Program Manual (Forsgren/BC H&S Program Manual) and Site Specific Arsenal Site Safety and Health Plans (SSHPs). A copy of this Benicia Arsenal General SSHP and the appropriate SSHP(s) will be kept on site during any field work activities. Forsgren/BC H&S Program Manual will be readily available in BC's Sacramento office and at the Sacramento District office of the United States Army Corps of Engineers (USACE).

The Benicia Arsenal is located approximately one mile east of the City of Benicia and 25 miles northeast of San Francisco, California (Figure 1-1). The Arsenal's history is detailed in a Records Research Report, and summarized below. As a result of the records search, the Arsenal has been divided into 5 separate and distinct areas, WIRMS, which reflect the use of each area during the active life of the Arsenal (Figure 1-2). Area W is the warehouse expansion area of the 1940's and 50's. Area I is the industrial/manufacturing area. Area R is the revetment area or the explosives holding yard. Area M is the motor pool area and the former historical ordnance storage area, and Area S is the storage or igloo area.

The characterization of the five areas will be described in an Arsenal-Wide Investigation Workplan. The Arsenal-Wide Investigation Workplan will be separated into five subsections corresponding to the five major areas of the Arsenal, the WIRMS. Information that is common to the area and a detailed historical use of each of the facilities within an area will be included in the main body of the workplan under the appropriate subsection. The actual investigation will proceed by facility. Each facility or site will have its own FSIP/SSHP, which will be specific to the site. The chemicals of potential concern (COPC), site geology, site hazards, etc. will be evaluated for each individual facility. Each SSHP will reference Forsgren/BC H&S Program Manual, or this Benicia Arsenal General SSHP. Each SSHP will provide specific details on the site safety requirements and for the COPC. The first set of FSIP/SSHP will be included in the appropriate subsection(s) at the time of submittal of the main body of the workplan. At the front of each WIRMS subsection will be an index that will list the included FSIP/SSHP.



Location of Benicia Arsenal

General Site Safety and Health Plan
Benicia Arsenal

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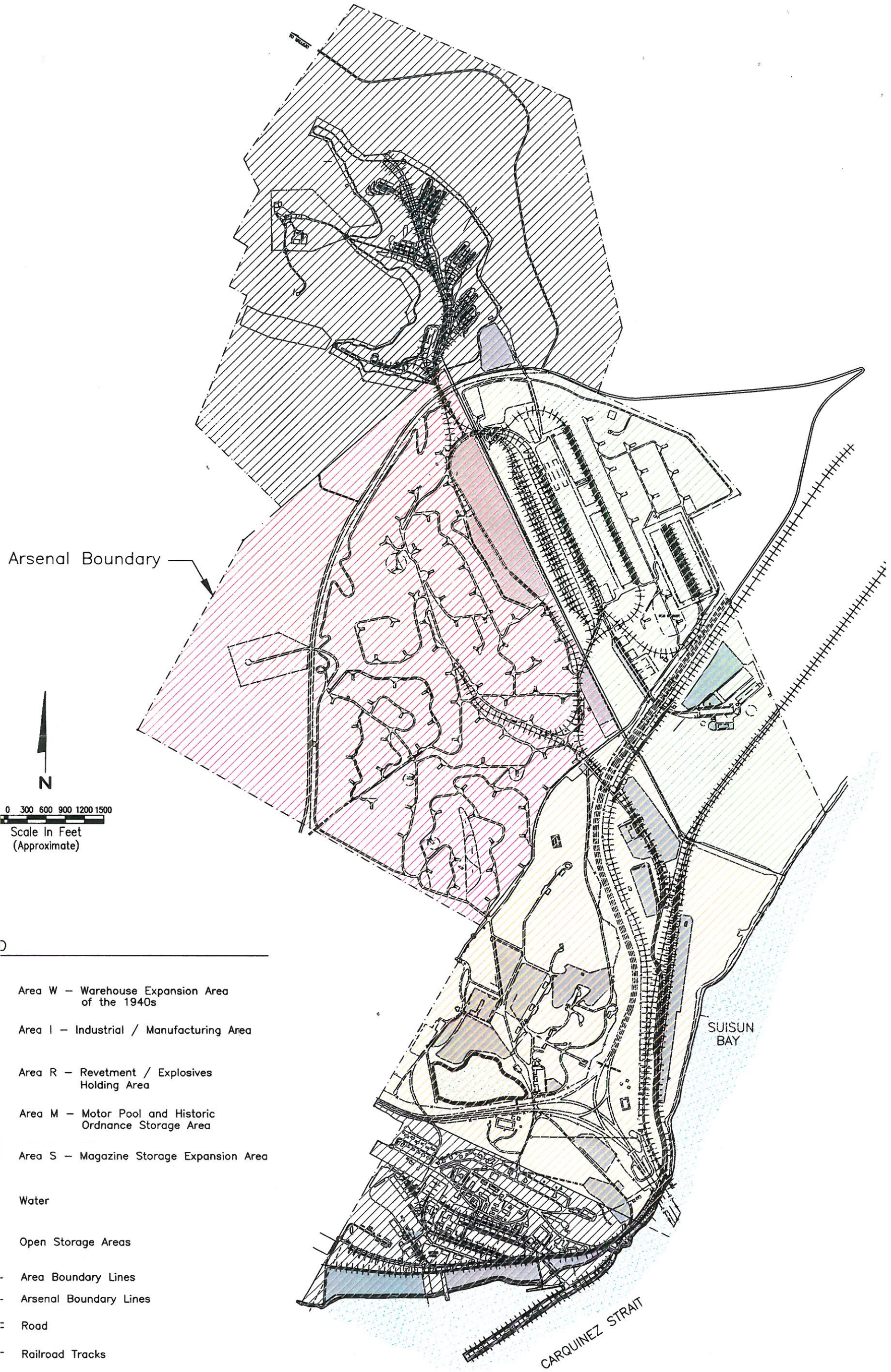
FIGURE 1-1



LEGEND

- Area W – Warehouse Expansion Area of the 1940s
- Area I – Industrial / Manufacturing Area
- Area R – Revetment / Explosives Holding Area
- Area M – Motor Pool and Historic Ordnance Storage Area
- Area S – Magazine Storage Expansion Area
- Water
- Open Storage Areas
- Area Boundary Lines
- Arsenal Boundary Lines
- Road
- Railroad Tracks

SOURCE: BASIC INFORMATION MAPS, MARCH 1958
LAND UTILIZATION MAP, MAY 1956
PRELIMINARY BENICIA ARSENAL REHABILITATION
OF MAINTENANCE BLDGS. PLOT PLAN, AUGUST 1950

Benicia Arsenal WIRMS Areas

General Site Safety and Health Plan
Benicia Arsenal

FIGURE 1-2

As the study moves to additional sites, only the new FSIP/SSHPs will be submitted for review and approval. After approval, an updated index will be provided for the subsection along with the final approved FSIP/SSHP for inclusion in the original document. This approach is intended to shorten the workplan writing/submittal/review/approval process without compromising quality.

1.1 The Benicia Arsenal

As discussed above, the Arsenal has been divided into five separate and distinct areas, WIRMS. Area W houses five large warehouse facilities and several smaller facilities used to store inert materials. Small warehouses were constructed in 1942, and four of the larger structures were constructed between 1952 and 1954. Other features include two underground small arms storage magazines, the guided missile shop, two septic tanks associated with the warehouse expansion facilities, a tank test track, and a fire-water reservoir. Following deactivation of the Arsenal several new industrial facilities were constructed.

Area I contains heavy industrial type structures dating to the 1850s. Other features include two sandstone quarries, two landfills, the Storehouse or "Clock Tower", and military housing. Several service stations were later constructed. Small arms and artillery manufacturing and servicing, repairing and preserving were performed in this area from circa 1861 until deactivation in 1964.

Area R was improved in the mid-to late-1940's for managing and storing explosives. Other features include eighteen earthen revetments constructed around railroad spurs, several ordnance disposal areas, howitzer test tunnels, a firing butt, a concrete powder loading room, and a weapons testing facility which was built in the 1950s. Explosives were routinely burned on the Arsenal grounds. A demolition site is noted on base maps, located on the northwest edge of the Arsenal in Area R (USACE, 1997).

Area M was originally (1852 to 1945) used for storage of explosives and fabricated ordnance. Detonation of ordnance was probably conducted on the Suisun Bay tidal flats adjoining Area M. A gasoline refueling station was added in 1955. During this period, in 1945, the motor pool was temporarily moved from Area I into Area M. In 1953 the motor pool was permanently located in Area M. Area M contains some of the oldest remaining structures of the Arsenal, including the Camel Barn Museum and the original Arsenal hospital. Other features include a tire retreading facility, 2 sandstone quarries, 4 fire/domestic water reservoirs, and an Italian POW barracks

(later used for California Youth Authority housing).

Area S houses over 100 former underground storage igloos, both medium and large in size. One of these igloos reportedly contained radioactive material. Other features include two open storage areas, a firing range, a demolition area, several railroad loading platforms, and two former NIKE missile launch sites. Scattered throughout the hills of the Arsenal were NIKE launching racks, which held the missiles in readiness (Cowell, 1963).

Under the FUDS program, work cannot proceed in an area until the area is cleared of unexploded ordnances (UXO). Area I has been chosen as the starting point for work at the Arsenal because it has the lowest potential for buried UXO. Eventually, the entire Arsenal will be investigated. UXO is proceeding on a separate but parallel track from the environmental investigation, and will not be handled by BC or its subcontractors.

1.2 Key Personnel and Responsibilities

The Arsenal FUDS is represented by Ms Brenda Pedersen, Technical Manager, of the USACE. Ms. Eilean Moreno-Davis serves as assistant to Ms. Pedersen. Mr. David Elskamp is the Senior Industrial Hygienist for USACE. Mr. Dave Jones of BC serves as the USACE Program Manager (PM) for BC. Mr. Jay Lucas and Ms. Patti De La O of BC serve as Technical Manager (TM) and Project Manager (PjM), respectively, for the Benicia Arsenal FUDS. Ms. Anne Baptiste, JD, CIH, is BC's Corporate Health and Safety Director (HSD). Ms. Wendy Linck and Mr. Paul Lopez of BC serve as the Site Safety Officers (SSOs). Ms. Linck and Mr. Lopez will also serve as the Project Geologist (PG) and Project Technician (PT), respectively. All project field staff have completed 40 hours of comprehensive health and safety training and 8-hour refresher training which meets the requirements of Title 29, Code of Federal Regulations (CFR), Part 1910.120 (29 CFR 1910.120).

The BC PM is responsible for the overall project operations. The PM will attend regularly scheduled meetings to discuss budget and evaluate project progress. In addition, the PM is responsible for reviewing and approving all contract related documents.

The PjM is responsible for generating, organizing, and compiling the SSHP, which describes all planned field activities and potential hazards that may be encountered at the site. The PjM is also responsible for ensuring that adequate training and safety briefing(s) are provided to the project team. The PjM has provided a copy of the SSHP

to each member of the project field team and one copy to the subcontractor before the start of field activities.

The PjM and the TM are also responsible for the direct communication between BC and USACE. The PjM and TM are also responsible for program administration and distributing relevant USACE information to BC project staff.

The BC HSD is responsible for developing and coordinating the BC Health and Safety program. For specific projects, the HSD is responsible for reviewing and approving the draft SSHP for accuracy and incorporating new information or guidelines that aid the PjM and SSO in further definition and control of the potential health and safety hazards associated with the project. The resume for Ms. Baptiste is included as Appendix A.

The BC SSO has on-site responsibility for ensuring that all team members, including subcontractors, comply with the SSHP. It is the SSOs responsibility to inform the subcontractors and other field personnel of chemical and physical hazards as he/she becomes aware of them. The SSO must report to the PjM any unsafe conditions or practices and all facts pertaining to incidents that result in injury or exposure to toxic materials. Deviations from the plan must be based on field conditions encountered and well documented in the field notes. The SSO has the authority to monitor and correct BC health and safety problems as noticed on site. The resumes for Ms. Linck and Mr. Lopez are also included in Appendix A. Additional SSO responsibilities include:

1. Providing site safety briefing for team members.

2. Updating equipment or procedures to be used on site based on new information gathered during the site investigation.

3. Inspecting all Personal Protective Equipment (PPE) prior to on-site use.

4. Assisting the PjM in documenting compliance with the SSHP by completing the standard BC forms.

5. Assisting in and evaluating the effectiveness of decontamination procedures for personnel, protective equipment, sampling equipment and containers, and heavy equipment and vehicles.

6. Enforcing the "buddy system" as appropriate for site activities.

7. Posting location and route to the nearest medical facility; arranging for

emergency transportation to the nearest medical facility.

8. Posting the telephone numbers of local public emergency services; i.e., police and fire.

9. Stopping operations that threaten the health and safety of the field team or surrounding populace.

10. Entering the exclusion area in emergencies after he/she has notified emergency services.

11. Observing field team members for signs of exposure, stress, or other conditions related to preexisting physical conditions or site work activities.

The PG and PT are responsible for ensuring that all data acquisition is performed in accordance with the workplan (if applicable) and the SSHP, and that any deviations from the plans are based upon field conditions encountered and are well documented in the field notes. The PG and PT health and safety responsibilities include:

1. Following the SSHP.

2. Reporting to the PjM any unsafe conditions or practices.

3. Reporting to the PjM all facts pertaining to incidents that result in injury or exposure to toxic materials.

4. Reporting to the PjM equipment malfunctions or deficiencies.

Project Contacts

The following is a reference list of project contacts.

USACE:

Ms. Brenda Pedersen
(916) 557-6771
Ms. Eilean Moreno-Davis
(916) 557-6743
Mr. David Elskamp
(916) 557-7903

BC Program Manager:

Mr. Dave Jones
(916) 444-0123
(916) 854-5303 (direct)

BC Project Manager:

Ms. Patti De La O
(916) 444-0123
(916) 854-5313 (direct)

BC Technical Manager:

Mr. Jay Lucas
(916) 444-0123
(916) 854-5315 (direct)

BC Health & Safety Director:

Ms. Anne Baptiste, JD, CIH
(619) 528-9090

BC Site Safety Officers:

Ms. Wendy Linck and Mr. Paul Lopez
(916) 444-0123

1.3 Emergency Telephone Numbers

Site-specific emergency telephone numbers will be included in the individual SSHPs. Other generic emergency phone numbers are as follows:

Name or Business/Telephone Number

Fire, Police and Ambulance
9-1-1

Mr. Dave Jones, Program Manager
(916) 444-0123 or (916) 854-5303

Ms. Patti De La O, Project Manager
(916) 444-0123 or (916) 854-5313

Ms. Anne Baptiste, JD, CIH
(619) 528-9090

1.4 Subcontractor Responsibilities

All subcontractors are responsible for their own health and safety program and the health and safety of their own employees. This requirement is based on the Occupational Safety and Health Administration (OSHA) regulations, which recognize the employer-to-employee responsibility for health and safety. A copy of their written program must be submitted for review to BC, if requested. In an effort to assist the subcontractors, and to comply with hazard communication requirements, BC will provide a copy of the site safety and health plan for this project to each subcontractor.

2.0 HAZARD ANALYSIS

The potential hazards to personnel working at the Arsenal have been classified as chemical hazards, physical safety hazards, noise, heat stress, cold stress, biological, and radiological hazards. Each potential hazard relative to the potential for exposure are described below and are summarized in Table 2-1. The potential hazards presented in Table 2-1 include all of the steps in the field work activities.

2.1 Chemical Hazards

Health hazards associated with potential chemical exposures at the Arsenal include flammability, corrosivity, toxicity, and explosivity. Toxicity may occur following inhalation of chemical vapors that could potentially be released from chemical-affected (eg. gasoline and/or diesel, or solvents) soil or groundwater, and direct contact with soil and/or groundwater that could potentially contain hazardous materials. The direct chemical hazards associated with each specific site will be addressed in the site specific SSHPs. Table 2-2 is a summary of the potential chemical hazards, exposure limits, and characteristics, for chemicals that may be encountered during fieldwork at the Arsenal. Table 2-2 is based on the chemicals that were identified in the Draft Records Research Report (Jacobs Engineering Group, 1998) and does not necessarily indicate those chemicals were spilled or mishandled.

2.2 Physical Hazards

Physical hazards are safety hazards associated with heavy equipment used for excavating and drilling as well as heat stress or cold stress, physical injury, noise, electrical hazards, and biological hazards. Each potential hazard is described in detail within Forsgren/BC H&S Program Manual. Some level of PPE is necessary for virtually all field sampling activity for protection against physical and/or chemical hazards. Certain types of PPE may place a physical strain on the wearer and may increase the risk of heat stress or may limit manual dexterity or other body movements. When the risk of heat stress is increased, the work-rest cycle should be monitored and modified as necessary. General PPE requirements are presented in the Forsgren/BC H&S Program Manual (300; p. 1-30). Site-specific PPE requirements will be addressed in the site-specific SSHPs.

Table 2-1

Potential Hazards and Recommended Controls for Investigation Activities at the Benicia Arsenal

Chemical exposure	Wear proper PPE during activities as described in Sections 301 and 302 of the Forsgren/BC H&S Program Manual. Conduct air monitoring as described in Sections 412.9 and 512.11 of the Forsgren/BC H&S Program Manual.
Heavy equipment	Personnel communication, wear proper PPE during work activities such as drilling and excavating. Standard operating procedures (SOPs) for drilling are described in Section 203 of the Forsgren/BC H&S Program Manual and SOPs for excavating are described in Section 204 of the Forsgren/BC H&S Program Manual. Wear proper PPE to prevent physical injuries (i.e. safety glasses, hard hat, steel toed shoes/boots, other protective clothing as necessary. Provide training on proper lifting techniques and provide adequate back support.
Slips, trips, and falls	Wear proper footwear and anticipate footing hazards (i.e. steep slopes, potholes, and uneven surfaces).
Noise	Wear hearing protection whenever the noise levels are such that conversation is impaired without raising the voice level as described in Section 210 of the Forsgren/BC H&S Program Manual.
Utilities	Have all utilities (underground and overhead) located and documented prior to the initiation drilling or excavation activities.
Trenching/excavations	Personnel communication (verbal or visual). Delineate excavation with a physical barrier (fencing, trench plates, etc.) when not actively excavating. Do not enter unshored or unsloped excavations deeper than 4 feet. Provide adequate entrance and egress routes for personnel in excavations. Monitor air quality within excavation.
Sunburn	Protect skin from sun exposure with sunscreen lotions or long sleeve shirt and a brimmed hat or hardhat.
Unexploded ordnance	Suspend work, contact USACE and PjM if UXO is suspected.
Biological hazards	Wear proper PPE during work activities, if conditions indicate an infestation of insects, mold, or animal droppings.
Radiological Hazards	There are no anticipated radiological hazards associated with the Benicia Arsenal project.

BC = Brown and Caldwell
PjM = Project Manager
PPE = Personal Protective Equipment
SOP = Standard Operating Procedure
USACE = United States Army Corps of Engineers
UXO = Unexpected Ordnance

Table 2-2
Chemical Exposure Limits and Characteristics

Chemical	IP(a)	OVA (b) relative response percent	TLV (c) 8-hour TWA	IDLH (d) level	Flammable range percent	Odor threshold, ppm	Notes (e)	Potential symptoms of exposure (f)
Acetone	9.69	82	500 ppm	2500 ppm	2.5-12.8	NA		irritation to nose, eyes, throat, headache, dizziness, dermatitis
Benzene	9.24	185	0.5 ppm	Ca (500 ppm)	1.3-7.9	4.68	C,65	irritation to eyes, nose, respiratory system, giddiness, headache, nausia, staggered gait, fatigue, anorexia, lassitude, dermititis, bone marrow, depression
Boric acid	13.5	NA	10 mg/m^3	2000 mg/m^3	(f)	NA		nasal irritation, conjectivitis, erythema
Carbon tetrachloride	11.5	8	5 ppm	200 ppm	NC	NA	C,65	central nervous system, depression, nausea, vomiting, liver/kidney damage, irritation to skin
Chloracetophenone	9.44	NA	0.05 ppm	15 mg/m^3	unknown	NA		irritation to eyes, skin, respiratory system, pulmonary edema
Chlorine	11.5	NA	0.5 ppm	10 ppm	NF	NA		burning of eyes, nose, mouth, lacrimation, rhinorrea, coughing, choking, substernal pain, nausea, vomiting, headache, dizziness, syncope, pulmonary edema, pneumonia, hypoxemia, dermatitis, eye and skin burns
Chlorobenzene	9.07	179	10 ppm	1000 ppm	1.3-9.6	NA		irritation to skin, eyes, nose, drowsiness, incoherence
Dichloroethene	9.65	40	5 ppm	1000 ppm	5.6-12.8	NA		irritation to eyes, respiratory system, central nervous system, depression
Ethylbenzene	8.76	111	100 ppm	800 ppm	1.0-6.7	0.25-200		irritation to eyes, muscle membranes, headache, dermatitis, narcosis, coma
Hydrochloric acid	NA	NA	NA	NA	NC	NA		inflammation of the nose, throat, laryngeal, coughing, burns throat, choking, burns eyes, skin, dermatitis

Table 2-2
Chemical Exposure Limits and Characteristics

Chemical	IP(a)	OVA (b) relative response percent	TLV (c) 8-hour TWA	IDLH (d) level	Flammable range percent	Odor threshold, ppm	Notes (e)	Potential symptoms of exposure (f)
Hydroquinone	7.95	NA	2 mg/m^3	50 mg/m^3	unknown, combustible solid	NA		irritation to eyes, conjunctivitis, keratitis, central nervous system, excitement, colored urine, nausea, dizziness, suffocation, rapid breathing, muscle twitching, delirium, collapse
Methenal	10.8	10	200 ppm	6000 ppm	6-36	NA		irritation to eyes, headache, drowsiness, lightheadedness, nausea, vomiting, visual disturbance, blindness
Methyl ethyl ketone	NA	80	200 ppm	NE	unknown	NA		irritation to nose, eyes, headache, drowsiness, light-headedness, frostbite
Methylene chloride	11.3	84	50 ppm	2300 ppm	13-23	NA	C, 65	fatigue, weakness, sleeplessness, light headedness, numb limbs, tingling, nausea, irritation to eyes and skin
Naptha	NA	0.13	10 ppm	1000 ppm	unknown	NA		light headedness, drowsiness, irritation to eyes, nose, skin, dermatitis
Phosphoric acid	NA	NA	1 mg/m^3	1000 mg/m^3 (246 ppm)	NC	NA		irritation to upper respiratory tract, irritation to eyes, skin, burns skin, burns eyes, dermatitis
Potassium bichromate	NA	NA	NA	NA	unknown	NA		No exposure symptom information available
Potassium bromide	NA	NA	NA	NA	unknown	NA		CNS depression, mental deterioration, achey
Potassium hydroxide	NA	NA	NA	NE	NC	NA		burns to skin, mucous membranes and eyes, erythmea, pulmonary edema, pneumontitis
Sodium carbonate	NA	NA	NA	NA	NC	NA		irritation to mucous membranes, coughing, shortness of breath, perforation of the nasal septum

Table 2-2
Chemical Exposure Limits and Characteristics

Chemical	IP(a)	OVA (b) relative response percent	TLV (c) 8-hour TWA	IDLH (d) level	Flammable range percent	Odor threshold, ppm	Notes (e)	Potential symptoms of exposure (f)
Sodium hydroxide	NA	NA	NA	10 mg/m^3	NC	NA		irritation to nose, pneuitis, burns eyes, skin, temp. loss of hair
Sodium hypochlorite	NA	NA	NA	NA	unknown	NA		irritation to skin, ingestion may cause mucous membrane corrosion, esophageal perforation, gastric perforation laryngeal edema, inhalation bronchial irritation, pulmonary edema
Sodium orthosilicate	NA	NA	NA	NA	NC	NA		irritation to skin, mucous membranes, vomiting, diarrhea
Stoddard solvent	NA	approx 40	100 ppm	20,000 mg/m^3	unknown	NA		irritation to eyes, nose, throat, dizziness, dermatitis
Sulfur trioxide chlorosulforic acid	NA	NA	NA	NA	unknown	NA		irritation and corrosive to mucous membranes, coughing, choking
Sulfuric acid	NA	NA	1mg/m^3	15 mg/m^3	NC	NA		irritation to eyes, nose, throat, pulmonary edema, bronchitis,
Tetrachloroethene	9.32	68	25 ppm	150 ppm	NC	NA	C,65	irritation to eyes, nose, throat, nausea, flush face and neck, vertigo, dizziness, incoherance, headache, somnolence, skin erythema, liver damage
Titanium tetrachloride	NA	NA	NA	NA	unknown	NA		irritation to eyes and respiratory tract
Toluene	8.82	126	50 ppm	500 ppm	1.2-7.1	0.17-40		fatigue, weakness, confusion, euphoria, dizziness, headache, dialated pupils, lassitude, nervousness, muscle fatigue, insomnia, paresthesia, dermatitis
Trichloroethene	9.5	54	50 ppm	1000 ppm	8-10.5	NA	C,65	headache, vertigo, visual disturbance, tremors, somnolence, nausia, vomiting, irritation to eyes, dermatitis, cardiac arrhythmias, parasthesia

Table 2-2
Chemical Exposure Limits and Characteristics

Chemical	IP(a)	OVA (b) relative response percent	TLV (c) 8-hour TWA	IDLH (d) level	Flammable range percent	Odor threshold, ppm	Notes (e)	Potential symptoms of exposure (f)
Tri-sodium phosphate	NA	NA	NA	NA	unknown	NA		No exposure symptom information available
White phosphorus	NA	NA	0.02 ppm	5 mg/m^3	unknown, flammible solid	NA		irritation to eyes, respiratory tract, abdominal pain, nausea, jaundice, anemia, cachexia, dental pain, excess salivation, jaw pain, swelling, burns to skin and eyes
Xylene	8.56	111	100 ppm	900 ppm	1.0-7.0	0.05-200		dizziness, drowsiness, excitement, incoherence, staggard gait, irritation to eyes, nose, throat, corneal vacuolization, anorexia, nausia, vomiting, abdominal pain, dermatitis
Metals								
Antimony	NA	NA	0.5 mg/m^3	50 mg/m^3	NC	NA		irritation to nose, throat, mouth, coughing, dizziness, headache, nausea, vomiting, diarrhea, stomach cramps, insomnia, anorexia, irritation to skin, unable to smell properly, cardiac abnormalities in antimony trichloride exposures
Arsenic	NA	NA	0.01 mg/m^3	5 mg/m^3	NC	NA	C,65	ulceration of the nasal septum, dermatitis, gastro-intestinal disturbance, periphreal neuropathy, respiratory irritation, hyperpigmentation of the skin

Table 2-2
Chemical Exposure Limits and Characteristics

Chemical	IP(a)	OVA (b) relative response percent	TLV (c) 8-hour TWA	IDLH (d) level	Flammable range percent	Odor threshold, ppm	Notes (e)	Potential symptoms of exposure (f)
Cadmium	NA	NA	0.01 mg/m^3	9 mg/m^3	NC	NA	C,65	pulmonary edema, dyspnea, coughing, chest tightness, substernal pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, anosmia, emphysema, protienuria, mild anemia
Chromium	(g)	NA	0.5 mg/m^3	25 mg/m3	NC	NA	65	histologic fibrosis of the lungs, lung cancer, nexochrome; ulceration and perforation of the nasal septum
Copper	NA	NA	1 mg/m^3	100 mg/m^3	NC	NA		irritation to nasal and mucous membrane, pharynx, nasal perforation, irritation to eye, metallic taste, dermatitis
Cyanide	NA	NA	NA	NA	unknown	NA		ashpyxia and death can occur, weakness, headache, confusion, nausea, vomiting, increased rate of respiration, slow-gasping respiration, irritation to eyes, skin
Lead	NA	NA	0.05 mg/m^3	3100 mg/m3	NC	NA	65	weakness, lassitude, insomnia, facial pallor, pal eye, anorexia, low weight, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, paralysis of the wrists and ankles, encephalopathy, nephropathy, irritation to eyes, hypotension

Table 2-2
Chemical Exposure Limits and Characteristics

Chemical	IP(a)	OVA (b) relative response percent	TLV (c) 8-hour TWA	IDLH (d) level	Flammable range percent	Odor threshold, ppm	Notes (e)	Potential symptoms of exposure (f)
Nickel	NA	NA	1 mg/m^3	10 mg/m^3	unknown combustible solid	NA		headache, vertigo, nausea, vomiting, epigastric pain, subsernal pain, coughing, hyperpnea, cyanosis, weakness, leukocytosis, pneuitis, delirium, convulsions
Silver	NA	NA	0.1 mg/m^3	10 mg/m^3	NC	NA		blue-gray eyes, nasal septum, throat skin, irritaiton to skin, ulceration, gastro-intestinal disturbance
Zinc	NA	NA	NA	NA	unknown	NA		(as zinc chloride fumes) conjunctivitis, irritation to nose, throat, coughing, copious sputum, dyspnia, chest pain, pulmonary edema, bronchopneumonia, pulmonary fibrosis, corpulmonale, fever, cyanosis, tachypnea, burns to skin, irritation to eyes, skin
Magnesium (MnO)	NA	NA	NA	750 mg/m^3	NC	NA		(magnesium oxide fumes) irritation to eyes, nose, metal fume fever, coughing, chest pain, flu-like fever
Pesticides								
Chlordane	NA	NA	0.5 mg/m^3	100 mg/m^3	NC	NA	C,65	blurred vision, confusion, ataxia, delerium, coughing, abdominal pain, nausea, vomiting, diarrhea, irritability, tremor, convulsions, anuria
DDT	NA	NA	1 mg/m^3	500 mg/m3	unknown combustible solid	NA	C,65	paresthesia toungue, lips, face, tremor, apprehension, dizziness, confusion, malaise, headache, fatigue, convulsions, paresis hands, vomiting, irritation of eyes and skin

Table 2-2
Chemical Exposure Limits and Characteristics

Chemical	IP(a)	OVA (b) relative response percent	TLV (c) 8-hour TWA	IDLH (d) level	Flammable range percent	Odor threshold, ppm	Notes (e)	Potential symptoms of exposure (f)
Dieldrin	NA	NA	0.25 mg/m^3	50 mg/m^3	NC	NA	C,65	headache, dizziness, nausea, vomiting, malaise, sweating, myoclonic limb jerks, clonic, tonic convulsions, coma
Lead arsenate		NA	0.15 mg/m^3			NA	65	fever, anorexia, napatometals, melanosis, cardiovascular failure, irritation to mucous membranes
Lime (CaC03)	NA	NA	10 mg/m^3	NE	NC	NA		no exposure information available
Lindane	NA	NA	0.5 mg/m^3	50 mg/m^3	NC	NA	65	irritation to eyes, nose throat, headache, nausea, clonic convulsions, respiratory difficulty, cyanosis, apalstic anemia, irritation to skin, muscle spasms
Nicotine sulfate (nicotine)	8.01	NA	0.5 mg/m^3	5 mg/m^3	0.7-4	NA		(nicotine) nausea, salivation, abdominal pain, vomiting, diarrhea, headache, dizziness, disturbance to hearing and vision, confusion, weakness, incoherence, paraxysmal artrial fibrilation, convulsions, dyspnea
Pentachlorophenol	NA	NA	0.5 mg/m^3	2.5 mg/m^3	NC	NA	65	irritation to eyes, nose, throat, sneezing, coughing, weakness, anorexia, low weight, sweating, headache, dizziness, nausea, vomiting, dyspnea, chest pain, high fever, dermatitis
Strychnine	NA	NA	0.15 mg/m^3	3 mg/m^3	unknown combustible solid	NA		stiff neck and facial muscles, restlessness, apprehesion, increased acuity of perseption, increased reflex excitablility, cyanosis, tetanic convulsions with opisthotonos
Sulfur dust (S02)	12.3	NA	2 ppm	100 ppm	NC	NA		irritation of skin and mucous membranes

Table 2-2
Chemical Exposure Limits and Characteristics

Chemical	IP(a)	OVA (b) relative response percent	TLV (c) 8-hour TWA	IDLH (d) level	Flammable range percent	Odor threshold, ppm	Notes (e)	Potential symptoms of exposure (f)
Warfarin	NA	NA	0.1 mg/m^3	100 mg/m^3	unknown combustible solid	NA		hematopoietic, back pain, hematoma in armsan legs, epistaxis, bleeding lips, hemmoraging of mucous membranes, abdominal pain, vomiting, fecal blood, petechial rash, abnormal hematologic indicies
Zinc phoshide	NA	NA	NA	NA	unknown	NA		no exposure information available
Herbicides								
Dioxin	NA	NA	unknown	NA	unknown	NA	C,65	irritation to eyes, allergic dermatitis, chlorache, gastrointestinal disturbances, possible reproductive toxicity, tesotogenic affects
Miscellaneous								
Mustard gas (CMW)	NA	NA	0.003 mg/m^3 (h)	NA	unknown	NA	65	irritation to eyes, skin respiratory tract, GI tract, and tissue damage
Lewisite (CWM)	NA	NA	0.003 mg/m^3 (h)	NA	unknown	NA		Immediate stinging pain. Acts as a systemic poison causing pulmonary edema, diarrhea, restlessness, weakness, subnormal temperature, and low blood pressure.
Polychlorinated biphenyls	NA	NA	0.5 mg/m^3	5 mg/m^3	NC	NA	C,65	nausea, lethargy, chloracne, dermal lesions, dec. pulmonary function, hepotic injury

Table 2-2
Chemical Exposure Limits and Characteristics

Chemical	IP(a)	OVA (b) relative response percent	TLV (c) 8-hour TWA	IDLH (d) level	Flammable range percent	Odor threshold, ppm	Notes (e)	Potential symptoms of exposure (f)

(a) Ionization potential in electron-volts(eV).

(b) Century Organic Vapor Analyzer relative response to the compound in percent with methane calibration.

(c) Threshold Limit Value as the airborne 8-hour time-weighted average (TWA) established by the American Conference of Governmental Industrial Hygienist (ACGIH), 1997.

(d) Immediately Dangerous to Life or Health level as published in the National Institute for Occupational Safety and Health (NIOSH), Pocket Guide to Chemical Hazards, 1994 edition.

(e) Hazard category; C-known or suspected Carcinogen; 65 – Proposition 65 chemicals known to the State of California to cause cancer or reproductive harm.

(f) Sources: NIOSH Pocket Guide to Chemical Hazards, June, 1994; Amdur, Mar, O; Doull, John; Klaassen, Curtis, D., Toxicology, The Basic Science of Poisons, fourth Edition, 1993; and Merk & Co. Inc. The Merk Index, 1996.

(g) IP varies with chromium compound

(h) Source: DA Pam 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustarh H, HD, HT, and L.

Notes:
NC = Noncombustible
NA = Not applicable or not available
NF = Non-flammable
NE = Not established

Area M and Area S contain the Exxon Refinery. It is anticipated that work as part of Benicia Arsenal Investigation will not occur on the Exxon Refinery. However, some work may be conducted on adjacent properties. As a result, all personnel will be familiar with emergency warnings and procedures associated with the refinery.

The following are brief descriptions of physical hazards that may be encountered during field activities at the Arsenal.

2.3 Heavy Equipment

Drill rigs, cone penetrometer testing (CPT) rigs, direct push technology (DPT) rigs, development rigs, backhoes, cranes are examples of heavy equipment that may be utilized during site activities. Caution shall be maintained at all times when working around heavy equipment to avoid injury or death from tip over, dropped loads, collision with vehicle or equipment, or being caught in the swing radius or in moving parts. Construction Safety procedures are detailed in the Forsgren/BC H&S Program Manual (500; p. 1-44).

2.4 Slips, Trips, Falls, and Ergonomics

Uneven ground will be encountered during some activities at the site. The risk of injury due to slips, trips, and falls will be increased in areas of uneven ground. Extreme caution is advised if it becomes necessary to walk in areas of uneven ground or in areas where open ventilation shafts are located. Lifting and repetitive tasks will be evaluated prior to the start of the project and engineering controls or worker assistance and training provided as necessary.

2.5 Noise

Noise is a potential hazard when working with heavy equipment including drill rigs, power tools, pumps or generators. When noise levels reach or exceed 85 decibels (DBA), as established by the (OSHA), hearing protection must be used. The SSO will monitor noise levels throughout each shift. A sound level meter will be used the first day of fieldwork where there is heavy equipment operating, to establish zones within which hearing protection should be worn. Based on this monitoring, criteria will be developed for requiring hearing protection. For example: either 25-30 feet around the equipment or everyone within the work zone.

2.6 Utilities

When using heavy equipment including drill rigs, the most deadly hazards encountered are underground and overhead utility lines. Within 48 hours prior to commencing work a utility locator service will be notified. Additional means to locate underground

utilities will be used if it is believed that the locator service was incomplete. High voltage power lines should be identified prior to commencing work. A minimum of 20 feet clearance shall be maintained in all vertical and horizontal directions from all energized power lines. Additional information regarding electrical hazards can be found in the Forsgren/BC H&S Program Manual (206;p. 28-34).

2.7 Trenching/Excavating

OSHA regulations apply to all open excavations, which includes trenches. No one is to enter a trench or excavation that is over 4 feet deep without proper access, such as with ladders, ramps, or stairs. There should be no more than 25 feet lateral distance between an employee location and the nearest means of exit from a trench. Be aware that the possibility of an oxygen-deficient or hazardous atmosphere could exist or occur in excavations, especially when excavating in industrial or historically contaminated areas. A trench could be a confined space where gases heavier than air can collect.

A means of protection from cave-ins must be provided for all employees working in an excavation or trench. This protection may be accomplished by sloping or benching the sides, or by installing a support system, such as shoring. No one is to enter a trench or excavation which is four feet or greater in depth unless a means of protection from cave-ins is in place.

No one is to work in excavations where there is an accumulation of water or where water is seeping in. Adequate precautions must be taken to remove water and prevent accumulation.

For trenching operations a trained, competent person will be on site to provide guidance with trenching conditions and protective measures.

2.8 Sunburn

Working outdoors with the skin unprotected for extended periods of time can cause sunburn to the skin. Excessive exposure to sunlight is associated with the development of skin cancer. Field staff should take precautions to prevent sunburn by using sunscreen lotion and/or wearing hats and long-sleeved garments. Sunscreen will be provided to personnel on-site.

2.9 Unexploded Ordnance

There is a possibility, based on historical usage, that some of the sites at the Arsenal may contain UXO. The USACE will conduct a surface and subsurface clearance by qualified explosive ordnance disposal (EOD) personnel prior to excavation or drilling work, if the presence of a UXO is suspected. Work will be suspended, the area evacuated, and

the USACE notified immediately if the presence of a UXO is suspected. If presence of UXO is confirmed, Benicia Police Department must be notified immediately.

Although Chemical Warfare Materials (CWM) have been stored and transported through the arsenal, there is no evidence that these materials were spilled, inappropriately handled, or misused in any way. Therefore, they are not included in the list of COPC or considered as a hazard at this time. However, as additional information becomes available, CWM may be added to the list of COPC in the future.

2.10 Biological Hazards

Biological hazards are generally not anticipated because most of the fieldwork will be performed in and around buildings. However, if conditions indicate that biological hazards may exist such as an infestation of insects, mold or animal droppings, the Health and Safety staff will be contacted to determine the appropriate control measure prior to proceeding with work. For example: bird droppings may carry disease agents and deer mice droppings may contain the hanta virus, which only qualified personnel should handle.

2.10.1 Insects. During field work at this site, personnel may encounter a wide variety of insects including bees, mosquitoes, ticks, and spiders. Field personnel are encouraged to use insect repellent when mosquitoes are present.

Stings of bees and wasps may cause serious allergic reactions in certain individuals. The SSO should identify all personnel with known insect allergies or sensitivities before field work begins.

Ticks and other parasites that feed on the blood of an animal/human host can carry several severe diseases. Effects from bites of ticks and other parasites range from minor, several days of fever and pain, and the worst causing brain damage.

Spider bites can be extremely serious, e.g., those of the black widow. Others are unpleasant or uncomfortable, resulting in rashes, itching, and possible infection. The possibility of allergies greatly increases the danger since people are not usually aware of such allergies until they have been bitten. Therefore, spiders should be regarded as potentially hazardous.

2.10.2 Snakes. Poisonous snakes may be encountered on-site. Personnel should check for snakes before walking through grassy or debris-strewn areas. The most common poisonous snake in the Northern California region is the Western Diamondback Rattlesnake. If bitten by a poisonous snake, wash the bite area with

soap and water, immobilize the bitten area and keep it lower than the heart, and seek medical attention immediately. Try to identify the snake so that the appropriate treatment can be administered at the medical facility.

2.10.3 Other animals. Chipmunks, ground squirrels, rats, and other mammals have been known to harbor fleas carrying bubonic plague. Their bites can also transmit rabies and other infections. Chipmunk-like animals pose a special problem because people tend to try to feed them or pet them, the increased contact bringing greater possibility of danger. Avoid wildlife when possible.

2.10.4 Microorganisms. Microbial action may be active within animal fecal matter. Some of these microorganisms may be capable of causing infection. Personnel sustaining lacerations or punctures from objects in the fecal matter are at particular risk of infection. All personnel should have a current tetanus shot.

2.10.5 Poisonous Plants. Poison Ivy, Poison Oak, and stinging nettle are common poisonous plants in the Arsenal area. Many of the work areas will be in commercial or populated areas, where native plants do not grow. However, in rural parts of the Arsenal these plants may grow. In general, these plants are irritants. They cause skin irritation. Poison Oak or Poison Ivy usually can cause more severe reactions, such as itching, burning, redness, and blisters. Avoid touching these plants, symptoms and physical reaction can be different to each person.

To treat Poison Ivy victims, first remove all contaminated clothing or footwear, and clean it carefully without direct skin contact. Residual plant oils on clothing can easily recontaminate unless it is thoroughly washed.

Next, wash all affected skin with strong soap and water, followed by rubbing alcohol. Antihistamine first-aid creams are often helpful, and a tincture (extract in alcohol) of calendula is also said to relieve the itching.

2.10.6 Radioactivity. Although radioactive source materials (probably used in calibration of equipment) may have been stored in small quantities in one of the igloos in Area S, there is no evidence that these materials were spilled, inappropriately handled, or misused in any way. Therefore, radionuclides are not considered a chemical hazard at this time. However, as additional information becomes available, radionuclides may be added to the list of COPC.

2.11 Heat Stress

The potential for heat stress is a concern when field activities are performed on warm, sunny days and is accentuated when chemical protective clothing is worn. Heat stress prevention measures and monitoring will be implemented if site temperatures are above 70 degrees Fahrenheit (F). Two critical illnesses, if not recognized and treated immediately, can become life-threatening. These are heat exhaustion and heat stroke. Heat exhaustion will result if prevention measures are not implemented. Ignoring the signs or symptoms of heat exhaustion will lead to the development of heat stroke.

The signs and symptoms of heat exhaustion are headache; dizziness, nausea; weakness; fainting; profuse sweating; loss of appetite; approximately normal body temperature; dilated pupils; weak and rapid pulse; shallow and rapid breathing; possible cramps in the abdomen and extremities; possible vomiting; difficulty walking; cool and sweaty skin to the touch; pale to ashen gray coloring.

First aid for heat exhaustion is as follows:

1. Immediately remove victim to the support area; if you are the victim, go to the support area.
2. Decontaminate, if practical, before entering support area.
3. Start cooling, but be careful not to cause a chill (i.e., rest in shade and apply wet towel to forehead; open up and/or remove clothing as much as practical, especially chemical-resistant clothing).
4. Drink cool water slowly, but only if conscious and not in shock.
5. If vomiting, and/or the signs and symptoms are not lessening within an hour, call for emergency help and/or transport the victim to emergency room.
6. It is likely that a heat exhaustion victim will be unable to work for the remainder of the day.

2.11.1 Heat Stroke (aka sun stroke). The signs and symptoms of heat stroke are **hot, dry skin to the touch with reddish coloring**; body temperature >105 degrees F; no sweating; mental confusion; deep, rapid breathing that sounds like snoring progressing to shallow, weak breathing; headache; dizziness; nausea; vomiting; weakness; dry mouth; convulsions; muscular twitching; sudden collapse and possible unconsciousness.

First aid for heat stroke is as follows:

1. Immediately remove the victim to the support area; prior to entering the support area, remove and dispose the victim's chemical-resistant clothing.

2. Cool the victim rapidly using whatever means are available, such as shade, opening up and/or removing clothing, soaking clothing/skin with water and fanning, placing victim in vehicle using air conditioning on maximum.

3. Do not give drinking water to victim.

4. Treat for shock, if needed.

5. Transport the victim to the emergency room or call for emergency help; no exceptions for heat stroke victim.

Precautions to prevent heat stress include work rest cycles, drinking water, and control devices. A work rest cycle of 1 hour work and 15 minutes rest is recommended when the heat stress hazard is high. Drink two 8-ounce glasses of water before work begins and during each rest period. Control devices include shading the work area, if possible, and wearing cooling vests if the potential for heat stress is high. Additional precautions to prevent heat stress are described in the Forsgren/BC H&S Program Manual (201; p.1-5).

2.12 Cold Stress

The potential for cold stress is a particular concern when field activities are performed while air temperatures at the site are below 40 degrees F. It is not anticipated that field work will occur during cold weather conditions. However, precautions that will be taken to prevent cold stress include wearing cold-protective clothing appropriate for the level of cold and the physical activity, changing underclothing if it becomes wet, and establishing a work/warming regimen. Detailed information regarding cold stress can be found in the Forsgren/BC H&S Program Manual (202; p. 6-10).

2.0 Hazard Analysis

3.0 Training Requirements

3.0 TRAINING REQUIREMENTS

All BC staff working on-site will have completed training in hazard recognition and basic health and safety issues as required by the occupational safety and health regulations contained in 29 CFR 1910.120. The SSO will have completed the 8-hour Site Supervisor course, have current training in first aid and CPR, and any additional training appropriate to the level of site hazards. Before fieldwork begins, all field personnel, including subcontractor employees, must be briefed on their work assignments and safety procedures contained in this document. Each person must be provided with and read a copy of this Benicia Arsenal General SSHP. No person shall be allowed to enter the work area until they have signed a Site Safety & Health Plan Employee Acknowledgement provided as Attachment A. If site specific training is required, it will be addressed in the site-specific SSHP.

4.0 Personal Protective Equipment

4.0 PERSONAL PROTECTIVE EQUIPMENT

On the basis of the hazard analysis for this project, the following Levels of Protection will be required and used. Changes to these specified items of PPE for each Level of Protection will not be made without the approval of the SSO.

The minimum required level of personal protection on the site at all times is level D. Level D consists of hard hat, safety glasses, steel-toed boots. Colored Tyvek coveralls should be used for protection against potential hazards (contaminated materials, spills, etc.). Hearing protection will be worn if, at any time, verbal communication becomes difficult to comprehend within a radius of three feet. Hard hats, safety glasses, and safety shoes must meet American National Standards Institute (ANSI) approval. Contact lenses are permitted if goggles are worn.

If level C protection is required, it will consist of Level D protection listed above, plus nitrile gloves and liners, chemical-resistant safety boots, and half or full face respirator with cartridges that are appropriate for the COPC. Contact lenses are permitted in Level C protection (with a full-face respirator) or higher. If at any time throughout this job, there is a potential for increased exposure to personnel, the appropriate upgrade of PPE will be required. Use of Level A and B PPE is not anticipated.

5.0 Environmental Monitoring Plan

5.0 ENVIRONMENTAL MONITORING PLAN

Identification of potential hazards in the hazard analysis portion of this Benicia Arsenal General SSHP indicated the following need for initial and/or ongoing monitoring for assessment of exposure to the hazards as follows.

5.1 Air Monitoring

The direct-reading instrument that will be used to monitor air quality in and around the work area is the Organic Vapor Monitor (OVM). The OVM measures the total organic vapors present in the ambient air. For health and safety purposes, total organic vapors detected will generally be used to confirm the selection of protective equipment. At a minimum, the OVM will be calibrated or checked prior to each day's activities and at the end of each day's activities according to the manufacturers specifications.

Air monitoring for background levels of air contamination upwind of the project will be performed prior to the start of field activities. Monitoring with the OVM will be based on tasks and exposure potential of each project site. If at any time the OVM reading exceeds the action levels in the Site Specific SSHP, action will be taken as directed in the Site Specific SSHP up to and including suspension of work.

5.2 Combustible Gas/Oxygen/ Hydrogen Sulfide (H_2S) Monitoring

Explosive concentrations of air contaminants may be encountered during drilling in former landfills, drilling in areas where free product (e.g., fuels, solvent, etc.) is present, or working near sewer lines and sewer discharge joints. During these activities, the SSO will monitor the work area to detect, measure, and document any explosive contaminant concentrations.

Hydrogen sulfide (H_2S) will also be measured due to its potential occurrence in landfills and sewers. A direct reading combustible gas/oxygen/H_2S meter will be used to monitor air quality with potentially explosive conditions. Specific monitoring for this instrument will be described in each site specific SSHP.

5.3 Direct Reading Detector Tubes

A Dräger detector tube (DT) kit shall be available to determine airborne concentrations of specific contaminants during work activities where the OVM/combustible gas indicator (CGI) is used. Detector tubes will be available for:

- Benzene
- Dichloroethylene
- Trichloroethene
- Vinyl chloride; and
- Cyanide

These measurements will be collected in the general work area and in the worker breathing zone as a means of speciating airborne concentration of VOCs measured by the OVM.

5.4 Airborne Particulate Monitoring

BC personnel are not required to monitor for airborne particulate on a routine basis. However, if field activities begin to generate visible levels of airborne particulate, personnel will be required to don a half-face air-purifying respirator equipped with an organic vapor/HEPA cartridge. If work activities generate prolonged airborne dust concentrations, the SSO will arrange for measurements with a Mini-Ram airborne particulate monitor.

5.5 Personnel Monitoring

Personnel exposure monitoring should be performed as often as necessary and wherever necessary to protect field personnel from hazardous concentrations of organic vapors. Monitoring must be performed by individuals trained in the calibrations, use and care of the required instruments.

Toxicity action levels are considerably lower than explosivity action levels. Therefore, initial and periodic monitoring should be conducted with the OVM. Monitoring shall be conducted in the worker's breathing zone, which is a 1 foot diameter sphere surrounding the worker's head. The alarm on this instrument should be set to sound at the action level. If vapors are measured continuously and the instrument must be unattended, the detector inlet should be located as close to the worker's breathing zone as possible. Decisions regarding respirator use should be based on breathing zone vapor concentrations of personnel expected to have the greatest exposures. Particular effort should be made to monitor personnel exposures while trenching, boring or tank inerting progresses.

Explosivity monitoring should be continuous, with the detector set at a location near and downwind of the source of emission. Additional monitoring with the CGI should be performed when organic vapor concentrations exceed the ppm range of the PID or FID instrument. If the alarm sounds while continuously monitoring with a CGI, initiate shut-down and evacuation procedures immediately.

Personnel shall measure the percent LEL and the hydrogen sulfide (H_2S) concentration when opening manholes or sewer vents. If the reading exceeds 10 percent of the LEL or H_2S>10 ppm,

personnel shall cease operations and contact the on-shift Health and Safety Supervisor for instructions.

5.6 Heat or Cold Stress

Heat or cold stress will be monitored as necessary as described in the hazard analysis portion of this Benicia Arsenal General SSHP. A thermometer (measuring in degrees F) will be maintained in a shady area when the ambient air temperature is 70 degrees F or higher.

6.0 Medical Surveillance Requirements

6.0 MEDICAL SURVEILLANCE REQUIREMENTS

Medical surveillance is conducted as a routine program for BC field staff in accordance with the requirements of 29 CFR 1910.120(f). If special medical tests or examinations are required for staff involved with a specific site, those tests will be discussed in the Site Specific SSHP.

All subcontractor personnel directly involved with the field activities must also meet the medical surveillance requirements of 29 CFR 1910.120(f).

7.0 Site Control Measures

7.0 SITE CONTROL MEASURES

Work zones will be delineated using traffic cones and, if necessary, caution tape in a 25-foot radius around the work area. This is only a guideline as field conditions will dictate the actual size of the work zone (work zone would be smaller when working along a street for example). Since most of the sampling activities will be conducted in Level D PPE, and in generally public areas, specific exclusion zones, decontamination zones and support zones will not be established. Site control such as caution tape etc. will still be used when appropriate for protection of the public.

All excavations will be delineated with caution tape, temporary fencing or other means to prevent accidental entry by the general public p.25-28).

Further details regarding site control measures can be found in the Forsgren/BC H&S Program Manual (406; p. 4-25-4-28)

7.1 Hazard Communication

Communication between field team members will consist of verbal and telephone (standard or cellular) communication.

The Exxon refinery is located within the Arsenal boundaries. There is a potential that work will take place on properties adjacent or near the refinery. The refinery has a specific hazard communication plan for its workers. In the event field personnel hear horns, Table 7-1 summarizes the purpose of the sound and action to be taken by field personnel.

Table 7-1

Exxon Refinery Emergency Horn Signals

Horn Signal	Reason	Action by Field Personnel
4 to 5 second blasts of horn	Fire in refinery	STOP WORK. Turn off all motorized equipment. Evacuate area – move upwind of the site of emergency. Call SSO and PjM.
1 second blast of horn	Toxic Gas Release	STOP WORK. Turn off all motorized equipment. Evacuate area – move upwind of the site of emergency. Call SSO and PjM.
1 long blast	"All Clear"	Return to work

Note: The Toxic Gas alarm will continue until the emergency condition is under control or the Exxon Incident Commander orders that the horns be silenced.

Always evaluate the wind direction and travel crosswind until clear of the hazard and then travel upwind to a safe area.

8.0 Work Practices

8.0 WORK PRACTICES

Safe work practices are part of ensuring a safe and healthful working environment. These practices are standardized for all field activities, and it is the responsibility of BC employees to follow safe work practices when conducting field activities. Safe work practices to be employed during the entire progress of field work are as follows:

1. Set up, assemble, and check out all equipment for integrity and proper function before starting work activities.

2. Do not use faulty or suspect equipment.

3. Use only new and intact protective clothing. Change the suit, gloves, etc., if they tear.

4. Do not use hands to wipe sweat away from face. Use a clean towel or paper towels.

5. Practice contamination avoidance at all times.

6. Do not smoke, eat, drink, or apply cosmetics while in the contaminated areas of the site, or before decontamination.

7. Wash hands, face, and arms before taking rest breaks and lunch breaks and before leaving the site and the end of the work day.

8. Check in and out with the SSO upon arrival and departure from the site.

9. Perform decontamination procedures completely as required by this Benicia Arsenal General SSHP.

10. Notify the SSO immediately if there is an accident that causes an injury or illness.

11. Use the buddy system when working in the contaminated areas of the site.

12. Do no approach or enter an area where oxygen deficiency or toxic or explosive concentrations of airborne contaminants may exist without the proper PPE and appropriate support personnel.

13. Use respirators correctly and as required for the site; check the fit of the respirator with a negative or positive pressure test; do not wear respirator with facial hair or other

9.0 Decontamination

9.0 DECONTAMINATION

Decontamination will take place in an appropriate location within the established work zone. The decontamination station will be set up at the time the work zone is defined. A sample decontamination set-up can be found in the Forsgren/BC H&S Program Manual (405; p.23). All workers, PPE, sampling equipment, and heavy equipment leaving the work zone will be decontaminated, as necessary, to prevent the spread of hazardous materials. For work activities in which workers come in direct contact (i.e. personal clothing) with contaminated material. All workers will wash hands, arms, and face after removing PPE and before leaving the site. The decontamination station will include: glove/boot wash station, PPE disposal containers, potable water, and rest area. The temporary decontamination line should provide sufficient space to wash and rinse boots, gloves, and all sampling equipment prior to placing equipment into a vehicle. Disposable items will be bagged for disposal along with other hazardous wastes removed from property. Sampling equipment will be decontaminated using at least two 5-gallon buckets: one filled with a clean water and soap mixture (wash) and the other with clean deionized water (rinse). Support vehicles are to be left outside the work zone, when practical, so that decontamination of them will not be necessary. All contaminated parts of heavy equipment will be steam-cleaned before removal from the site. Wet-wipes can be used as an alternative decontamination procedure for low-potential dermal contact activities. There are no special emergency decontamination procedures anticipated for this project.

10.0 Emergency Procedures

10.0 EMERGENCY PROCEDURES

In the event of an emergency on-site, the SSO will direct the course of action. It may be necessary for the SSO to depend on the other on-site personnel for assistance. The SSO will call for emergency assistance if needed. As soon as practical, the SSO will contact the PjM and the HSD. All staff assigned to this project will be briefed on the procedures and responsibilities for implemented.

The nearest medical assistance center is **Kaiser Permanente Hospital** located at **975 Sereno Dr., Vallejo, CA** , telephone number: **(707)-651-1000.** General directions from the Arsenal to the nearest hospital are shown on the route to hospital map included in this document as Figure 10-1. Site-specific routes will be included in each FSIP.

The SSO is trained in first-aid and CPR. A first-aid kit and fire extinguisher will be located in the support vehicle on-site.

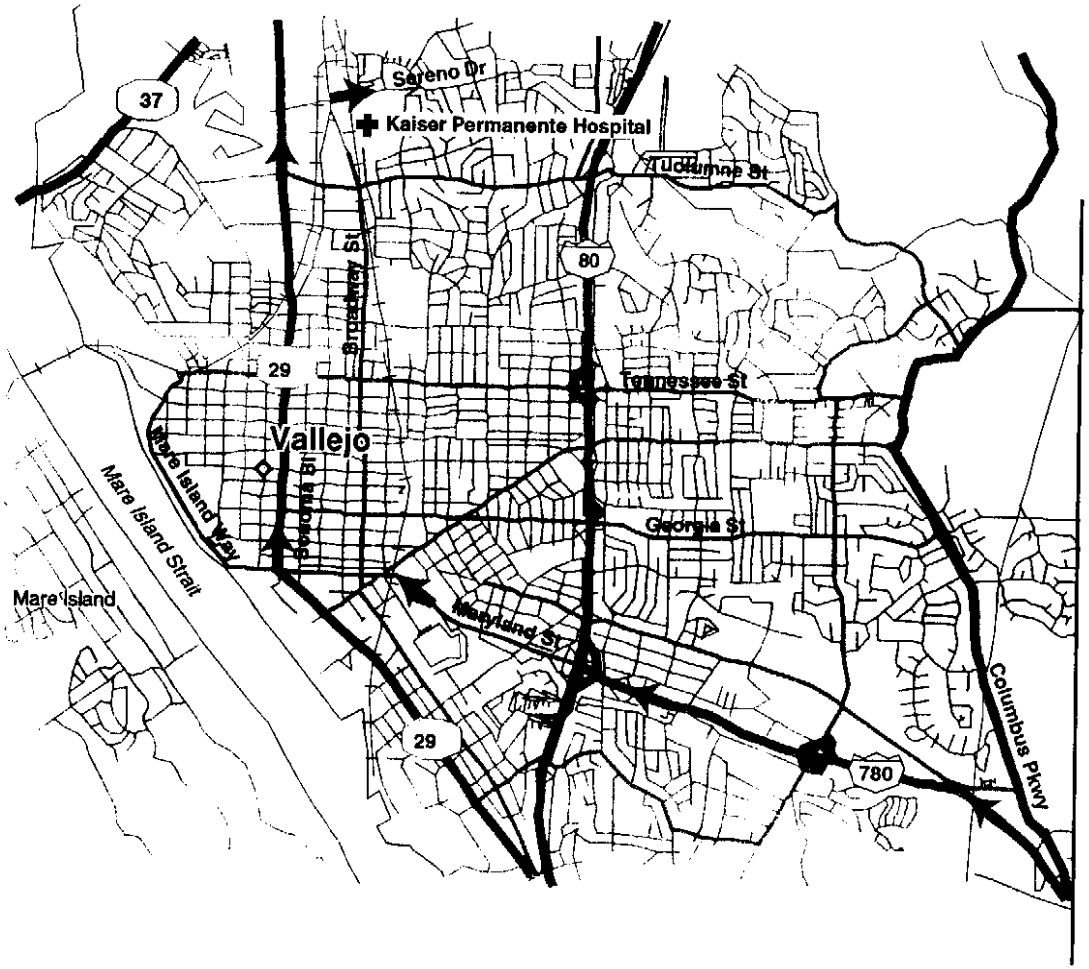
Equipment emergency shut-off switches will be identified, if so equipped, and all field personnel working in the area will be informed of its location and function during the site safety briefing.

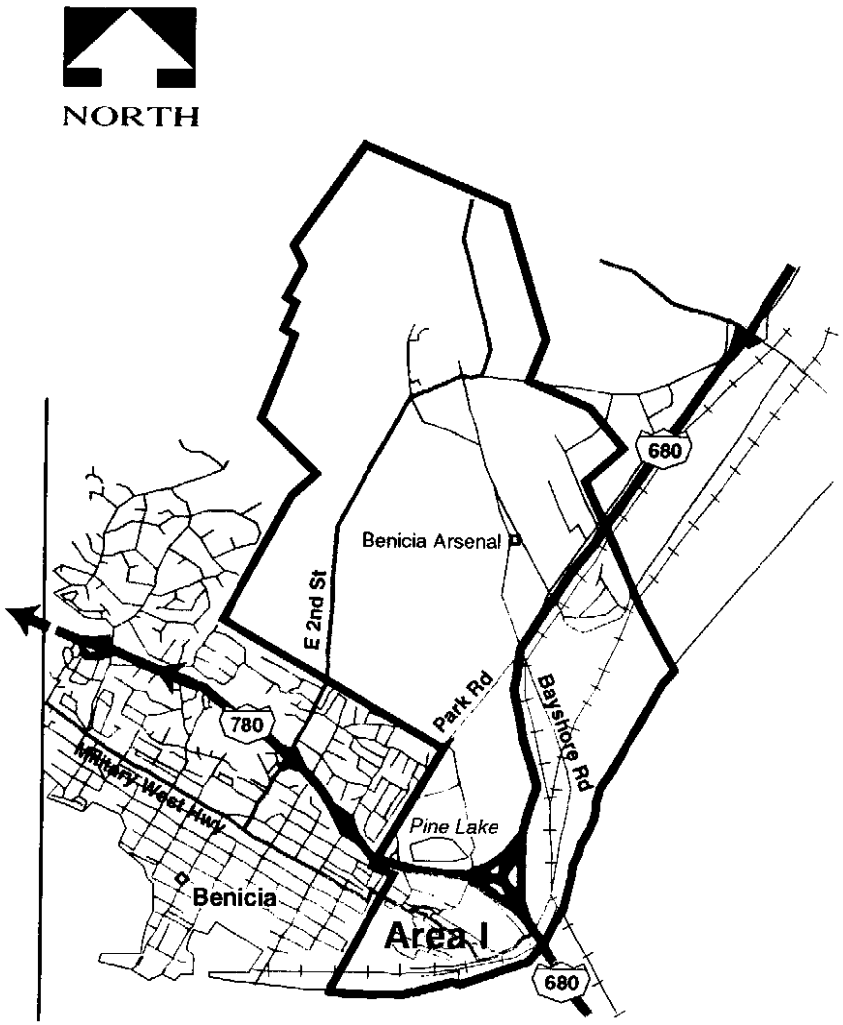
The nearest telephone is located in the support vehicle. The emergency telephone numbers to be used to call for assistance are listed in the section on Key Personnel and Responsibilities at the beginning of this document. **In the event of a medical emergency, dial 911 first.**

In the event of extraordinary emergency situations associated with natural disasters, technological incidents, and nuclear defense operations, both war and peacetime, the SSO will direct the course of action. The Benicia General Plan includes the City's Emergency Operations Plan (Plan). In this Plan, the major arterial streets would serve as the principal routes for evacuation of people north of the City. There are four potential emergencies in the Plan: 1) major fire, 2) major earthquake, 3) hazardous chemical incident, and 4) war emergency.

Major fire is a potential in Area R and Area S. A majority of these areas is grassland with some structures. Access into and out of Area R and Area S would be limited to one or two streets.

The Exxon Refinery, located in Area S and Area M, utilizes a substantial amount of automatic fire fighting equipment. They maintain a highly trained Industrial Fire Brigade and two fire stations associated with their facilities.





TRAVEL ON **I-780** WEST FOR APPROXIMATELY 5.4 MILES
CONTINUE WEST ONTO **MARYLAND STREET** FOR 1.6 MILES
RIGHT ON **SONOMA BOULEVARD** HEADING NORTH FOR 2.1 MILES
RIGHT ON **SERENO DRIVE** HEADING EAST FOR 0.4 MILES TO 975 SERENO DRIVE

TOTAL TRAVEL TIME TO **KAISER PERMANENTE HOSPITAL**
IS APPROXIMATELY 10 MILES TAKING 20 MINUTES.

SITE SPECIFIC ROUTES TO THE HOSPITAL ARE LOCATED IN EACH FSIP.

General Route to Hospital

General Site Safety and Health Plan
Benicia Arsenal
FIGURE 10-1

Earthquakes have occurred along fault zones in the area. Elevated structures such as bridges, freeways, overpasses, and buildings should be avoided in the event of an earthquake. Some of the oldest buildings are located in Area I and Area M, which may have the greatest potential to collapse. Access to the nearest medical assistance, Kaiser Permanente Hospital, may be impeded, if freeways are damaged during an earthquake.

There is a potential of exposure to toxic emissions of hazardous materials due to accidental releases at the Exxon Refinery or from trucks or railcars traveling through the area. Move all personnel up wind of the toxic emission.

Benicia could sustain damage from a wartime attack in the Bay Area. Depending on the nature of the war emergency the result could be physical damage to buildings and facilities and/or injury to persons. As with an earthquake, avoid all structures that may have the potential to collapse.

11.0 Documentation

11.0 DOCUMENTATION

The implementation of the SSHP must be documented to ensure employee participation and protection. In addition, the regulatory requirements must be met for recordkeeping on training, medical surveillance, injuries and illnesses, exposure monitoring, health risk information, and respirator fit-tests. Documentation of each employee's activities is maintained by the HSD in Pleasant Hill, California.

Documentation of the implementation of this plan will be accomplished using Attachments A through E. Attachment A must be completed by each BC employee at the initiation of field work for the project. The SSO is responsible for ensuring that each BC employee has completed this form and for submitting copies to the appropriate industrial hygienist. The SSO is also responsible for completing the other attachments as required for a specific project. Working copies of each of the attachments will be included with each FSIP/SSHP. Completed copies should be maintained in the project file.

Appendix A
Resumes

Industrial Hygienist

Anne K. Baptiste, JD, CIH

Assignment:
Expert Witness

Education:
J.D., Law, University of San Diego, California, 1994

M.P.H., Industrial Hygiene, University of Pittsburgh, Pennsylvania, 1977

B.S., Biology, Duquesne University, Pennsylvania, 1974

Certification
Industrial Hygienist, 1984

Attorney at Law, California, 1988

Lead in Construction (all aspects), 1996

AHERA Certified in Asbestos (all aspects)

Courses: Management Planner, Project Designer, Supervisor/Competent Person, and Building Inspector

40-Hour Hazwhoper/Supervisor Certified

Experience Summary

Anne Baptiste is an industrial hygienist with project management experience in environmental health and legal issues specializing in regulatory compliance, exposure assessment and training programs. She manages the development of cross-functional, geographically broad and diverse client programs in the interest of cost savings or reducing liability. Ms. Baptiste's project experience includes:

- OSHA Compliance and Defense
- Written Program Development Management/Employee/Union Training
- Exposure Monitoring
- Indoor Air Quality
- Asbestos/Lead/Hazwhoper Services
- Illness/Injury Fact-Finding
- Workplace Toxics
- Regulatory Tracking Interpretation
- Trial Preparation/Expert Witness

Industrial Hygiene, Health and Safety

- Practice leading edge industrial hygiene techniques in the areas of worker exposure monitoring, ergonomics, ventilation evaluations, indoor air quality services, unique environmental investigations and asbestos and lead services (surveys, operations and maintenance plans and demolition oversight).
- Develop and present training modules for a range of 27 OSHA topics annually to about 500 employees, management and union personnel.
- Conduct risk management compliance audits for a full range of employer size and type organizations.
- Provide employer OSHA citation defense as well as services to attorneys in cases involving workplace exposure scenarios.
- Oversee the Health & Safety aspect of bid specifications and EIR/EIS documents.
- Built an interoffice health and safety practice team from the ground level to $1-2 million project dollars per year.
- Provide legal services for environmental, health and safety employer citation defense as well as toxic tort and due diligence cases.
- Supervise the development of construction bid specification packages and contractor selection for demolition of buildings

containing hazardous materials and the construction of remediation systems.

- Perform workers' compensation investigations for claims or lawsuits. Services saved one company alone, more than $300,000 in insurance premiums.
- Provide legislative reviews (federal and state) for seminars and to assist company managers with regulatory planning.
- Perform indoor air quality and ergonomics services.
- Industry leader in developing and upgrading written programs for all major OSHA and Cal-OSHA mandatory standards.
- Performed ISO 9000 program implementation for a major manufacturer.
- Managed an industrial aerospace industrial hygiene, radiation and ergonomics programs for four plants and 10,000 employees for the cruise missile, DC-10 and Atlas/Centaur programs. Performed complex indoor air quality, composites, plating, ventilation, radiation, RF and noise exposure assessments.
- Developed and supervised all aspects of a hazardous waste health and safety program including the development of health and safety plans and Superfund site emergency response plans.
- Provided due diligence and Phase I Site Investigations for property transfers of aerospace plants, a chemical manufacturing plant, a full-service hospital, a firing range slated for residential development and a DOE plant.
- Performed industrial hygiene audits, sampling and engineering analysis of all Naval bases in San Diego as well as ship underway inspections.
- Developed the initial computerized Navywide occupational health data management system format.

Teaching Experience

Cal State Fullerton University, Instructor, "Forensic Aspects of Workplace Health and Safety," 1997.

Adjunct Professor for Graduate School of Public Health, San Diego State University, California, 1989 to present.

Adjunct Professor, National University, San Diego, California, 1989 to present.

Instructor, California Community College District, San Diego, California, 1980

Associate Geologist

Wendy J. Linck

Assignment

Project Geologist

Education

B.S., Geology, California State University, Sacramento, 1991

Training

40-Hour Training per OSHA 29 CFR 1910.120 and 8-hour refreshers

CPR and Standard First Aid

Site Safety Officer Training (16 hours including subcontractor management)

Exposure Monitoring and Protocols

Experience

7 years

Joined Firm

1991

Relevant Expertise

- Geologic and hydrogeologic investigations.
- Management of field activities.
- Risk-Based Corrective Actions.
- UST removals and investigations.
- Monitoring well installation and development.

Experience Summary

Wendy Linck's responsibilities include hydrogeologic, geologic, and geophysical interpretation; hydrologic modeling; Risk-Based Corrective Action analysis; remedial investigation reports; interpretation of subsurface data; budget and schedule control; staff coordination; and client and regulator communication. In addition, her hydrogeologic responsibilities include aquifer testing, aquifer test data interpretation, field oversight during aquifer testing, documentation, and groundwater modeling. Ms. Linck's field experience includes hollow stem and mud rotary drilling; cone penetration testing; geophysical logging; logging of core samples according to the Unified Soil and Unified Rock Classification Systems; depth discrete groundwater sampling with the Hydropunch®, BAT® and GeoProbe® technology; aquifer testing; single and multiple well constructions in single and multiple aquifer systems; soil gas sampling; exposure monitoring protocol and equipment; and specialized techniques in landfill drilling, monitoring, and sampling.

Hazardous Materials Site Investigation/Remediation

Benicia Arsenal Investigation, U.S. Army Corps of Engineers, Sacramento District, Benicia, California

Project Geologist. Ms. Linck's responsibilities include fieldwork coordination and supervision of Brown and Caldwell field staff and subcontractors. She will also have a lead role in collecting subsurface data as a field staff geologist, interpreting results from the fieldwork, and incorporating the data into the Department of Defense Groundwater Modeling System (GMS).

EPA Superfund CERCLA Site, McClellan Air Force Base Remedial Investigation/Feasibility Study for Operable Unit C, Sacramento, California

Project Geologist. Served as a subconsultant assisting prime consultant during three, 2-6-month-long Remedial Investigation/Feasibility Studies at McClellan Air Force Base. Responsibilities included drilling crew coordination and supervision; supervision, implementation, and documentation of site safety and hazard monitoring plan; supervision of geophysical magnetic surveying; logging of nearly 4,000 feet of core; collection of soil and soil gas samples; radiation surveying; and exposure monitoring for combustible gases, volatile organic compounds (including vinyl chloride), and alpha/beta and gamma radiation. Drilling conditions varied from landfills to native soils in protection levels from chemical and airborne hazards of Level C (half-face respirators) to Level D. Additional responsibilities included report preparation of site-specific investigations, radiological records search, data interpretation for contingency sampling

locations, laboratory field coordination, and field quality control. In-house training by prime consultant included exposure monitoring in landfills and alpha/beta and gamma radiation.

RI/FS, Confidential Client, San Diego, California

Project Geologist/Field Manager. Hydrogeologic and geologic investigation to interpret chlorinated contaminant transport in a multiple aquifer system. Interpreted hydrogeologic, geologic, and analytical data. Project included coordination with subcontractors (drilling and mobile analytical laboratory), field client personnel, and field activities (permitting and drilling oversight).

RI/FS, Confidential Client, Chico, California

Project Geologist/Field Manager. Hydrogeologic and geologic investigations to interpret contaminant transport. Interpreted hydrogeologic, geologic, geophysical, and analytical data. Field manager responsibilities included coordination with subcontractors and field activities, permitting, and drilling oversight. Other responsibilities included report preparation, safety plan implementation, and coordination with county and state regulators.

Municipal Airport TCE Remediation, City of Chico, California

Project Geologist. Start-up of existing groundwater and soil treatment systems for remediation of TCE plume. Services include 1 year operations and maintenance on both systems and biannual sampling of groundwater monitoring wells.

Service Station Investigations, Confidential Petroleum Company, California

Project Geologist. Projects involved several underground storage tank removals and investigations. Responsibilities included logging core, soil sampling, and coordinating with state, county, and city regulators. Additional responsibilities included budget and schedule management; coordination of site activities; staffing; report writing; and interpretation of analytical, geologic, and hydrogeologic data.

Service Station Investigations, Confidential Petroleum Company, California

Project Geologist. For several remedial and site investigations, responsibilities included logging core; soil sampling; coordinating with state, county, and city regulators; coordinating site activities; report writing; and interpreting analytical, geologic, and hydrogeologic data.

Site Investigation, Confidential Client, Sacramento, California

Project Geologist. Preliminary assessment of metal contamination. Responsibilities included soil sampling in Level B and C protection within a semi-confined space entry with conditions which had the potential to release hydrogen cyanide.

Hydrogeologic Evaluations

Hydrogeologic Assessment, Confidential Client, Chico, California
Project Geologist. Assessment of hydraulic and groundwater modeling parameters for a single aquifer groundwater simulation. Responsibilities included assessment of existing groundwater simulation (provided by another consultant) and then expanding on the existing model to included solute transport. Computer model used was FLOWPATH II™ by Waterloo Hydrogeologic of Ontario, Canada.

Hydrogeologic Assessment, Confidential Client, Phoenix, Arizona
Project Geologist. Assessment of hydraulic parameters for multiaquifer testing in fractured rock. Responsibilities included determining hydraulic properties from multiple pump tests within a single aquifer in fractured and unconsolidated alluvial sediments using computer modeling. Computer models used were WHIP™ by HYDRO GEO CHEM of Tuscon, Arizona, and AQTESOLV™ by Geraghty & Miller Modeling Group of Reston, Virginia.

Service Station Investigations, Confidential Petroleum Company, California
Project Geologist. Assessments of hydraulic properties for remediation designs. Responsibilities included conducting slug, constant, and variable rate aquifer tests; making preliminary estimates of hydraulic parameters in-field; estimating hydraulic properties using computer software; and preparing reports of estimated hydraulic properties.

Hydrogeologic Assessment, Confidential Client, Clear Creek, California
Project Geologist. Project involved determining hydrogeologic and hydrologic parameters. Responsibilities included supervision of subcontractor and recordkeeping during a 12-hour variable rate and a 24-hour constant rate aquifer test. Additional responsibilities included monitoring and downloading data from the multiple observation wells equipped with data loggers; developing primary field interpretations of hydraulic parameters; estimating the aquifer properties with computer software; and using those parameters to estimate the future effects of continued pumping in a multiple pumping well system.

State of California, Department of Toxic Substances Control/California EPA, Sacramento, California
Student Assistant. Designed and implemented a 3-dimensional, multiple pumping well, homogenous groundwater flow model using MODFLOW by McDonald and Harbaugh (1984) which encompassed the downtown region of Sacramento as the domain.

Risk-Based Corrective Action (RBCA)

Service Station Investigations, Confidential Petroleum Company, California

Project Geologist. Assessment of the protection of human health and the environment, and beneficial uses of groundwater according to the American Society for Testing and Materials RBCA decision-making process. Responsibilities included conducting RBCA evaluations and interpretation, implementation of modeling programs (SESOIL and GSI RBCA Tier 2 Toolkit), modeling output interpretation, and report writing.

Memberships

National Groundwater Association

Groundwater Resources Association of California

Association of Engineering Geologists

Publications/Presentations

"Preliminary Structural Analysis of the Rabbit Hill Roof Pendant" by W. Linck, et al, 1991 Abstracts with Programs, Geological Society of America, Volume 23, Number 2, March 1991.

"Regulatory Review of Complex Groundwater Flow Models Using Simplified Publicly Available Computer Models" by R. Buell, W. Linck, et al, 1991 Abstracts with Programs, Geological Society of America, Volume 23, Number 2, March 1991.

Honors

Achievement Award, awarded by Radian Corporation for outstanding work on McClellan Air Force Base project, February 1995

Field Service Technician

Paul Lopez

Assignment

Technician

Education

California State University, San Diego, 1983-86

California State University, Sacramento, 1988

Training

40-hour OSHA certified safety training

First Aid/CPR certified

Level C and D work experience

Over 6,000 hours field experience

Experience

5 years

Joined Firm

1992

Relevant Expertise

- Air, water, and soil sampling using EPA accepted methods.
- Troubleshooting and O&M for wide range of remediation systems.

Experience Summary

Paul Lopez is the lead environmental technician for the Sacramento office of Brown and Caldwell. Mr. Lopez is experienced in obtaining air, water, and soil samples for laboratory analysis using strict quality control measures. He is responsible for the operations and maintenance of several remediation systems. He also schedules, staffs, and implements several quarterly sampling programs.

Environmental Services

Mr. Lopez has performed extensive sampling work with air, water, and soil. He has performed stationary source sampling per a variety of facilities. He is familiar with U.S. EPA methods 1 through 5. He is trained in quality control, sampling, and decontamination techniques. He maintains and operates remediation systems such as Groundwater Pump and Treat Systems, Air Tower Stripper Systems, Catalytic Oxidizer Systems, Therm Oxidizer Systems, Bio-remediation Systems, and a new prototype Two-Phase Extraction System. In addition, he has the responsibility of managing the repair, maintenance, and replacement of field service equipment for the Sacramento Brown and Caldwell office. Mr. Lopez is a knowledgeable troubleshooter for electrical and mechanical remediation systems. He routinely supervises subcontractors, such as electrical, plumbing, and carbon exchange, in connection with maintenance of remedial systems.

Mr. Lopez is responsible for quarterly sampling at over 30 sites in Northern California. His responsibilities include maintaining proper documentation and coordinating transfer of sample data to the end users. He routinely samples shallow and deep (300 foot) wells using EPA accepted methods. Most recently, Mr. Lopez was one of two lead technicians responsible for the successful completion of a sampling program that included 365 wells at 47 locations in six weeks. Mr. Lopez's field experience is key to keeping sampling programs on schedule.

Appendix B
Attachments A through E

BROWN AND CALDWELL	Attachment A—Site Safety and Health Plan Acknowledgment

Employee Name		
Project Name	Project Location	Project Number

Statement of Acknowledgment/Emergency Information

I hereby certify that I have read and that I understand the safety and health guidelines contained in the Benicia Arsenal General Site Safety and Health Plan (SSHP) and the Site-Specific SSHP for the site named above.

Employee Name	Employee Signature	Emergency Info /Relationship	Phone Number
Employee Name	Employee Signature	Emergency Info /Relationship	Phone Number
Employee Name	Employee Signature	Emergency Info /Relationship	Phone Number
Employee Name	Employee Signature	Emergency Info /Relationship	Phone Number
Employee Name	Employee Signature	Emergency Info /Relationship	Phone Number
Employee Name	Employee Signature	Emergency Info /Relationship	Phone Number
Employee Name	Employee Signature	Emergency Info /Relationship	Phone Number

Name of Site Safety Officer Receiving This Form	
Signature of Site Safety Officer	Date

NOTE: Send completed form to Health and Safety Director.

BROWN AND CALDWELL	**Attachment B—Site Safety and Health Plan Site Activity and Safety Briefing**	
Name of Site Safety Officer	Signature of Site Safety Officer	
Project Name	Project Location	Project Number

Who attended the briefing?

Names of Brown and Caldwell Employees	**Names of Subcontractor(s) Employees**

What items were discussed?

- ☐ Site Safety and Health Plan
- ☐ Specific Accident/Incident
- ☐ Protective Equipment to be Used
- ☐ Emergency Hospital Route
- ☐ Other _____
- ☐ Hazardous Site Conditions/Activities
- ☐ Changes/Solutions to Specific Accident(s)
- ☐ Location of Emergency Telephone Number
- ☐ Work Schedule

Do any items require assistance from BC Health and Safety staff? (If yes, describe the item and type of assistance required and contact the Health and Safety staff directly.)

☐ YES ☐ NO

_____

_____

_____

_____

NOTE: Place a copy of the completed form in the project file.

BROWN AND CALDWELL	Attachment C—Site Safety and Health Plan Safety Plan Implementation Checklist	
Project Name	Project Location (city and state)	Date
Name of Site Safety Coordinator	Weather Conditions	Project Number

BC Staff Present

Name	Office
_____	_____
_____	_____
_____	_____
_____	_____

Indicate the status of each of the following:

1.	Is a copy of the Site Safety and Health Plan (SSHP) on site?	☐ YES	☐ NO ☐ N/A
2.	Is the personal protective equipment required by the SSHP available and being used correctly?	☐ YES	☐ NO ☐ N/A
3.	Have the work zones been delineated?	☐ YES	☐ NO ☐ N/A
4.	Has a decontamination station been set up as required by the SSHP?	☐ YES	☐ NO ☐ N/A
5.	Are the decontamination procedures being followed?	☐ YES	☐ NO ☐ N/A
6.	Is access to the exclusion zone being controlled?	☐ YES	☐ NO ☐ N/A
7.	Has the site activities briefing and tailgate safety meeting been provided?	☐ YES	☐ NO ☐ N/A
8.	Is the list of emergency telephone numbers posted at the support zone?	☐ YES	☐ NO ☐ N/A
9.	Are directions to nearest emergency medical assistance posted at support zone?	☐ YES	☐ NO ☐ N/A
10.	Is emergency equipment available and functional, as required by the SSHP?	☐ YES	☐ NO ☐ N/A
11.	Has the nearest toilet facility been identified or a portable facility been set up?	☐ YES	☐ NO ☐ N/A
12.	Has an adequate supply of drinking water been provided?	☐ YES	☐ NO ☐ N/A
13.	Has water for decontamination been provided?	☐ YES	☐ NO ☐ N/A
14.	Have the instruments for environmental and exposure monitoring been calibrated and set up as required by the SSHP?	☐ YES	☐ NO ☐ N/A
15.	Are the instruments being used properly and periodically checked during the shift for battery charge status?	☐ YES	☐ NO ☐ N/A
16.	Have the trenches and excavations been clearly marked?	☐ YES	☐ NO ☐ N/A
17.	Have trenches and excavations been shored or sloped as required by soil type and work activities?	☐ YES	☐ NO ☐ N/A
18.	Are dust suppression measures being used?	☐ YES	☐ NO ☐ N/A
19.	Is food and tobacco consumption being restricted to the support zone?	☐ YES	☐ NO ☐ N/A
20.	Has a confined space been identified as part of this project?	☐ YES	☐ NO ☐ N/A
21.	Are the confined space entry procedures being correctly implemented?	☐ YES	☐ NO ☐ N/A
22.	Has the work/rest cycle for the shift been established?	☐ YES	☐ NO ☐ N/A
	TIME ON (minutes): _____ TIME OFF (minutes): _____		
23.	Has a shaded rest area been set up in the support zone?	☐ YES	☐ NO ☐ N/A

NOTE: Place completed form in project file.

BROWN AND CALDWELL	**Attachment D** **Notice of Unsafe Conditions**

Contractor	Date
Project Name	Project Number

THIS NOTICE . . .

This notice is to advise you, the Prime Contractor on the above-named Contract, that this Representative of the Owner of the above-mentioned Project has observed (on the date shown above) an unsafe condition on the Project.

These conditions are listed as follows:

ITEM	CONDITION

By this Notice, the Owner or its Representatives shall not assume any responsibility under the GENERAL CONDITIONS or assume any liability for the existence or correction thereof, for the unsafe conditions, or any others that may have been unnoticed.

These conditions shall be remedied as soon as possible within a safe working period. If these corrections are not made, the Owner will be forced to remove all field staff from the job. No payment shall be made for any work installed after this date without first examination of work in accordance with the GENERAL CONDITIONS.

Signature of Owner's Representative	Title	Date
Received by (Signature of Contractor's Representative)	Title	Date

NOTE: Place a copy of completed form in project file.

BROWN AND CALDWELL

Attachment E—Site Safety and Health Plan Environmental Monitoring Documentation

Project Name	Project Number
Employee Name	**Project Location**

Equipment Used (check as appropriate)

	Calibrated	Date	Used	Dates(s)
OVA (Organic Vapor Analyzer)/FID	☐	_____	☐	_____
OVM (Organic Vapor Monitor)/PID	☐	_____	☐	_____
HNU	☐	_____	☐	_____
PTLV Sniffer	☐	_____	☐	_____
Photovac TIP	☐	_____	☐	_____
Combustible Gas Meter/Explosimeter	☐	_____	☐	_____
Other _____	☐	_____	☐	_____

Instrument	Date	Time	Readout Value	Area Monitored	Changes in PPE			User's Initials
					YES	NO	Type of PPE	

NOTE: Place completed form in project file.