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of Engineers

HUNTSVILLE DIVISION

Draft

Defense Environmental Restoration Program
for
Formerly Used Defense Sites

Ordnance and Explosive Waste
Chemical Warfare Materials

ARCHIVES SEARCH REPORT

FINDINGS

BENICIA ARSENAL

Benicia, Solano County, California

Site No. J09CA075600

MARCH 1994

Prepared by
US ARMY CORPS OF ENGINEERS
ST. LOUIS DISTRICT

ORDNANCE AND EXPLOSIVE WASTE
CHEMICAL WARFARE MATERIALS
ARCHIVES SEARCH REPORT
FOR
BENICIA ARSENAL
BENICIA, CALIFORNIA

DERP-FUDS SITE NO. J09CA075600

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1.0	Introduction	
1.1	Authority	1-1
1.2	Subject	1-2
1.3	Purpose	1-2
1.4	Scope	1-3
2.0	Previous Site Investigations	2-1
3.0	Site and Site Area Description	
3.1	Location	3-1
3.2	Past Uses of the Site	3-1
3.3	Current Uses of the Site	3-1
3.4	Demographics of the Area	3-1
3.4.1	Center of Activity	3-1
3.4.2	Population Density	3-1
3.4.3	Type of Businesses	3-2
3.4.4	Type of Industry	3-2
3.4.5	Type of Housing	3-2
3.4.6	New Development in the Area	3-2
3.4.7	Typical Cross-Section of Population	3-2
4.0	Physical Characteristics of the Site	
4.1	Geology/Physiography	4-1
4.2	Soils	4-1
4.3	Hydrology	4-2
4.3.1	Ground Water	4-2
4.3.2	Surface Water	4-2
4.4	Weather	4-3
4.5	Ecology	4-4

2

**ORDNANCE AND EXPLOSIVE WASTE
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DERP-FUDS SITE NO. J09CA075600

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
5.0	Real Estate	5-1
6.0	OEW/CWM Site Analysis	
6.1	History of Activities at Benicia Arsenal	6-1
6.1.1	Prior to World War II	6-1
6.1.2	World War II	6-2
6.1.2.1	Shipments to Benicia	6-2
6.1.2.2	Mission	6-2
6.1.2.3	Storage	6-2
6.1.3	Post World War II	6-3
6.1.4	Base Cleanup	6-3
6.2	References Cited	6-4
6.3	Records Review	6-6
6.4	Summary of Interviews	6-11
6.4.1	Mr. Jim Campbell, Benicia Industries, Inc.	6-11
6.4.2	Mr. Ron Rice, Benicia Fire Department	6-11
6.4.3	Lt. Mike Daly, Benicia Police Department	6-11
6.4.4	Ms. Jeanette Fair, Exxon Oil Co.	6-12
6.5	Site Inspection	6-12
6.5.1	General	6-12
6.5.2	Detailed Site Inspection	6-12
6.6	Interpretation of Aerial Photography	6-14
6.7	Map Analysis	6-15
7.0	Evaluation of Ordnance Contamination	7-1

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**ORDNANCE AND EXPLOSIVE WASTE
CHEMICAL WARFARE MATERIALS
ARCHIVES SEARCH REPORT
FOR
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DERP-FUDS SITE NO. J09CA075600

MAPS/DRAWINGS

- Map 1** **Vicinity Map**
- Map 2** **Site Map**
- Map 3** **Cistern Locations**

APPENDICES

- A** **References (See Main Body of Report)**
- B** **Acronyms**
- C** **Reports/Studies/Letters/Memorandums**
- C - 1** **Inventory Project Report**
- C - 2** **Findings Of Fact**
- C - 3** **Endangered Species List**
- C - 4** **Site Specific Safety And Health Plan**
- C - 5** **Site Visit Trip Report**
- C - 6** **Benicia Police Department Incident Reports**
- D** **Historical Photographs**
- E** **Interviews**
- F** **Newspapers/Journals (Not Used)**
- G** **Present Site Photographs**

4

**ORDNANCE AND EXPLOSIVE WASTE
CHEMICAL WARFARE MATERIALS
ARCHIVES SEARCH REPORT
FOR
BENICIA ARSENAL
BENICIA, CALIFORNIA**

DERP-FUDS SITE NO. J09CA075600

APPENDICES

- H** **Historical Maps/Drawings (Not Used)**
- I** **Risk Assessment Code Procedure Forms**
- J** **Report Distribution List**
- K** **Archive Addresses (See Main Body of Report)**

1.0 Introduction

1.1 Authority

In 1980, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 42 USC 9601 et seq. Ordnance and Explosive Wastes (OEW) are included in the CERCLA definition of pollutants and contaminants that require a remedial response.

In 1983, the Environmental Restoration Defense Account (ERDA) was established by Public Law 98-212. This Congressionally-directed fund was to be used for environmental restoration at Department of Defense (DOD) active installations and formerly used properties. The DOD designated the Army as the sole manager for environmental restoration at closed installations and formerly used properties. The Secretary of the Army assigned this mission to the Corps of Engineers (USACE) in 1984.

The 1986 Superfund Amendments and Reauthorization Act (SARA) amended certain aspects of CERCLA, some of which directly related to OEW contamination. Chapter 160 of the SARA established the Defense Environmental Restoration Program (DERP). One of the goals specified for the DERP is "correction of environmental damage (such as detection and disposal of unexploded ordnance) which creates an imminent and substantial endangerment to the public health or welfare or to the environment."

The DERP requires that a CERCLA response action be undertaken whenever such "imminent and substantial endangerment" is found at:

- A. A facility or site that is owned by, leased to, or otherwise possessed by the United States and under the jurisdiction of the Secretary of Defense.
- B. A facility or site that was under the jurisdiction of the Secretary of Defense and owned by, leased to, or otherwise possessed by the United States at the time of actions leading to contamination.
- C. A vessel owned or operated by the Department of Defense.

The National Contingency Plan (NCP) was established by the Clean Water Act of 1972. The NCP has been revised and broadened several times since then. Its purpose is to provide the organizational structure and procedures for remedial actions to be taken in response to the presence of hazardous substances, pollutants, and contaminants at a site. Section 105 of the 1980 CERCLA states that the NCP shall apply to all response actions taken as a result of CERCLA requirements.

The March 1990 National Oil and Hazardous Substances Pollution Contingency Plan given in 40 CFR part 300 is the latest version of the NCP. Paragraph 300.120 states that "DOD will be the removal response authority with respect to incidents involving DOD military weapons and munitions under the jurisdiction, custody, and control of DOD."

On 5 April 1990, U.S. Army Engineer Division, Huntsville (USAEDH) was designated as the USACE Mandatory Center of Expertise (MCX) and Design Center for Ordnance and Explosive Waste (OEW). As the MCX and Design Center for OEW, USAEDH is responsible for the design and successful implementation of all Department of the Army OEW remediations required by CERCLA. USAEDH will also design and implement OEW remediation programs for other branches of the Department of Defense when requested. In cooperation with the Huntsville Division, the U.S. Army Corps of Engineers St. Louis District has been assigned the task of preparing Archives Search Reports for those Formerly Used Defense Sites (FUDS) suspected of chemical warfare materials (CWM) contamination.

1.2 Subject

The former Benicia Arsenal was located in Benicia, Solano County, California approximately 30 miles northeast of San Francisco (see Map 1). From 1849 to 1958, the United States acquired 2,728.04 acres for the Benicia Arsenal. From 1849 to 1960, the U.S. Army used the site as a principal depot for ordnance storage and issuance and the manufacture and testing of small arms, mobile and seacoast artillery targets. During DOD ownership of the property, more than 350 structures were built. On January 11, 1962, the Benicia Arsenal was declared excess by DOD and was reported to the General Services Administration. The arsenal remained vacant from 1965 to 1975. In 1975, the City of Benicia leased the arsenal property to Benicia Industries, Inc., a private land development firm. Benicia Industries currently maintains 22 DOD built structures. Exxon Oil Co. operates a refinery on the site and maintains 29 DOD built igloos. All of the other DOD built structures were either destroyed by several fires in 1922 and 1983, or were tom down. The site is currently used for residential housing, light to heavy industry, warehousing, commercial, and as a port. A significant portion of the site remains undeveloped.

1.3 Purpose

This Archives Search Report compiles information obtained through historical research at various archives and records-holding facilities, interviews with persons associated with the site, and a site inspection. All efforts were directed at determining the possible use or disposal of CWM or OEW on the site.

1.4 Scope

The historical data for this site presents evidence of significant shipment of CWM. The historical data as well as aerial photographs indicate storage facilities for OEW and possibly CWM. Interviews with local individuals confirmed the presence of weapons test areas. The OEW storage areas (open storage and igloos) and the weapons test areas are shown on Map 2. This investigation centered on the potential for OEW contamination in the ordnance storage areas and weapons test areas and CWM contamination in the ordnance storage areas.

This report presents site history, description and characterization of the immediate surrounding area, real estate ownership information, findings of the site inspection, and evaluation of potential OEW and CWM contamination.

9

2.0 Previous Site Investigations

A Findings and Determination of Eligibility (FDE) was prepared by the Sacramento District, Corps of Engineers in December 1990. The FDE determined no evidence of unsafe conditions resulting from DOD use of the site.

11

3.0 Site and Site Area Description

3.1 Location

The former Benicia Arsenal property is located in the City of Benicia, Solano County, California (see Map 1). The former arsenal begins at the shore of the Carquinez Strait and extends northward.

3.2 Past Uses of the Site

Use of Benicia Arsenal began in 1851. Prior uses of the site may have been grazing and marsh land, but exact uses are unknown. Benicia Arsenal existed from 1851 until it was declared excess in 1962. Benicia Arsenal served as a principal depot for the Division of the Pacific; manufactured small arms, mobile and seacoast targets; repaired and stored ordnance and ordnance stores; and served as a transshipment depot for chemical warfare materials.

3.3 Current Uses of the Site

Much of the former Benicia Arsenal is now Benicia Industrial Park, operated by the City of Benicia. The major tenant is Exxon, which has a refinery there. There is also a mix of heavy and light manufacturing, warehousing, and residential housing on the site.

3.4 Demographics of the Area

3.4.1 Center of Activity

The former Benicia Arsenal is currently known as the Benicia Industrial Park. This industrial park is the only center of activity, covering 4.9 square miles, and employs over 7,000 people.

3.4.2 Population Density

City: Benicia	County: Solano
Area: 13.8 sq.mi.	Area: 828 sq.mi.
POP: 27,000	POP: 340,421
PD: 1,956 persons per sq. mi.	PD: 411 person per sq. mi.

Population and area are based on the U.S. Department of Commerce, Bureau of the Census, 1990 statistics, and telephone interviews.

3.4.3 Type of Businesses

A review of both telephone interviews and County Business Patterns (1990) assisted in developing a business profile of the area. The only prevalent type of business in Benicia is a private deep water port where shipping of products occurs.

3.4.4 Type of Industry

Benicia's primary source of income is light to heavy manufacturing. Manufactured products vary from refined petroleum, compressed air and gases, bio-medical devices and products to food processing machinery and software.

3.4.5 Type of Housing

Housing in the vicinity is composed primarily of single family dwellings. There are a total of 9,587 units of which 67.4% are owner-occupied and 28.7% are rented. The median year of construction is 1978 and 40% were built between 1980 and 1990.

3.4.6 New Development in the Area

Development in the area is restricted to the industrial park.

3.4.7 Typical Cross-Section of Population

The percent of those under the age of 20 is 29.5%, over 65 years is 10.8 %. The median age is 34.6 years. Approximately 84.2% of the population is white, 5.4% black, and 7.5% Asian or Pacific Islander.

4.0 Physical Characteristics of the Site

4.1 Geology/Physiography

The Benicia, California site is located within the Sacramento Valley Subregion of the Central Valley of California Section of the Pacific Border province. The Central Valley is a major northwest trending, southerly tilting, structural trough, asymmetrical in form with a steep western flank and a more gently inclined eastern flank. The northern third is known as the Sacramento Valley, the southern two-thirds is the San Joaquin Valley (Thornbury, 1965). Up to ten miles of sediments have filled the Sacramento Valley and range in age from Jurassic to Holocene and include marine and continental rocks and deposits. This trough has probably existed since the Jurassic, when the Sierra Nevada and Klamath Mountains were uplifted. During the Cretaceous and through much of the Cenozoic, this trough extended westward over the site of the present Coast Ranges and may have received sediment from the Sierra Nevada on the east. The trough existed in this form until the late Pliocene when development of the Coast Ranges cut off the sea.

The most recent deposits are of Holocene to Oligocene age. River deposits (Holocene), of gravel, sand, silts and minor amounts of clay deposited along channels and floodplains may include parts of the Modesto Formation of Pleistocene age; Continental deposits (Oligocene to Holocene), are a heterogenous mix of gravels, sand, silts and clay with some cobbles, boulders and some conglomerates. The more recent deposits are underlain mostly by marine deposits of clay, shale, siltstone, and sandstone of pre-Tertiary to Eocene age (Page, 1986).

4.2 Soils

The site surficial soils at Benicia, California consist of well-drained soils underlain by siltstone at a depth of 20-40 feet.

Typically, the surface layer of these soils is pale-brown to dark grayish-brown clay or silty organic clay between 13-28 inches thick. The subsoil is light olive-brown heavy silty organic clay about 10-17 inches thick. The substratum is light yellowish-brown sandstone or siltstone starting at a depth of 30-38 inches. Some large cracks, extending into the substratum, appear in these soils when they are dry.

TABLE 4.1 BENICIA, CALIFORNIA, NEAR-SURFACE SOIL PROFILE						
DEPT H (IN)	SOIL DESCRIPTIO N	PERCENTAGE PASSING SIEVE NUMBER			LIQUID LIMIT	PLAS- TICITY INDEX
		#4	#40	#200		
0-20	Clay, silty organic clay (CH,CL)	100	90-100	75-95	30-60	10-40
20-34	Silty organic clay, light clay (CH,CL)	100	95-100	85-95	30-60	15-40
34	Sandstone or siltstone	---	---	---	---	---

SOURCE: SCS SOIL SURVEY OF SOLANO COUNTY, CALIFORNIA

Permeability of these soils is slow and runoff is medium. Erosion is a moderate hazard. Available water capacity is 4-7 inches and the shrink-swell potential is moderate to high. The risk of corrosion to uncoated steel is moderate to high as well. The reaction of these soils is slightly acid to moderately alkaline (Bates, 1977).

4.3 Hydrology

4.3.1 Ground Water

Post-Eocene continental deposits constitute the primary groundwater reservoir in the Sacramento Valley. The thickness of these deposits averages about 2,400 feet and increases from north to south. Natural ground water flow has been greatly altered by groundwater development and pumpage and is generally towards large withdrawal areas although there is still a large component of flow towards the Delta area. Recharge is from streams entering the valley from the Sierra Nevadas but has been increased from irrigation returns. The average hydraulic conductivity is 2.116×10^{-3} cm/sec (Williamson, et al., 1989).

4.3.2 Surface Water

About two-thirds of Solano County is drained eastward to the Sacramento River by a number of intermittent streams, such as Putah, Sweeney, and Ulatis Creeks. The rest of the county is drained southward into Suisun Bay by intermittent stream, such as Green Valley, Suisun, and Ledgewood Creeks. A large area of tidal flats and

marshland is adjacent to Suisun Bay. This area has been cut into islands by a maze of natural drainage channels. Benicia is just on the east of San Pablo Bay on the north side of the Carquinez Strait. Sacramento and San Joaquin Rivers flow into the Suisun Bay. In 1963, local landowners in the Suisun Marsh formed the Suisun Resource Conservation District to protect the environment quality of the marsh. The State Water Resources Control Board issued Water Right Decision 1485 in 1978, in which the Suisun Marsh was recognized as an endangered brackish water marsh, D-1485 set channel water salinity standards, ordered the development of a water quality monitoring program. Benicia is in the Delta. Flood flows reaching the Delta have been estimated to exceed 600,000 cfs. Water levels vary greatly during each tidal cycle, from less than a foot on the San Joaquin River at Interstate 5 to more than five feet near Pittsburg. During the tidal cycle, flow can also vary in direction and amount. For example, the flow near Pittsburg during a typical summer tidal cycle, can vary from 330,000 cfs upstream to 340,000 cfs downstream.

4.4 Weather

The climate of Solano County is strongly influenced by its location and topography. The Sacramento Valley to the east and north, has hot, dry summers and cool winters; the area near the Pacific Ocean, to the south and west, has cool, humid summers and moderate winters. Average annual precipitation ranges from 16 inches in some of the southern parts of the county, to as much as 30 inches at the top of the Vaca Mountains. About 17 to 20 inches per year falls on the eastern half of the county. In the driest years, about 1 year in 20, the annual total precipitation is as little as 9 inches in the southeast and 18 inches in the mountains. In the wettest years, 25 to 50 inches falls on 50 to 60 days per year. Approximately 95 percent of the total precipitation falls during the months of October through April. January is usually the month of maximum rainfall (3.25 inches) on the average. Snow commonly does not fall on the lowlands. Snow falls at the higher elevations every two to three years, but it generally lasts only a few hours to a few days.

The moderating influence of the marine air is reflected in the average annual temperature, which is 58 degrees F. in the vicinity of the strait but is 61 degrees F. or more in the somewhat protected northern parts of the county. The differences are more pronounced in mid-summer. The July average maximum is about 80 degrees F. in the San Pablo Bay area but reaches 96 degrees F. or more in the Lake Solano-Winters area. Average minimum temperatures are more uniform, ranging from 55 degrees F. in the south to 58 degrees F. in the northwest. In January the average maximum temperature is about 53 degrees F. and the average minimum is about 38 degrees F. near the water and 36 degrees F. inland.

In summer there is a steady marine wind that blows up the Carquinez Strait. Velocities of 15 to 25 knots or more are common late in the afternoon and in the

evening, but the winds are mostly 10 knots or less late in the morning. The jet of air sweeping eastward through the strait curls northward in the vicinity of the Sacramento River. By afternoon, it frequently forms an eddy that draws northerly winds across the eastern part of the county. The summer weather is dominated by a cool breeze resulting in an average summer wind speed of nearly 15 mph. Winds are light in the early morning but normally reach 20 to 25 mph in the afternoon.

In winter the relative humidity averages about 90 percent at night and about 70 percent in the afternoon. When the humidity is near 100 percent, periods of fog occur and last several days to 2 weeks or more. In July the relative humidity averages about 75 percent early in the morning and drops to 55 percent in the afternoon with the influx of marine air, and to about 35 percent in the drier interior. Some dry north winds cause the humidity to drop below 10 percent.

4.5 Ecology

The information provided for this site has been compiled from the U. S. Fish and Wildlife Service and the California Department of Fish and Game-Natural Diversity Data Base: Rarefind.

Federally protected species known to occur in the vicinity of Benicia include: Winter-run chinook salmon (Oncorhynchus tshawytscha), delta smelt (Hypomesus transpacificus), bald eagle (Haliaeetus leucocephalus), American peregrine falcon (Falco peregrinus anatum), California clapper rail (Rallus longirostris obsoletus), and salt marsh harvest mouse (Reithrodontomys raviventris). Fifteen candidate species may also be found in the project area (see Appendix C-3).

Based on information provided through the State Natural Diversity Data Base: Rarefind, several sensitive species and communities may be found near Benicia. They include: California black rail (Laterallus jamaicensis coturniculus), California clapper rail, saltmarsh common yellowthroat (Geothlypis trichas sinuosa), Suisun song sparrow (Melospiza melodia maxillaris), salt marsh harvest mouse, Suisun shrew (Sorex ornatus sinuosus), Mason's lilaeopsis (Lilaeopsis masonii), Delta tule pea (Lathyrus jepsonii ssp. jepsonii), soft bird's-beak (Cordylanthus mollis ssp. mollis), Suisun marsh aster (Aster chilensis var. lentus), Northern Coastal Salt Marsh, and Coastal Brackish Marsh.

5.0 Real Estate

From 1849 to 1958, the United States acquired 1,790.48 fee acres, 351.12 public domain acres, 6.40 license acres, 4.16 easement acres, and 575.88 lease acres for the Benicia Arsenal (2,728.04 total acres). On January 11, 1962, Benicia Arsenal was declared excess by DOD and was reported to the General Services Administration. On February 26, 1965, 1.33 acres of public domain property was reassigned to Benicia Arsenal Cemetery. The total property acres acquired were disposed of as follows (It appears that there were no restoration nor recapture provisions): from 1945 to 1960, lease terminated for 575.45 acres; on January 11, 1962, 360.78 public domain/license/easement/lease acres reported excess; and GSA quitclaim deed to the City of Benicia (Surplus property Authority) 5.03 and 1,785.45 fee acres on March 12, 1964 and February 20, 1965, respectively.

6.0 QEW/CWM Site Analysis

6.1 History of Activities at Benicia Arsenal

6.1.1 Prior to World War II

Benicia Arsenal was created on August 25, 1851 and during November of that year it was made the principal depot for ordnance and ordnance stores for the Division of the Pacific (Corps of Engineers, Sacramento District, 1968). Activity at Benicia Arsenal ended in 1964 (Department of Defense, c. 1970).

In 1898, during the Spanish-American War, those troops bound for the Philippines from Benicia Barracks drew their supplies and equipment from the ordnance stores of the arsenal. Benicia Arsenal furnished ordnance supplies to all troops west of the rockies during World War I (Benicia Police Department, 1954). By 1920 it was a manufacturing arsenal and proving ground (Department of Defense, c.1970).

Between World War I and World War II, Benicia Arsenal was used to reship ordnance supplies to Hawaii, the Philippines, Cuba, and Alaska. In 1919 only eight buildings were available for the storage of ammunition. Two unspecified magazines were used for the storage of high explosives (Office of Chief of Ordnance#1, date unknown). In 1925, authority was obtained to alter an old cistern to be used as a magazine. This was completed in 1926 and was used for the storage of chemical warfare ammunition (Office of Chief of Ordnance#1, date unknown). The exact location of this cistern is unknown. Map 3 shows the location of at least 14 cisterns. Cistern #1 is closest to other ordnance storage facilities. Seven standard magazines and four underground magazines were constructed in 1928 and 1929 (Office of Chief of Ordnance#1, date unknown). Training was also conducted at the arsenal. An Ordnance Reserve Officers Training Camp was held at Benicia Arsenal the last two weeks of June, 1925 (Army Ordnance, 1925).

An inspection report from 1932 notes that Benicia had bombs stored in igloo type magazines and black powder charges stored (Office of Chief of Ordnance#2, 1932). *usage of interest*
 A 1934 inspection of Benicia Arsenal listed among other items; machine guns, rifles, pistols, shotguns, 3" Mk I trench Mortars (55 on hand), and 8" MK VIII1/2 Howitzers (Office of Commanding Officer Benicia Arsenal, 1934). A 1937 inspection noted the principal mission of Benicia Arsenal was the supply and repair of ordnance material and equipment for the Ninth Corps Area and a limited supply of ammunition and minor ordnance material to Hawaii and the Philippines (Headquarters Ninth Corps Area, 1937).

6.1.2 World War II

6.1.2.1 Shipments to Benicia

Shipping documents from the World War II period indicate that Benicia Arsenal was used extensively as a transshipment point for chemical warfare material and conventional ordnance. Several shipping orders from 1942 provide evidence. One 1942 shipping order from Utah General Depot to Benicia Arsenal is for 36,000 pounds of mustard gas (HS) to be shipped in one ton containers (Office of Chief Chemical Warfare Service, 1942). Another is for 17 one ton containers of mustard gas from Edgewood Arsenal shipped to Benicia for shipment to the Pacific Area (OCCWS2, 1942). A third 1942 shipping document is for 48 500-pound clusters of 4-pound incendiary bombs (Gillet, 1942). Another from 1942 notes 80,000 4-pound incendiary bombs shipped from Utah General Depot (Chemical Section Utah General Depot, 1942). A 1942 shipment from the Eastern Chemical Warfare Depot to Benicia Arsenal lists 8,000 4.2" rounds of WP Smoke Shell, 5,000 4.2" fuzes including burster tubes, and 5,000 4.2" propelling charges (Willett, 1942).

6.1.2.2 Mission

The mission of Benicia Arsenal during World War II was stated in several documents. A 1943 document states its mission as transshipment of all classes of ammunition, as well as retail issues of assembled tanks, artillery, small arms, and the parts and supplies for them (Office of Chief of Ordnance #3, date unknown). Benicia Arsenal was also described as a filler depot for automatic weapons, small arms, and artillery for issue and shipment overseas through the San Francisco and Los Angeles Ports of Embarkation; as a storage depot for these ports; and as a transshipment depot for ammunition (Office of Chief of Ordnance #4, date unknown). Benicia Arsenal served the IX Corps Area with Ogden, Utah and served as an advance maintenance shop for it. Benicia was an intermediate depot that served as an area depot. Increased ammunition stocks during WWII included adding storage at Benicia, noted below. As a transshipment point, Benicia served the Ninth Service Command and supplied the Pacific bases (Office of Chief of Military History, 1960).

6.1.2.3 Storage

Major expansion occurred just prior to and during World War II, adding warehouses, igloos, magazines, docks, and more (Benicia Police Department, 1954). Hundreds of tons of ammunition, high explosives, bombs, incendiaries and toxic gases were being constantly handled by the Ports of Embarkation during World War II. Facilities at the warehouse of the Chemical Branch, San Francisco Port of Embarkation were limited to the storage of non-toxic and non-explosive CWS items. Safety regulations precluded even the overnight storage of dangerous materiel at Oakland, with the result that supplies of this kind had to be received at Benicia Arsenal. Bombs, grenades,

4.2" shells and toxic containers arrived at Benicia by rail from CWS Depots throughout the country. They were either loaded directly aboard ship at Benicia or transported by rail or barge to other facilities of the San Francisco Port of Embarkation such as Oakland Army Base or Pier No.1, Richmond (Hemleben, 1947).

Incendiary bombs, 4.2-inch mortar shells, smoke and white phosphorus grenades soon proved to be so effective in the Pacific campaign that problems concerning them became those of procurement and transport rather than storage. So urgent was the overseas demand for supplies of this kind, that only small quantities could be kept on hand for any length of time, even at Benicia. Efforts were made to correlate arrival and shipment times so that supplies could be moved out on cargo vessels shortly after they had been received at the arsenal, and only when a higher priority rating was given an emergency consignment at SFPE was this materiel stored at Benicia. In such an event, the arsenal acted as a back-up point and the munitions or toxics were stored there temporarily. Chemical warfare storage space at Benicia consisted of two igloos of standard size, and such open area as might be required. This space was under the supervision of the CWS section at the installation (Hemleben, 1947). When CWS materiel was loaded onto ships at Benicia, a SFPE Chemical Branch representative inspected the containers or shells for leakage before they were loaded on ship and during the actual loading (Hemleben, 1947). Photographs from the History of CWS Activities at Ports of Embarkation show toxic munitions being loaded onto ships at Benicia, and bombs being stored in igloos (Hemleben, 1947, 138-140).

In the 4th quarter of 1945, all CWS stock was shipped from the San Francisco Port of Embarkation, of which Benicia was a part, to interior depots. Materiel returned from overseas was also sent through the San Francisco Port of Embarkation (Hemleben, 1947)

6.1.3 Post World War II

Equipment and supplies were also routed through Benicia for the Korean conflict (Benicia Police Department, 1954). Specific munitions supplied are not known. An inspection report for Benicia Arsenal in 1957 showed 7,499 tons of small arms ammunition and 636 tons of guided missiles on hand (Ordnance Corps, 1957). Activity at Benicia Arsenal ended in 1964 (Department of Defense, c.1970). After Benicia Arsenal closed, nearly all of the former arsenal became an industrial park, with a few buildings of historic interest kept as museums and points of interest. Exxon is the major landowner in the industrial park today.

6.1.4 Base Cleanup

No records were found relating to the cleanup of Benicia Arsenal at the time of closing or immediately thereafter.

6.2 References Cited

Army Ordnance Magazine

"Ordnance Officers' Training Camp, Benicia Arsenal, 1925. Vertical Files, CBDCOM Historical Office, Edgewood Arsenal, Maryland.

Benicia Police Department

"Dedication Benicia Arsenal", Benicia Police Department 49er Festival Year Book 1954. Benicia Arsenal Sharpshooter Vertical File, Benicia Public Library, Benicia, California.

Chemical Section, Utah General Depot

Teletype to Chief Chemical Warfare Service, 3/28/42, by McGovern. Cabinet 73, Drawer 210-Procurement, CBDCOM Historical Office, Edgewood Arsenal, Maryland.

Corps of Engineers Sacramento District

Realty Control File Summary (Form 1603) "Benicia Arsenal", 2/2/68. Headquarters Corps of Engineers Historical Files, Washington, D.C.

Department of Defense

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Gillet, Lt. Col. Norman

Memo "Shipment of Mustard Gas in Ton Containers" to Commanding Officer, Umatilla Ordnance Depot, 2/12/42. Cabinet 73, Drawer 210-Procurement, CBDCOM Historical Office, Edgewood Arsenal, Maryland.

Headquarters Ninth Corps Area

Memo "Annual Inspection of Benicia Arsenal, Fiscal Year 1937", to the Commanding General Ninth Corps Area, 3/22/37. RG 156, Entry 41, Box 1, File "333.1 - Benicia Arsenal 2501-6000", National Archives Suitland Branch, Suitland, Maryland.

Hemleben, Sylvester John

History of CWS Activities at Ports of Embarkation, Historical Branch, Chemical Corps, 27 June 1947. CBDCOM Historical Office, Edgewood Arsenal, Maryland.

Office of Chief, Chemical Warfare Service

Shipping Order to Benicia Arsenal, May 30, 1942, by Col. N. Gillet. Cabinet 73, Drawer 210-Procurement, CBDCOM Historical Office, Edgewood Arsenal, Maryland.

Office of Chief, Chemical Warfare Service #2

"Bombs to Benicia Arsenal For Use By DUCOL Project", by Col. N. Gillet. Cabinet 73, Drawer 210-Procurement, CBDCOM Historical Office, Edgewood Arsenal, Maryland.[gillet 3]

Office of Chief of Military History

United States Army in World War II: The Technical Services, "The Ordnance Department: Procurement and Supply", 1960.

Office of Chief of Ordnance #1

"History of the Benicia Arsenal, Part I, Post War Period, July 1, 1919 to July 1, 1939", date unknown. RG 175, Entry 1, Box A337, Benicia Arsenal History File Vol. 1, National Archives Suitland Branch, Suitland, Maryland.

Office of Chief of Ordnance #2

Memo "Inspection of the Benicia Arsenal, Benicia, California" to the Chief of Ordnance, 5/9/32. RG 156, Entry 41, Box 1, File "333.1 Benicia Arsenal 2501-6000", National Archives Suitland Branch, Suitland, Maryland.

Office of Chief of Ordnance #3

"History of the Benicia Arsenal, Part IV, World War No. II, January 1, 1943 to March 31, 1943", date unknown. RG 156, Entry 646, Box A337, Benicia Arsenal File Vols. II-V, National Archives Suitland Branch, Suitland, Maryland.

Office of Chief of Ordnance #4

"History of the Benicia Arsenal, Part VI, 1 January 1944 thru 31 December 1944", date unknown. RG 156, Entry 646, Box A337, File "Benicia Arsenal Vols. VI, VII, VIII, IX History For Periods 1 January 1944 thru 31 December 1944", National Archives Suitland Branch, Suitland, Maryland.

Office of Commanding Officer Benicia Arsenal

Memo "Report of Annual Percentage Inspection and Annual Manometer Test Conducted on Selected Items of Material in Storage at Benicia Arsenal" to Chief of Ordnance, 4/16/34. RG 156, Entry 41, Box 1, File "333.1 Benicia Arsenal 2501-600", National Archives Suitland Branch, Suitland, Maryland.

Ordnance Corps

Memo "Inspection of Benicia Arsenal" to Chief of Ordnance from Assistant Area Ammunition Inspector, Area 4, 12/13/57. Acc 338-61A-3161, Box 5, Folder 333, National Personnel Records Center, St. Louis, Missouri.

Willett, Col. M.B.

Memo "Re Telephonic Instructions, 1/29/42" to Commanding Officer Benicia Arsenal, 2/24/42. Cabinet 73, Drawer 210-Procurement, CBDCOM Historical office, Edgewood Arsenal, Maryland.

6.3 Records Review

**Chemical Biological Defense Command
Edgewood Arsenal
Edgewood, Maryland**

The following documents were photocopied:

Cabinet # 72:

File, Readiness Messages:

1. Document, CO Ft. Shafter HA to CO San Francisco POE, Paraphrase of outgoing message, 4 May 1944.

Cabinet # 73:

Drawer 210, CWS General Correspondence, Procurement:

File, General Correspondence (Bound):

1. Letter, Utah General Depot Chemical Section, Ogden UT to Chief Chemical Warfare Service, Washington DC, Shipping Order for Benicia Arsenal of incendiary bombs, 28 Mar. 1942.
2. Letter, Utah General Depot Chemical Section, Ogden UT to Chief Chemical Warfare Service, Washington DC, Shipping Order, 13 Jun. 1942.
3. Document, Utah General Depot Chemical Section, Ogden UT to Chief Chemical Warfare Service, Washington DC, Shipping Order for San Francisco POE and Benicia Arsenal, 30 May 1942.
4. Memo, Lt. Col. Norman D. Gillet, Subject: Shipment of mustard gas in ton containers, 12 Feb. 1943.
5. Memo, Adjutant General James Hunter, Subject: Orders, 13 Feb. 1942.
6. Document, Lt. Col. Norman D. Gillet, Bombs to Benicia Arsenal for use in DUCOL Project, 23 Feb. 1943.
7. Memo, Col. M. B. Willett CO, Subject: Re Telephonic Instructions 1/29/42, 24 Feb. 1942.

Army Ordnance Magazine, Volume 6, 1925-26:

1. Extract.

History of CWS Activities at Ports of Embarkation, 27 Jun 1947:

1. Extracts from chapters 1-4.

US Army in WW II, The Technical Services, The Transportation Corps: Movements, Training and Supply,:

1. Extract.

US Army in WW II, The Technical Services, The Ordnance Department: Procurement and Supply,:

1. Extract.

Guide to Army Posts:

1. Extract, pgs 24-25 and 224-227.

Misc. Files:

1. Map, Depot Storage, undated.
2. Letter, Lt. Col. John P. Youngman, San Francisco Port of Embarkation Chemical Officer to CO, Fort Mason CA, Shortages: CWS equipment and supplies, 30 Sep. 1942.

**National Personnel Records Center
Military Records
St. Louis, Missouri**

Record Group 338 (U.S. Army Commands)

338-56-A-3039, Box 2/7, File:"326.21, 1-197, 1545". Map of portion of Benicia Arsenal as Inclosure #10 to "Report on ORC Ordnance Field Training School", 23 Aug 51.
Author?

338-56-A-3039, Box 3/7, File???. Map of Preliminary Benicia Arsenal Rehabilitation of Maintenance Buildings Plot Plan, August 1950.

Record Group 342: U.S. Air Force Commands, 1942-): No Help.

**National Archives
Suitland Branch
Suitland, Maryland**

Record Group:

175 (Chemical Warfare Service)

U.S. Army, Benicia Arsenal
Photographs of ordnance loading activities, NARA-Suitland, RG 175, E1, Box A337, Vol. 101: Selected Photographs.

U.S. Army Historians
"History of Benicia Arsenal, Part 1", NARA-Suitland, RG 175, E1, Box A337, Vol. I (from 7/19 to 7/39)

"History of Benicia Arsenal, Part IV", NARA-Suitland, RG 175, E1, Box A337, Vols. II, III, IV, V (from 1/43 to 12/43).

"History of Benicia Arsenal", pp.181-184, NARA-Suitland, RG 175, E1, Box A337, Vols. VI, VII, VIII, IX (from 1/44 to 12/44)

77 (Corps of Engineers): No Help.

156 (Chief of Ordnance)

Entry 41, Box 1, Ord. Dept. Dec. File 1931-1940, 333.1 Benicia Arsenal.

Entry 646, Box A337, Hist. of Ord. Install.1940-1945, Benicia Arsenal V.1-13.

Kiehl, Lt. Col. P.J.R., Ordnance

"Report of Annual Percentage Inspection and Annual Manometer Test Conducted on Selected Items of Material Stored at Benicia Arsenal", 4/16/34, NARA-Suitland, RG 156, E41, Box 1, File "333.1 Benicia Arsenal 2501-6000".

Chief of Ordnance

"Inspection of the Benicia Arsenal, Benicia, California", 5/9/32, NARA-Suitland, RG 156, E41, Box 1, File "333.1 Benicia Arsenal 2501-6000".

Office of the Inspector General

"Annual Inspection of Benicia Arsenal, Fiscal Year 1937", 3/22/37, NARA-Suitland, RG 156, E41, Box 1, File "333.1 Benicia Arsenal 2501-6000".

18 (Army Air Forces)

Far East Air Forces

Memorandum to Commanding General, San Francisco Port of Embarkation, Fort Mason, on request for toxic chemical bombs, 8/14/93, NARA-Suitland, RG 18, Office of the Ass't Chief of Air Staff, Materiel and Services, Air Chemical Officer, Plans & Policy Records 1944 to Feb. 1946.

269 (General Services Administration): No Help.

338 (U.S. Army Command, 1942-): No Help.

**General Services Administration
Washington, D.C.**

Records borrowed back from the WNRC.

Record Group 269 (General Services Administration): No Help.

**National Archives
Washington, D.C.**

RG 18 (Army Air Forces): No Help.

RG 342 (Air Force Commands, Activities, Organizations, U.S.): No Help.

**Washington National Records Center
Suitland, Maryland**

Record Group:

77 (Corps of Engineers): No Help.

121 (Public Buildings Service)

Real Property Disposal Review Board:

121-54-A-567, Box 1/27, Ala.11 - W.Cal.130

121-54-A-567, Box 2/27, W.Cal.140 - W.Kansas40.

**National Archives and Records Administration
Pacific Sierra Region
San Bruno, CA**

Federal Records Center:

RG 77: Accession # 77-74-A-1193,
Maps of Benicia Arsenal Channel

RG 121: Accession # 121-76-A-602,
Box 1 of 7, Contract Files, No Help

RG 291: No Help.

Archives:

RG 77: No Help.

RG 121: No Help.

RG 270: No Help.

RG 291: No Help.

RG 338: No Help.

RG 156:

Entry 1156:

- Boxes 10 - 16, Benicia Arsenal General Correspondence, 1903 - 1915, Code 11, Ordnance Stores, No Help
- Box 21, Benicia Arsenal General Correspondence, 1903 - 1915, Code 140, Orders for Supplies, No Help
- Box 27, Benicia Arsenal General Correspondence, 1903 - 1915, Code 118, Inspections, No Help
- Box 56, Benicia Arsenal General Correspondence, 1903 - 1915, Ordnance, No Help
- Box 84, Benicia Arsenal General Correspondence, 1903 - 1915, Code 102, Ordnance Detachment at Benicia, No Help
- Box 91, Benicia Arsenal General Correspondence, 1903 - 1915, Code 110, Target Practice, No Help
- Box 97, Benicia Arsenal General Correspondence, 1903 - 1915, Code 110, Target Practice, No Help
- Box 102, Benicia Arsenal General Correspondence, 1903 - 1915, Ordnance, No Help
- Box 105, Benicia Arsenal General Correspondence, 1903 - 1915, Code 102, Ordnance Detachment at Benicia, No Help
- Box 108, Benicia Arsenal General Correspondence, 1903 - 1915, Code 102, Ordnance Detachment at Benicia, No Help

**National Archives and Records Administration
Pacific Southwest Region
Laguna Niguel, CA**

Federal Records Center:

RG 77: No Help.

National Archives:

RG 77: No Help.

RG 270: No Help.

**Benicia Public Library
Benicia, California**

Benicia Police Department

"Dedication Benicia Arsenal", Benicia Police Department 49er Festival Year Book 1954. Benicia Arsenal Sharpshooter Vertical File, Benicia Public Library, Benicia, California.

**Army Corps of Engineers
Historical Office
Ft. Belvoir, Virginia**

Corps of Engineers Sacramento District

Realty Control File Summary (Form 1603) "Benicia Arsenal", 2/2/68.
Headquarters Corps of Engineers Historical Files, Washington, D.C.

6.4 Summary of Interviews

Several people were interviewed regarding OEW and CWM contamination on the Benicia Arsenal property. Most of the interviews revealed no useful information, no cause for concern, or led to another person to interview. Only interviews that produced specific information are summarized.

6.4.1 Mr. Jim Campbell, Benicia Industries, Inc.

Mr. Campbell is general manager of Benicia Industries. Our original purpose in contacting him was to obtain permission to inspect bunkers on Benicia Industries property. Mr. Campbell had military experience with the arsenal and informed us of an artillery test area.

6.4.2 Mr. Ron Rice, Benicia Fire Department

Mr. Rice is associated with the Benicia Fire Department and the local museums. He was not aware of any suspected OEW or CWM contamination but did inform us of tunnels used to test fire howitzer barrels.

6.4.3 Lt. Mike Daly, Benicia Police Department

Lt. Daly informed us of three documented incidents of found ordnance. His record keeping system has been in place for about six years, so other incidents are possible but not on record.

6.4.4 Ms. Jeanette Fair, Exxon Oil Co.

Our original purpose in contacting Ms. Fair was coordination of our inspection of the bunkers on Exxon property. Ms. Fair informed us that Exxon had removed many bunkers as the refinery was constructed. No problems were encountered during construction. She also informed us that the remaining bunkers were empty when Exxon took possession and the bunkers are now used by various private companies for storage. She requested that information related to occupants of the bunkers remain confidential.

6.5 Site Inspection

6.5.1 General

The site inspection was performed during the period 30 November 1993 through 2 December 1993 by the following St. Louis District personnel:

Ted Moore	Project Manager
Pat O'Donnell	Historian and Site Safety Officer
Ken Brimm	Historian

6.5.2 Detailed Site Inspection

Prior to our arrival in Benicia, we were aware of ordnance storage bunkers on Benicia Industries property and on Exxon's property. Our records review indicated the possibility that two igloos were used for chemical weapons storage and that a cistern may have been used for chemical weapons storage.

We contacted Mr. Dan Schiada of the Benicia Public Works Department prior to our arrival in Benicia. He suggested we visit his office to review maps and records and decide the areas to inspect. He would help us get permission to inspect the properties after our arrival in Benicia.

We met with Mr. Schiada at 1:00 p.m. on 30 November to review maps and drawings. Based on this records review, we selected specific areas to inspect. We performed a driving tour of the site to verify the areas to be inspected and then contacted owners to obtain permission to enter their properties. The specific areas identified for inspection were; Area 1) ordnance storage bunkers on Benicia Industries property; Area 2) ordnance storage bunkers on Exxon Oil Co. property; and Area 3) open air ordnance storage on property owned by Mr. Stephen David. Inspection of all of the storage bunkers was arranged for 1 December. We made several attempts to find Mr. David but were not successful.

Prior to departing for the subject sites on 1 December, Pat O'Donnell gave the safety briefing.

Our first stop was the storage bunkers on Benicia Industries property. Mr. Jim Campbell of Benicia Industries met us there to open the gate. While discussing the site with Mr. Campbell, he advised us of an area where artillery pieces were test fired. He agreed to show us the area later in the day. We inspected three storage bunkers on Benicia Industries property. We were able to open doors on two of the bunkers and found both of them empty. The third bunker contained property owned by a private individual and was locked. We inspected a band approximately 100 feet wide around each bunker and found scattered debris. The debris around one of the bunkers was a variety of scrap metal. We inspected this debris very closely and found nothing to indicate OEW or CWM. Photographs of these bunkers are in Appendix G.

Our next stop was the storage bunkers on Exxon's property. There are 23 bunkers on Exxon's property. Ms. Jeannette Fair, Security Officer for Exxon, made arrangements for our inspection. She also provided a map of the area and a list showing who is using each bunker for storage. She indicated that all but two of the bunkers are currently in use. One of these remaining two is available for use. The door is jammed on the other one. She indicated that all of the bunkers were empty when Exxon took possession of the property. She also indicated that many bunkers were destroyed as Exxon built its refinery. No incidents of OEW or CWM were reported when the bunkers were destroyed. We were accompanied by an Exxon security guard on our inspection. We did not ask for permission to inspect the inside of the bunkers based on the occupancy information provided by Ms. Fair. We did look into a couple bunkers that were open, and found no evidence of OEW or CWM. We inspected a band approximately 100 feet wide around each bunker. The only suspicious item found was a mound near bunker A-218. The mound is approximately three feet high and 15 feet in diameter. There is a depression near the mound which indicated to us that the mound was made intentionally. There was no evidence of OEW or CWM found around this mound or around any other bunkers. Typical photographs of these bunkers are shown in Appendix G.

We next met Mr. Campbell at his office. He accompanied us to the area where artillery pieces were test fired. He needed a few minutes to orient himself with the area but was able to show us the area where the guns were set up and the impact area. This test area is located on City of Benicia property. We inspected this area as well as the hillside beyond the impact area and found no evidence of OEW or CWM. The location of the artillery test area is shown as Area 4 on Map 2. Photographs of this area are in Appendix G.

During the evening of 1 December, we phoned Mr. Ron Rice. Mr. Rice is associated with the local museums and the fire department. We asked Mr. Rice about suspected burial sites or contaminated areas on the arsenal property. We also described the areas we had inspected. Mr. Rice indicated his belief that the arsenal had generally been left in good condition, but asked why we didn't inspect the tunnels located near

the artillery test area we had inspected earlier in the day. We informed him that we hadn't seen any tunnels. Although he could not give specific directions to the tunnels, he insisted they are there and should be easy to find since they are built of concrete and are 15 feet in diameter. He said Yuba Mfg. used the tunnels to test howitzer barrels. This seemed like a bit of a challenge so we decided to try to find the tunnels the next day.

On 2 December, we returned to the artillery test area inspected the previous day. The roads were muddy so we began walking up the valley. We found the tunnels about 1 mile from the artillery test area. There are two concrete tunnels side by side. Each tunnel is approximately 10' by 10' and extends about 100' into the hillside. The firing point is about 100' from the tunnel openings and is enclosed by concrete walls. We inspected the tunnels and the firing point and inspected the surrounding area. We found no evidence of OEW or CWM. The location of the tunnels is shown as Area 5 on Map 2. Photographs are contained in Appendix G.

As stated previously, we were not able to locate Mr. Stephen David. We drove the public road through his property on 30 November and found most of the area occupied by industrial buildings and parking areas. The unimproved area appears to be used by a construction company as an office and equipment storage area. Our route to the tunnel area overlooks Mr. David's property. We could see nothing of concern. Photographs of Mr. David's property are contained in Appendix G.

Apparently all of the bunkers were referred to as igloos. We found nothing that indicated specific bunkers were used for CWM storage. No evidence of a cistern used for CWM storage was found. We asked each individual who assisted us with the site inspection for information about CWM storage. No one was aware of igloos or a cistern used for CWM storage.

6.6 Interpretation of Aerial Photography

Photo analysis and land use interpretation were performed at the site with the use of aerial photography from 1962, 1973 and 1991. The Benicia, California and Vine Hill, California USGS quadrangle maps were used as a reference for the photography. The approximate negative scale is as follows:

<u>Photography Date</u>	<u>Scale</u>	<u>Source</u>	<u>Identifier(s) Frame(s)</u>
02 Jul 1962	1" = 2,000'	Geonex	1/56-59
22 Jul 1962	1" = 2,000'	Geonex	8/131-133
10 Jul 1973	1" = 2,000'	Geonex	3594/181-185 3594/188-191 3594/238-239
17 Feb 1991	1" = 2,000'	Geonex	6/1-3

The site covers a portion of the eastern limits of the town of Benicia, California. It extends northeast from the city limits. The July 1962 photographs show an industrial complex, bordered by a small residential area, in the southern portion of the site. Several lagoons appear and a few buildings appear on the extreme eastern side, bordering the Carquinez Strait. On the eastern side of the site are a railroad yard and an apparent warehouse complex. A tip on the northern end of the site contains numerous short railroad spurs leading from the trunk line. These lead to flat, unused areas which may have been outside storage at some previous time. The remainder of the site, perhaps roughly half, shows evidence of a very irregular access road system. Leading from these roads are driveways which terminate at apparent doorways into the natural terrain. These could be underground bunkers, probably used for storage. A few of these bunkers showed evidence of blast walls, most do not. The majority of these bunkers blended in with the natural terrain but a few showed evidence of semicylindrical roofing. Erosion may have washed away the soil covering these structures. The July 1973 photos show a number of major changes on the site. An Interstate-type highway has been put in place which runs northeastward through the site. A large building complex with adjacent tank farms, giving the appearance of a refinery, has been constructed through the middle of the site and extends toward the west, replacing about half of the underground storage bunker area that appeared on the 1962 photographs. The February 1991 photographs show a limited expansion of the refinery. Also, there are numerous new buildings in the northern tip and in the 1962 warehouse complex serviced by the railroad trunk line in the northeast part of the site. The appearance of the buildings in proximity of the railroad give the impression of storage warehouses. The underground bunker network that covered a significant area on the 1962 photos now covers a relatively small section.

The period between July 1962 and February 1991 shows a vast change in the cultural picture of the site. A significant portion of the site was covered by a complex of underground storage bunkers in 1962. Much of this area has been converted to an expanding refinery. A warehouse storage area that appeared on the 1962 photographs is expanded with many new buildings.

6.7 Map Analysis

The site was analyzed by referencing to the USGS 7.5 minute quadrangle sheets BENICIA, CALIFORNIA and VINE HILL, CALIFORNIA with the site located at 38° 03' 30" North Latitude by 122° 07' 30" West Longitude in Solano County, California.

The quadrangles show Interstate 680 highway, regular city streets, Southern Pacific Railroad, irregular secondary road pattern, oil refinery, lagoons, warehouse type buildings, and industrial complex. Contours, at 20' intervals, are shown. A wide water course on the eastern boundary is labeled Carquinez Strait.

Another map reviewed in this analysis was Sheet No. 2 of the Basic Information Maps series of the Benicia Arsenal. This is entitled Reservation Boundary & Land Use Map. Quarters, warehouses, administrative structures, igloo magazines, garages, storehouses, and outbuildings are labeled and identified. Contours are traced at 10' intervals from a map drawn in 1942 by Clyde C. Kennedy and in 1944 by troops of the 305th Engineer Battalion. The map identifies the underground storage structures that are visible on the photographs as large and medium size igloo magazines. This map shows part of Interstate 680 as being complete and part is under construction. Scale of this map is 1" = 400'. No date is noted on this map.

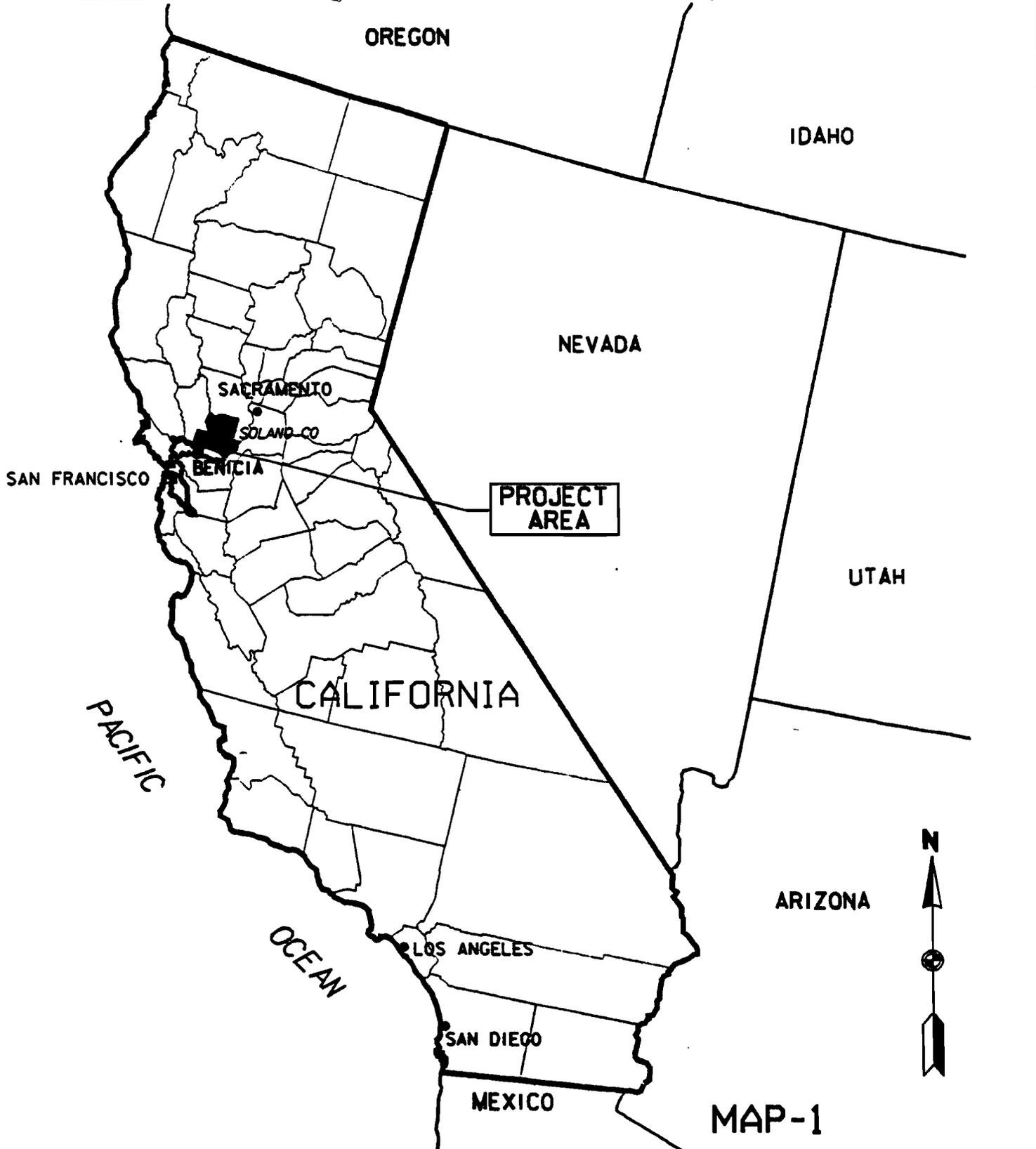
7.0 Evaluation of Ordnance Contamination

Our records searches, aerial photo review, interviews, and site inspections confirm the presence of ordnance storage bunkers, artillery test areas, and the open air ordnance storage areas. There was no evidence of OEW or CWM contamination at any of the areas inspected. Neither Benicia Industries Inc. or Exxon Oil Co. reported any OEW or CWM incidents.

Records searches revealed a cistern was altered for storage of chemical warfare ammunition. Map 3 shows the location of 14 cisterns on Benicia Arsenal. It is possible there were others. Cistern #1 is the most likely site since it was located in the vicinity of other ordnance storage facilities. We looked for cisterns in the vicinity of Area # 1 (Map 2), but no evidence of cisterns was found.

Interviews with the Benicia Fire Department revealed anecdotal evidence of a few incidents involving OEW. Our interview with the Benicia Police Department revealed some anecdotal evidence of incidents involving OEW and three recorded incidents. Their record keeping system has been in place for about six years. One of the recorded incidents involved aluminum shrapnel. One involved a hand grenade dug up by landscapers. The last incident involved a 105 mm howitzer round dug up at the site of an environmental cleanup of lead contamination. The round was empty. The cleanup involved considerable excavation and the round was found in the middle of the lot. Copies of the incident reports are contained in Appendix C-6.

MAPS/DRAWINGS



**BENICIA ARSENAL
 SOLANO COUNTY
 BENICIA, CALIFORNIA
 DERP-FUDS * J09CA075600
 VICINITY MAP**

NOT TO SCALE

PROJ. DATE: DEC 1993

DATE OF MAP: 1993

07-FEB-1994 12:08

MORE/SITE/IGM/MAP/CA0756

APPENDIX A
REFERENCES

(SEE MAIN BODY OF REPORT)

APPENDIX B
ACRONYMS

**ORDNANCE AND EXPLOSIVE WASTE
CHEMICAL WARFARE MATERIALS
ARCHIVES SEARCH REPORT
FOR
BENICIA ARSENAL
BENICIA, CALIFORNIA**

DERP-FUDS SITE NO. J09CA075600

APPENDIX B

ACRONYMS

ASR	Archive Search Report
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CWM	Chemical Warfare Material
DERP	Defense Environmental Restoration Program
DOD	Department of Defense
ERDA	Environmental Restoration Defense Account
FDE	Findings and Determination of Eligibility
FUDS	Formerly Used Defense Sites
HQUSACE	Headquarters, U.S. Army Corps of Engineers
HTW	Hazardous and Toxic Waste
INPR	Inventory Project Report
MCX	Mandatory Center of Expertise
NCP	National Contingency Plan
OEW	Ordnance and Explosive Waste
RAC	Risk Assessment Code
SARA	Superfund Amendments and Reauthorization Act
SFPE	San Francisco Port of Embarkation
SSHP	Site Specific Safety and Health Plan
USACE	U.S. Army Corps of Engineers
USAEDH	U.S. Army Engineer Division, Huntsville
USGS	U.S. Geological Survey
UXO	Unexploded Ordnance

APPENDIX C

REPORTS/STUDIES/LETTERS/MEMORANDUMS

**ORDNANCE AND EXPLOSIVE WASTE
CHEMICAL WARFARE MATERIALS
ARCHIVES SEARCH REPORT
FOR
BENICIA ARSENAL
BENICIA, CALIFORNIA**

DERP-FUDS SITE NO. J09CA075600

APPENDIX C

REPORTS/STUDIES/LETTERS/MEMORANDUMS

- APPENDIX C - 1 INVENTORY PROJECT REPORT**
- APPENDIX C - 2 FINDINGS OF FACT**
- APPENDIX C - 3 ENDANGERED SPECIES LIST**
- APPENDIX C - 4 SITE SPECIFIC SAFETY AND HEALTH PLAN**
- APPENDIX C - 5 SITE VISIT TRIP REPORT**
- APPENDIX C - 6 BENICIA POLICE DEPARTMENT INCIDENT REPORTS**

APPENDIX C - 1

INVENTORY PROJECT REPORT

)

**DEFENSE ENVIRONMENTAL RESTORATION PROGRAM
FORMERLY USED DEFENSE SITES**

INVENTORY PROJECT REPORT

**BENICIA ARSENAL
SOLANO COUNTY, CALIFORNIA**

PROJECT NO. J09CA075600

Prepared for:

**SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 Capitol Mall, CESP-K-ED-M/ISS
Sacramento, California 95814-4794**

Prepared by:

**THE EARTH TECHNOLOGY CORPORATION
100 W. Broadway, Suite 5000
Long Beach, California 90802-4443**

August, 1990

**SITE SURVEY SUMMARY SHEET
FOR
DERP-FUDS SITE NO. J09CA075600
BENICIA ARSENAL**

SITE NAME: Benicia Arsenal. The site was also known as Benicia Arsenal Expansion Project; Benicia Arsenal Expansion, Railroad Car Holding Yard Project; Benicia Arsenal Reservation; Benicia Arsenal Wharf; Arsenal Reservation; Benicia Ordnance Report; Benicia Arsenal Military Reservation; Benicia Barracks; and "The Original Garrison", Benicia Arsenal, Solano County, California.

LOCATION: San Francisco Bay area, Solano County, approximately one mile east of the City of Benicia and 25 miles northeast of San Francisco, California, Figure 1.

SITE HISTORY: From 1849 to 1958 the United States acquired 1,790.48 fee acres, 351.12 public domain acres, 6.40 license acres, and 580.04 easement acres (2,728.04 total acres). The site was used for an arsenal by the U.S. Army Ordnance Corps. The arsenal served as a principal depot for ordnance storage and issuance (supplies, ammunition, small arms parts and accessories), and the manufacture of small arms, mobile and seacoast artillery targets.

Prior to 1940, improvements to the site consisted of four brick officers quarters; nine frame, one brick, one sandstone enlisted men's barracks and quarters; one frame, four brick, one sandstone, and two concrete shop buildings; four sandstone, three brick, one galvanized iron, seven hollow tile, and four concrete magazines; thirteen frame, fourteen brick, nine concrete, one sandstone, one hollow tile, and one galvanized iron building for storage and other purposes. The site also had a water pumping and distribution system; sewer and drainage system; electric power and light distribution system; and a telephone and fire alarm system.

From 1941 to 1960, improvements to the site consisted of civilian and officer family units, a carpenter shop, storage and warehouse facilities, a fire station, a motor repair shop, office buildings, garages, loading platforms, recreation facilities, ammunition bunkers, and a wharf. The majority of the buildings were constructed of reinforced concrete. At the peak of activity (1941-1953) the arsenal accommodated over 4,500 civilian workers.

Benicia Arsenal was declared excess by DOD and was reported to the General Services Administration on January 11, 1963. On February 26, 1965, 1.33 public domain acres were reassigned to Benicia Arsenal Cemetery. The total property acres acquired were disposed of as follows: from 1945 to 1960, lease terminated for 575.45 acres; on January 11, 1962, 360.78 public domain/license/easement/lease acres reported excess; and, GSA quitclaim deed to the City of Benicia (Surplus Property Authority) 5.03 and 1,785.45 fee acres on March 12, 1964 and February 20, 1965, respectively. The arsenal remained vacant from 1965 to 1975. In February 1975, the City of Benicia leased the arsenal property (except for six

buildings currently maintained by the City of Benicia) to Benicia Industries, Inc., a private land development firm. The site is currently a mixture of residential housing, light to heavy industrial/commercial activities, and warehousing.

SITE VISIT: A site visit was conducted on July 25, 1990. Mr. Douglas Perreira and Mr. Paul Robinson, Earth Technology, visited the site. They met with Mr. Don Curtis, Director of Public Works for the City of Benicia. Mr. Curtis presented a brief history of the site and pointed out current activities.

Currently, twenty-eight DOD built structures remain at the site, six of which are maintained by the City of Benicia. The others are either occupied by private industry or vacant. The buildings are in fair to good condition. Ten ammunition storage bunkers (igloo-type) and two large magazine storage bunkers were observed. Six of the bunkers are currently used by private industry for equipment or food product storage. The others are not in use.

The site does not contain any known underground storage tanks or landfills. Military debris and waste by-products (paint, solvent, oil, etc.) were reportedly dumped into the Suisun Bay and Carquinez Straits during DOD occupancy (per conversation with Benicia Arsenal historian Mr. James Milburn on July 30, 1990). There is no report on file regarding complaints, observations, or inquiries in connection with explosive ordnance at the site. There is no documentation that an ordnance and explosive waste disposal assessment was performed at the site.

State and local environmental agencies contacted and their response to environmental contamination concerns at the Benicia Arsenal site are as follows: State RWQCB -- no groundwater contamination; State DHS -- lead contamination at Powder Magazine 1; and Solano County DHS -- lead contamination only (at Powder Magazine 1).

Lead contamination was suspected at two areas of the arsenal by Benicia Industries, Inc. in 1987 during property inspection for future site development. In 1987, Benicia Industries, Inc. commissioned Harding Lawson Associates to perform soil testing for lead contamination at Powder Magazine 1 (Building 10, east side of arsenal) and at Building No. 49 (southeast corner of arsenal). Test results were negative for Building No. 49 and positive for Powder Magazine 1. Seventy-eight samples were taken on July 13, 1987 at both areas, with nine samples exceeding Total Threshold Limit Concentrations (TTL) and forty samples exceeding Soluble Threshold Limit Concentrations (STLC). The highest lead concentration in these samples was 14,000 ppm. Excavation and removal of 100 cubic yards of soil adjacent to Powder Magazine 1 was performed by Harding Lawson Associates on November 15, 1988. Post-excavation sampling tested below DHS specified cleanup levels. Backfill and compaction with imported fill was completed on November 18, 1988 (refer to photograph of Powder Magazine No. 1). Names of all persons and agencies contacted are in the project file.

50

CATEGORY OF HAZARD: NOFA.

PROJECT DESCRIPTION: None proposed.

AVAILABLE STUDIES AND REPORTS: Harding Lawson Associates; Assessment of Lead Contamination Powder Magazine 1 Site; May 12, 1988. Harding Lawson Associates; Remediation of Lead-Contaminated Soil Powder Magazine 1 Site; January 11, 1989.

Bruegmann, Robert; Benicia: Portrait of an Early California Town, an Architectural History; Schibners; 1980.

PA POC: Ms. Sharon V. Bruno, CESP-K-ED-M-DI, 916/551-1049

APPENDIX C - 2
FINDINGS OF FACT

**DEFENSE ENVIRONMENTAL RESTORATION PROGRAM
FORMERLY USED DEFENSE SITES
FINDINGS AND DETERMINATION OF ELIGIBILITY**

**BENICIA ARSENAL, CALIFORNIA
SITE NO. J09CA075600**

FINDINGS OF FACT

1. From 1849 to 1958, the United States acquired 1,790.48 fee acres, 351.12 public domain acres, 6.40 license acres, 4.16 easement acres, and 575.88 lease acres for the Benicia Arsenal (2,728.04 total acres).
2. From 1849 to 1960, the U.S. Department of the Army used the site as a principal depot for ordnance storage and issuance (ammunition, small arms parts, and military supplies) and the manufacture and testing of small arms, mobile and seacoast artillery targets. During DOD ownership of the property, more than 350 structures were built, of which approximately 40% were temporary structures. The site had a water pumping and distributing system; sewer and drainage system; electric power and distributing system; and a telephone and fire alarm system. The Army abandoned the site after 1960. The site was exclusively under the jurisdiction of DOD and owned by the United States.
3. On January 11, 1962, Benicia Arsenal was declared excess by DOD and was reported to the General Services Administration. On February 26, 1965, 1.33 acres of public domain property was reassigned to Benicia Arsenal Cemetery. The total property acres acquired were disposed of as follows (it appears that there were no restoration nor recapture provisions): from 1945 to 1960, lease terminated for 575.45 acres; on January 11, 1962, 360.78 public domain/license/easement/lease acres reported excess; and, GSA quitclaim deed to the City of Benicia (Surplus Property Authority) 5.03 and 1,785.45 fee acres on March 12, 1964 and February 20, 1965, respectively. The arsenal remained vacant from 1965 to 1975. In 1975, the City of Benicia leased the arsenal property (six historic buildings were withheld for public use) to Benicia Industries, Inc., a private land development firm. The six city maintained DOD built structures are the Clocktower, Commandants House, Camel Barns (2), engine house, and an ammunition storage bunker. Benicia Industries currently maintains twenty-two DOD built structures. The structures are in fair to good condition. All of the other DOD built structures were either destroyed by several fires in 1922 and 1983, or were torn down. The site is currently used for residential housing, light to heavy industry, warehousing, and as a port.

DETERMINATION

Based on the foregoing findings of fact, the site has been determined to be formerly used by DOD. It is, therefore, eligible for the Defense Environmental Restoration Program - formerly used Defense Sites established under 10 USC et. seq.

Date

Dennis K. Culp, Jr.
Colonel, EN
Commanding

APPENDIX C - 3

ENDANGERED SPECIES LIST

Appendix C-3

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND
 CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA OF THE PROPOSED
 STORAGE AND/OR DISPOSAL OF EXPLOSIVE WASTE AND CHEMICAL WARFARE MATERIALS
 IN THE BENICIA AREA,
 SOLANO COUNTY, CALIFORNIA
 (1-1-94-SP-221, DECEMBER 21, 1993)

Listed Species**Fish**

winter-run chinook salmon, *Oncorhynchus tshawytscha* (T)
 delta smelt, *Hypomesus transpacificus* (T)

Birds

bald eagle, *Haliaeetus leucocephalus* (E)
 American peregrine falcon, *Falco peregrinus anatum* (E)
 California clapper rail, *Rallus longirostris obsoletus* (E)

Mammals

salt marsh harvest mouse, *Reithrodontomys raviventris* (E)

Proposed Species

None

Candidate Species**Fish**

green sturgeon, *Acipenser medirostris* (2R)
 longfin smelt, *Spirinchus thaleichchys* (2R_a)

Amphibians

California tiger salamander, *Ambystoma californiense* (2_a)
 western spadefoot toad, *Scaphiopus hammondi hammondi* (2R)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (2)

Birds

black rail, *Lateralus jamaicensis* (2)
 Suisun ornate shrew, *Sorex ornatus sinuosus* (1)
 Suisun song sparrow, *Melospiza melodia maxillaris* (2)
 salt marsh common yellowthroat, *Geothlypis trichas sinuosa* (2)

Appendix C-3

Mammals

- San Francisco dusky-footed woodrat, *Neotoma fuscipes arnectans* (2)
 Pacific western big-eared bat, *Plecotus townsendii townsendii* (2)
 greater western mastiff-bat, *Eumops perotis californicus* (2)

Plants

- Suisun aster, *Aster chilensis* var. *lenticus* (2)
 soft bird's-beak, *Cordylanthus mollis* ssp. *mollis* (1)
 delta tula-pea, *Lathyrus jepsonii* var. *jepsonii* (2)

- (E)--Endangered (T)--Threatened (P)--Proposed (CH)--Critical Habitat
 (1)--Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.
 (2)--Category 2: Taxa for which existing information indicated may warrant listing, but for which substantial biological information to support a proposed rule is lacking.
 (1R)--Recommended for Category 1 status.
 (2R)--Recommended for Category 2 status.
 (a)--Listing petitioned.
 (*)--Possibly extinct.
 (#)--Published 1 year petition finding indicates that taxon warrants listing.

APPENDIX C - 4

SITE SPECIFIC SAFETY AND HEALTH PLAN

SITE SPECIFIC SAFETY AND HEALTH PLAN (SSHP)
for
Benicia Arsenal
Benicia, California

1. **PURPOSE.** This plan prescribes the safety and health requirements for team activities and operations conducted to determine the presence of ordnance and explosive waste (OEW) from conventional munitions and/or chemical warfare material (CWM) at the specified site.
2. **APPLICABILITY.** This plan applies to HQUSACE personnel and assigned elements under the control of HQUSACE.
3. **REFERENCES.** The provisions of this plan implement safety and health standards and requirements contained in 29 CFR 1926, 29 CFR 1960, 30 CFR 56, Executive Order 12196, DODI 6055.1, AR 385-10, AR 385-40, and EM 385-1-1.
4. **STATEMENT OF SAFETY AND HEALTH POLICY.**
 - a. No person shall be required or instructed to work in surroundings or under conditions which are unsafe or dangerous to his or her health.
 - b. Each team member has the responsibility to immediately halt the team's operations and activities upon encountering an unsafe situation or act.
 - c. Each team member is responsible for reading the SSHP before a site visit, complying with applicable safety requirements, wearing prescribed safety equipment, knowing the symptoms of chemical agents, and preventing avoidable accidents.
5. **TRAINING.** Prior to site visits each team member shall have received the necessary training, to include refresher training on a scheduled basis, as required by the references listed in paragraph 3.
6. **REPORTING REQUIREMENTS.** Safety violations will be immediately reported to the designated team safety officer. The team safety officer shall report the findings of fact regarding the safety violation(s) through designated channels, as prescribed by the references listed in paragraph 3.
7. **SITE SPECIFICS.** Site description, possible hazards, OEW procedures, emergency telephone numbers (medical, police, fire, and other contacts), personnel protective equipment, weather precautions, responsible personnel, site control and communications are provided in enclosure 1AA. Map 2 is the map of the site to be surveyed. Prior to entering the site itself, a briefing by the team safety officer shall be provided to all team members.

Patrick O'Donnell
Safety Officer

59
42

**Enclosure 1AA
SITE SPECIFICS
for
Benicia Arsenal
Benicia, California**

1. Site Descriptions: Benicia Arsenal is now an industrial park in Benicia, California.

2. Possible Hazards.

a. OEW/CWM Hazards. A records search to date indicates that there may be contamination from the storage, handling and shipment of Mustard Gas and conventional ordnance at Benicia Arsenal. Records indicate that 1000-pound Mustard Gas bombs were held at Benicia Arsenal. Normal safety precautions will be observed at all times. Team members should be familiar with the characteristics and symptoms associated with all agents mentioned. All members should refer to the charts at the back of this plan for full information.

b. Toxic Wastes.

c. Natural Hazards. In addition to snakes and other dangerous wildlife, also avoid harmful vegetation such as poison ivy and oak, exercise caution in walking the area to avoid slips, trips, and falls. Site vegetation could pose a trip hazard.

d. Other Hazards. Other hazards associated with any outdoors trek are expected. Hard hats should be worn in old, unstable bunkers or old unused buildings. Keep alert for work vehicles associated with the industrial park operations.

3. OEW/CWM Reconnaissance Procedures.

a. Movement. Before walking in a particular direction, scan your approach with your eyes. Do not stray from travelled paths or enter areas with dense vegetation. **REMEMBER – STAY ALERT, STAY ALIVE!** Teams will walk in pairs with a safety officer monitoring a pair of individuals. It is important to stay in eyesight of team members and to stay in pairs.

b. Sighting. Upon sighting a suspicious object, note its size, shape, any markings, and specific location. **DO NOT TOUCH ANYTHING!**

c. Actions. Alert all team members. Withdraw to a safe distance. The safety officer will mark the area with survey tape. If the suspicious object is considered to be an immediate threat, designated team members will remain in the area at a safe distance to warn civilians until the unexploded ordnance (UXO) personnel arrive. Notes regarding the suspicious object will be compiled by the project manager on the team for the archival search report.

d. Notification. If the suspicious object is considered to be an immediate threat, the safety officer will contact and advise the Huntsville Safety Division and the local police.

4. Emergency Telephone Numbers.

a. Medical: Vallejo Hospital, 525 Oregon Street, Vallejo, California.
(707) 648-2200

b. Fire: 911 or 746-4275

c. Police: 911 or 745-3412

d. Other Contacts. Huntsville Safety Division, (205) 955-4968; St. Louis District Corps of Engineers, PM-M (Mike Dace), (314) 331-8036.

5. Location of Nearest Telephone to Site. Companies in the industrial park and the Benicia Museum.

6. Location and Telephone Number of Nearest Hospital. As above, Vallejo Hospital, 648-2200, 525 Oregon Street, Vallejo.

7. First Aid. If a medical emergency arises, each team member qualified in Standard First Aid/CPR should be prepared to administer aid, until medical personnel arrive.

8. Personnel Protective Equipment.

a. Personal Equipment on Site. Check the following equipment: eye protection, ear protection, gloves, boots, notebook/pen, and personal SSHP copy with associated chemical charts.

b. Team Equipment on Site. Check the following equipment: first aid kit, survey tape, flashlight w/batteries, 35 mm camera, w/100-300 mm zoom lens, 35 mm film (24 exp., 400 ASA), binoculars, general purpose knife, maps of area, FM 9-16 (Explosive Ordnance Recognition), and carrying bag.

9. Weather Precautions.

a. Cold Weather: Although freezing temperatures are unlikely, the bay area is often chilly and damp. Dress appropriately to avoid hypothermia.

b. Heat: Not applicable for this trip.

c. Severe Weather. The safety officer will monitor local newscasts for any type of severe weather and take the necessary safety precautions.

10. Team Personnel and Responsibilities.

a. Safety Officer: Patrick O'Donnell. The safety officer has overall authority and responsibility to ensure safety procedures are complied with while on site.

b. Project Manager: Ted Moore. Prior to actually entering the site, the project manager will inform the safety officer of the time schedule, routes to be taken and the specific locations on the site to be surveyed. If the safety officer becomes incapacitated, the project manager will assume the duties of the safety officer.

c. Other Team Member: Ken Brimm. Team member will assist the safety officer as necessary. Under no circumstances will any team member participate in any activity contrary to the advice of the safety officer.

d. On-Site Personnel: Any personnel of Benicia Museum, Benicia Industrial Park, or members of private concerns in the industrial park are not under the jurisdiction of the appointed safety officer. However, personnel will not participate in activities deemed unsafe by the safety officer, regardless of the advice given by any personnel of Benicia Museum, Benicia Industrial Park, or private concerns within the industrial park.

e. Other Personnel: All other accompanying personnel must attend the safety briefing of this plan.

11. Site Control and Communications.

a. Site Control. While on site, team members will stay together in pairs and remain within eyesight and vocal contact with each other.

b. Site Communications. The nearest telephones are at the Benicia Museum.

c. Hand Signals among members. If audible communications are not possible, the following standard hand signals will be used:

Hand gripping throat----choking/can't breathe due to smoke or other airborne contaminants.

Grip partner's wrist or both hands around waist----Leave area Immediately/stop movement.

Hand gripping nose----Unusual smell detected.

Thumbs up/down----OK, I am all right, I understand/No, negative.

Wave hand in a circular motion above head----gather together here, now.

12. Changes to SSHP. As the situation dictates and without risking the safety of team personnel, the safety officer may modify aspects of the plan in coordination with team personnel.

OSHP SAFETY BRIEFING CHECKLIST

Site Name Benicia Date/Time _____
check subject, when briefed

General

Purpose of Site Visit Statements of Safety and Health
Training Received Administrative Reporting Requirements

Specifics

Site Description
Possible Hazards: OEW/CWM Hazards Toxic Wastes _____
Natural Hazards Other Hazards

OEW/CWM Reconnaissance Procedures: General Movement _____
Sighting Actions
Notification

Emergency Telephone Numbers: Medical Fire
Police Other Contacts

Location of Nearest Telephone to Site
Location and Telephone Number of Nearest Hospital
First Aid

Personnel Protective Equipment: Personal Equipment
Team Equipment

Weather Precautions: Cold Weather Heat Severe Weather

Team Personnel and Responsibilities: Safety Officer _____
Project Manager _____
Other Team Members _____

Site Control and Communications: Site Control _____
Site Communications _____
Alternate Audible _____ Hand Signals _____

Changes/Additional Comments _____

ACKNOWLEDGEMENT OF BRIEFING BY TEAM PERSONNEL

Full Name & Organization	Signature
Theodore K. Moore CELMS-PM-M	<u>Theodore K. Moore</u>
Kenneth Brimm CELMS-PD-AC	<u>Kenneth J. Brimm</u>
_____	_____
_____	_____

Safety briefing presented by: Patrick O'Donnell
Patrick E. O'Donnell
(Signature)

APPENDIX C - 5
SITE VISIT TRIP REPORT

MEMORANDUM FOR: Mike Dace

3 December 1993

SUBJECT: Trip Report, Benicia Arsenal, 29 November - 2 December 1993

The following personnel participated in this trip:

Pat O'Donnell
Ken Brimm
Ted Moore

Monday, 29 November 1993

1000 Departed St. Louis for San Francisco (Scheduled departure was 0917)

1530 Arrived in Benicia, CA

1530 to end of the day. We visited the local library and police station. Mr. David Dodd of the Benicia library was contacted prior to our arrival in Benicia. He provided pictures and general information about the site. Sgt. Eger of the Benicia Police Department gave us a general idea of types and locations of ordnance items found on the former arsenal property. He did not have time to search their records and suggested we return on Wednesday to get more detailed information.

Evening Contacted local veterans organizations to get names of individuals familiar with the arsenal.

Tuesday, 30 November 1993

0730 - noon We visited the City offices to locate maps, visited the local museum to obtain a list of people to contact regarding activities at the arsenal, visited the fire department to find out about instances of ordnance being found, and drove around the site to familiarize ourselves with the area. The fire department gave a general description of items found, but felt the police department records would be more accurate.

1300 to end of the day. We had an appointment with Dan Schiada of the Benicia Public Works Department at 1:00 p.m. We reviewed old maps and records and made a preliminary tour of the arsenal so that specific areas could be identified and the owners contacted. Mr. Rob Braulik, Economic Development Director, accompanied us on the tour. The maps and records review revealed two areas that we were not previously aware of; an open air ordnance storage area and a firing range. We were given the names of owners to contact so that site inspections could be arranged. We spent the rest of the day setting up site inspections for Wednesday. We were not able to find the owner of the property used for open air storage.

Wednesday, 1 December 1993

0800 - 0900 We returned the police station. Sgt. Eger was not available, but we were able to meet with Lt. Mike Daly. He was not able to do a records search for us at the time but promised to provide information later. He indicated that they have only been on a computerized system since 1987. He will probably not be able to provide reports of incidents prior to 1987.

0900 Our first site inspection consisted of three ordnance storage igloos (magazines) located on property owned by Benicia Industries. Mr. Jim Campbell met us at the site and unlocked the gate. He also was familiar with the location of a firing range and agreed to meet with us later in the day to inspect that area.

1000 Our second site inspection consisted of 23 ordnance storage igloos located on Exxon's property. Ms. Jeanette Fair was our contact point and made arrangements for us to be escorted to the individual igloo sites. She also provided a list showing current use of the igloos

1400 to end of the day. We met Mr. Campbell at his office and proceeded to the firing range. Mr. Campbell needed some time to reorient himself with the area but was able to show us where the artillery pieces were set up and the impact area. We then performed a sweep of the area including the field beyond the impact area.

Evening. We made phone calls to local individuals familiar with the site. One of the calls revealed another area that we did not know about. According to Mr. Ron Rice, there were tunnels used to test howitzer barrels. The tunnels were supposedly located near the firing range we had visited earlier in the day. He acted surprised that we had not seen them. We decided to try to find the tunnels the next morning.

Thursday, 2 December 1993

0730 Since Mr. Rice was not able to give us an exact location of the tunnels, we decided to start at the base of the valley where we thought the tunnels should be and work our way up. Most of the area was inaccessible by car so it took considerable walking to find the tunnels. The tunnels were about 1 1/2 miles further up the valley from the firing range we inspected on Wednesday.

Even though we were not able to get permission to inspect the open air storage areas, the route we took to find the tunnels overlooked the open air storage areas. We photographed the areas which consist primarily of industrial building and paved parking areas.

1000 Departed Benicia, CA

0705 Arrived in St. Louis

APPENDIX C - 6

BENICIA POLICE DEPARTMENT INCIDENT REPORTS

1. AGENCY BENICIA P.D.		2. CASE NUMBER 93-03363	
BENICIA POLICE DEPARTMENT CONTROLLED DOCUMENT			

3. COPY TO	D.A.	PROB.	D.O.J.	OTHER	NOT TO BE DUPLICATED	US ARMY CORP	PAGE 1	
4. DATE & TIME OCCURRED (MO. DY. YR.)	9/2/93	1130	5. DATE	9/3/93	0135	CONSTRUCTION SITE	6. REP. DEV. CO	120

8. NARRATIVE

NAMES TO APPEAL:

Released by	Date
-------------	------

1- BLEVENS, ~~LEWIS ROAD~~, 1021 SAN ANTONIO, ALAMEDA (*)
 (370) 522-3512 1/12/31, FIELD OPERATIONS MGR,
 HAZELG CONSTRUCTION SERVICES, INC. (415) 892-0821

2- EGGL, SGT. DAVE, 200 EAST L ST., BENICIA (*)
 745-3412

3- OLIVEIRO, JOHN, CONSTRUCTION MATERIALS (*)
 TRIDENT, INC, JOEL TRISTER, H.P. 625-4281,
 PEA # 444-2199

9/3/93, APPROX. 0820 AM, MYSELF AND SGT. EGGL MET WITH (*) BLEVENS AT THE DIRT CONSTRUCTION SITE ACROSS FROM RUSSELL WOODWORKS, 2980 RAYSHORE ROAD, RELATIVE TO A EXPLOSIVE DEVICE (LATER IDENTIFIED AS A .155 ARTILLERY ROUND).

(*) BLEVENS STATED THAT WHEN EXCAVATING YESTERDAY 9/2/93 @ 1130 AM, THE ABOVE MENTIONED EXPLOSIVE WAS DETECTED NEAR THE MED-LOT, APPROX. 30' FROM RAYSHORE ROAD, THEN WAS HAND-CARRIED, SHORTLY AFTER BY (*) OLIVEIRO, TO THE N/W SIDE OF THE CONSTRUCTION SITE, NEAR THE CONSTRUCTION PORTABLES.

AT APPROX. 0900 AM, THREE DAYS (9/3/93) E.O.D. (EX-PLORERS ORDNANCE DISPOSAL AGREED), FOUND THE .155 ARTILLERY ROUND TO BE EMPTY, THEN LEFT WITH SAME.

9. SIGNATURE OF REPORTING OFFICER	11. I.D. NUMBER	12. REVIEWED BY	13. FOLLOW-UP REFERRED TO	14. FURTHER ACTION
	#1634			YES <input type="checkbox"/> NO <input type="checkbox"/>

** POLICE CALL NO: 01-932460051 MISC/INFO/EXTRA PATROL **

Disposition.: REPORT TAKEN Date Recvd: 090393 WS-ID: C5 User: CHRIS
Incident No.: 01-93003363 Resp: 1 Units: 01 Lock : U Status: F/A
Caller Name: COMES OFFICER Phone#: (000) 000-0000
Caller Addr: 00000 BENICIA POLICE Apt: City/ST:
Loc. of Call: 03001 BAYSHORE ROAD Apt: City...:

I
N
F
O
R
M

Common Name:						Intersection:	
Unit#	Received	Dispatch	At Scene	Available	Police Employees	Veh ID	
- 203	085322	085328	085331	000000	0634		
001 REQUESTS A CASE & PULLED FOR INFO REPORT REGARDING CAD						Narrative	T
002 CALL # 932450111. CALL IS REGARDING THE EXPLOSIVE DEVICE						Narrative	I
003 FOUND IN THE CONSTRUCTION SITE AT 3001 BAYSHORE.						Narrative	O
004 ** EOD ENROUTE AT 0745 HOURS ** EOD ON SCENE AT 0906 HRS **						Narrative	N
005 ** THE DEVICE WAS AN EMPTY 105 HOWITZER ** /CH						Narrative	

Control Line:
Narrative #1:
Caller Name: L-
Caller Addr: 00000
Loc. of Call: 00000
Common Name:
Intersection:
Type of Call:

F- M- Phone: 000 0000 / 000
Apt: Ct/St:
Apt: City :
Call#: Resp: Units:
Asgn.:
Disp.:

CAD202 9/03/93 09:21:30

**BENICIA POLICE DEPARTMENT
CONTROLLED DOCUMENT
NOT TO BE DUPLICATED**

Released to _____

Released by _____ Date _____

1. AGENCY BENICIA P.D.					<input checked="" type="checkbox"/> INFORMATION REPORT <input type="checkbox"/> CONTINUATION <input type="checkbox"/> FOLLOW-UP			2. CASE NUMBER 93-00752			
3. COPY TO		D.A.		PROB.		D.O.L.		OTHER		PAGE 1	
4. DATE & TIME OCCURRED (MO. DY. YR.) 2-28-93 0957			DATE & TIME REPORTED 2-28-93 0957			5. DAY SUN		7. LOCATION BAYSHORE N. OF BRIDGEHEAD		8. REP. DEV. CT.	
9. NARRATIVE											
NAMES TO APPEAR:					Released by:						
MIKE R. BOARDMAN			5-15-56			605 EAST FIFTH ST.			745-9103 (RP)		
SGT. REILLY			E.O.D.			PRESIDIO ARMY BASE			(415) 561-2437 (*)		
SGT. ANDERSON			E.O.D.			PRESIDIO ARMY BASE			(415) 561-2437 (*)		
<p>FACTS: (RP) BOARDMAN PHONED THE POLICE DEPARTMENT AND REPORTED FINDING A SUSPICIOUS OBJECT, POSSIBLY A PIPE BOMB, IN THE PICNIC AREA ON THE SHORELINE ADJACENT TO BAYSHORE ROAD, APPROX. 300 YARDS NORTH OF THE BENICIA BRIDGE. I CONTACTED (RP) BOARDMAN AT THE SCENE AND OBSERVED THE OBJECT LYING IN PLAIN VIEW ON THE GRASS.</p> <p>THE OBJECT WAS CYLINDRICAL IN SHAPE, APPROX. 1 FOOT LONG AND APPROX. 4" IN DIAMETER. IT APPEARED TO BE A LARGE BEVERAGE CAN WRAPPED IN TAPE. THERE WAS A SMALL HOLE IN THE SIDE OF THE OBJECT WITH THE BURNT REMNANTS OF A FUSE OR WICK PROTRUDING. THE OBJECT LOOKED WATERLOGGED.</p> <p>I SECURED THE AREA AND E.O.D. WAS NOTIFIED. SGT. REILLY AND SGT. ANDERSON ARRIVED. SGT. REILLY EXAMINED THE OBJECT AND AFTER OPENING IT, DETERMINED IT TO BE A CONTAINER OF SMOKELESS BLACK POWDER, WITH A FUSE ATTACHED. THE OBJECT WAS DAMP AND IN NO DANGER OF DETONATING. E.O.D. TOOK THE OBJECT WITH THEM.</p>											
10. SIGNATURE OF REPORTING OFFICER DEL TORCHIO					11. I.D. NUMBER 956		12. REVIEWED BY A 2-28-93		13. FOLLOW-UP REFERRED TO		14. FURTHER ACTION YES <input type="checkbox"/> NO <input type="checkbox"/>

**** POLICE CALL NO: 01-930590047 SUSPICIOUS CIRCUMSTANCES ****

Disposition.: REPORT TAKEN Date Recvd: 022893 WS-ID: C4 User: JENN
 Incident No.: 01-93000752 Resp: 2 Units: 02 Lock : L Status: F/A
 Caller Name: BOARDMAN MIKE Phone#: (000) 745-9103
 C Caller Addr: 00605 EAST 5TH Apt: City/ST:
 Loc. of Call: 00000 BAYSHORE ROAD BY Apt:F City....
 A Common Name: Intersection:

Unit#	Received	Dispatch	At Scene	Available	Police	Employees	Veh ID
L SS	095702	100043	100052	000000	0956		

001	RPTS ON BAYSHORE ROAD EAST OF THE RAILROAD TRESSELS BY	Narrative
L 002	SULFUR SPRINGS HE NOTICED A POSSIBLE PIPE BOMB. RP	Narrative
003	STATES THERE IS A METAL CONTAINER WITH TAPE WRAPPED	Narrative
* 004	AROUND IT, WITH A SMALL HOLE IN THE SIDE AND A WICK COMING	Narrative
005	OUT OF IT. HE STATED IT LOOKED LIKE SOMEONE TRIED TO	Narrative
006	LIGHT IT BUT WAS UNSUCCESSFUL AND THEY DISGARDED IT.	Continuat

Control Line:
 Narrative #1: RPTS ON BAYSHORE ROAD EAST OF THE RAILROAD TRESSELS BY
 Caller Name: L- BOARDMAN F- MIKE M- Phone: 745 9103 / 000
 Caller Addr: 00605 EAST 5TH Apt: Ct/St:
 Loc. of Call: 00000 BAYSHORE ROAD BY SULFUR S Apt: City :
 Common Name: Call#: 47F Resp: 2 Units: 02
 Intersection: / Asgn.: SS
 Type of Call: 102 SUSPICIOUS CIRCUMSTA Disp.: REPORT TAKEN
 CAD202 2/28/93 11:59:48

**BENICIA POLICE DEPARTMENT
 CONTROLLED DOCUMENT
 NOT TO BE DUPLICATED**

Released to _____

Released by _____ Date _____

**** POLICE CALL NO: 01-930590047 SUSPICIOUS CIRCUMSTANCES ****

Disposition.: REPORT TAKEN Date Recvd: 022893 WS-ID: C4 User: JENN
 Incident No.: 01-93000752 Resp: 2 Units: 02 Lock : L Status: F/A
 Caller Name: BOARDMAN MIKE Phone#: (000) 745-9103
 C Caller Addr: 00605 EAST 5TH Apt: City/ST:
 Loc. of Call: 00000 BAYSHORE ROAD BY Apt:F City...:
 A Common Name: Intersection:
 Unit# Received Dispatch At Scene Available Police Employees Veh ID
 L 007 IT ALSO LOOKED LIKE OTHERS WERE LITE IN THE AREA DUE Narrative
 008 TO HIM SEEING ALUMINUM SHRAPNEL AROUND. Narrative
 L 009 ** EDD RESPONDING. CASE# PULLED FOR AN INFO REPORT. Narrative

Control Line:
 Narrative #1: RPTS ON BAYSHORE ROAD EAST OF THE RAILROAD TRESSELS BY +--
 Caller Name: L- BOARDMAN F- MIKE M- Phone: 745 9103 / 000
 Caller Addr: 00605 EAST 5TH Apt: Ct/St:
 Loc. of Call: 00000 BAYSHORE ROAD BY SULFUR S Apt: City :
 Common Name: Call#: 47P Resp: 2 Units: 02
 Intersection: / Asgn.: ^SS
 Type of Call: 102 SUSPICIOUS CIRCUMSTA Disp.: REPORT TAKEN
 CAD202 2/28/93 12:00:02

BENICIA POLICE DEPARTMENT
CONTROLLED DOCUMENT
 NOT TO BE DUPLICATED

Released to _____

Released by _____ Date _____

** POLICE CALL NO: 01-921290061 ASSIST HEALTH DEPARTMENT **
 Disposition.: REFERRED TO OT Date Recvd: 050892 WS-ID: C5 User: DIRK
 Incident No.: Resp: 2 Units: 01 Lock : U Status: F/F
 Caller Name: MCKELVEY J.C. Phone#: (000) 747-5508
 C Caller Addr: 00000 NICKS CUSTOM GOL Apt:R City/ST:
 Loc. of Call: 03190 PARK ROAD Apt: City...:
 A Common Name: NICK'S CUSTOM GOLF CART Intersection: BAYSHORE ROAD
 Unit# Received Dispatch At Scene Available Police Employees Veh ID
 L T1 131009 131221 131338 144548 1060
 S2 131009 131221 000000 144548 0078
 L 001 RPTS SOME LANDSCAPERS DUG UP A HAND GRENADE ON THE PROPERTY. Narrative :
 002 *** 1317 HRS EDD E/R Narrative (

Control Line:
 Narrative #1:
 Caller Name: L- F- M- Phone: 000 0000 / 000
 Caller Addr: 00000 Apt: Ct/St:
 Loc. of Call: 00000 Apt: City :
 Common Name: Call#: Resp: Units:
 Intersection: / Assn.:
 Type of Call: Disp.:
 CAD202 12/07/93 11:18:08

BENICIA POLICE DEPARTMENT
CONTROLLED DOCUMENT
 NOT TO BE DUPLICATED

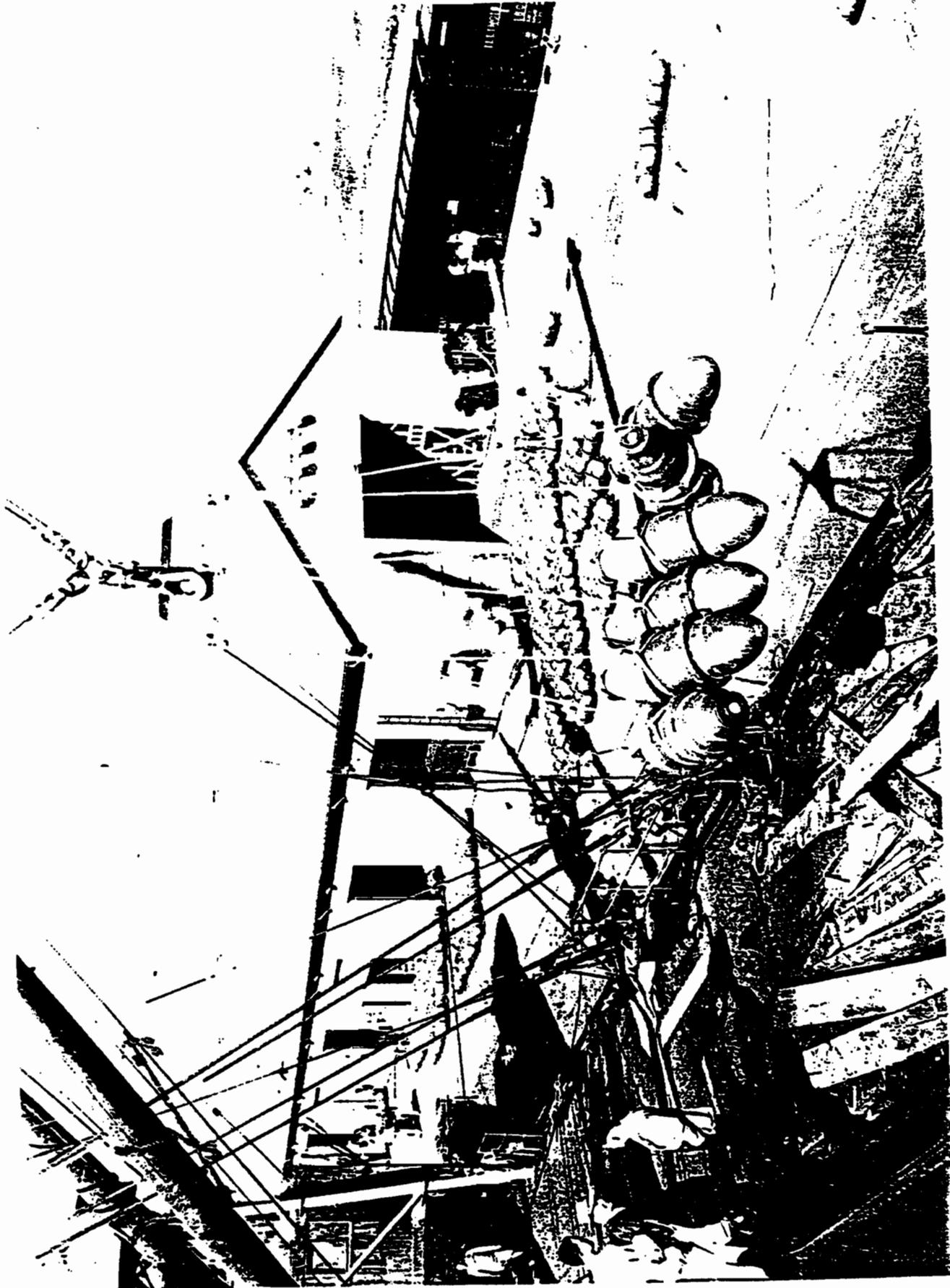
Released to _____

 Released by _____ Date _____

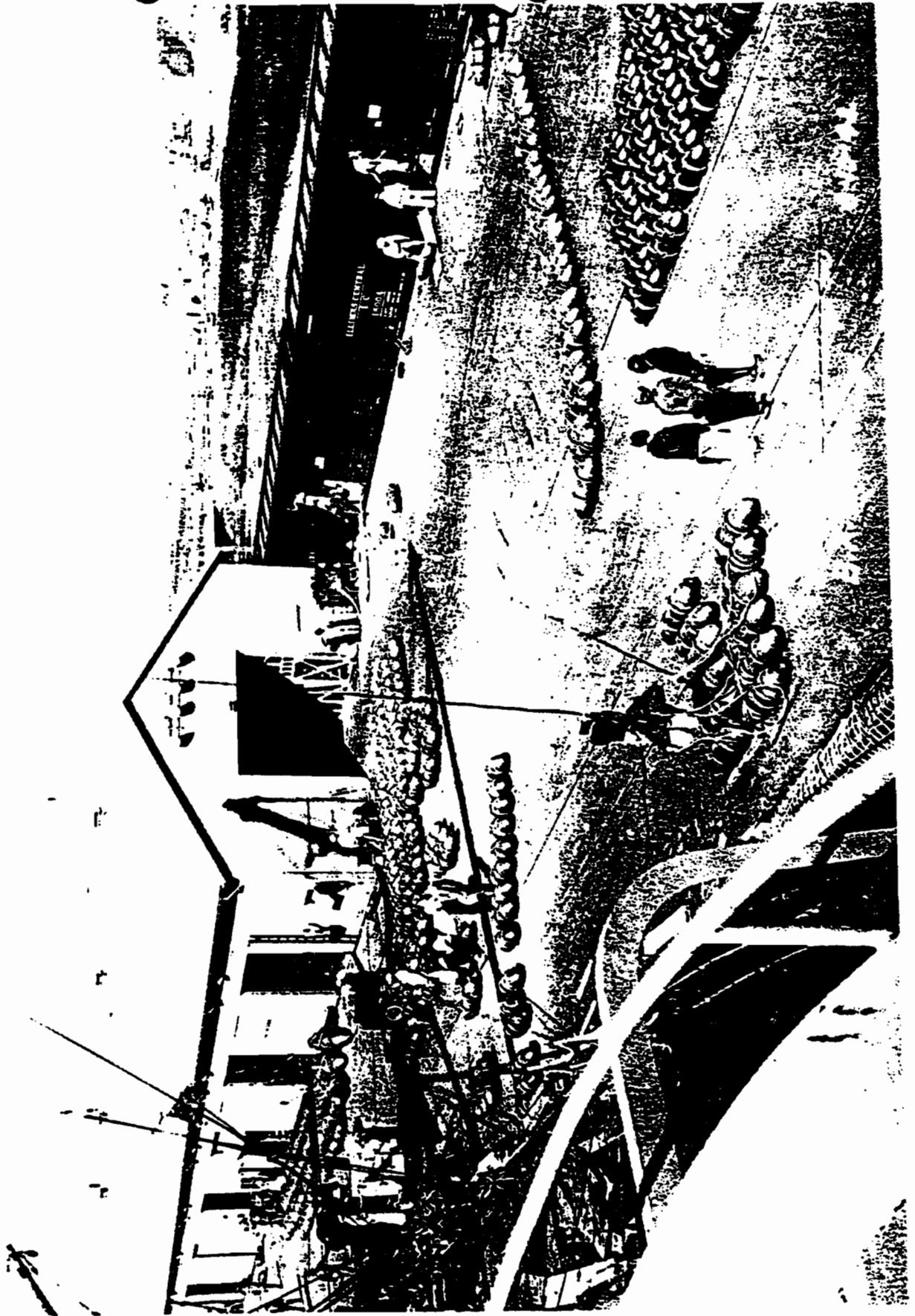


APPENDIX D
HISTORICAL PHOTOGRAPHS





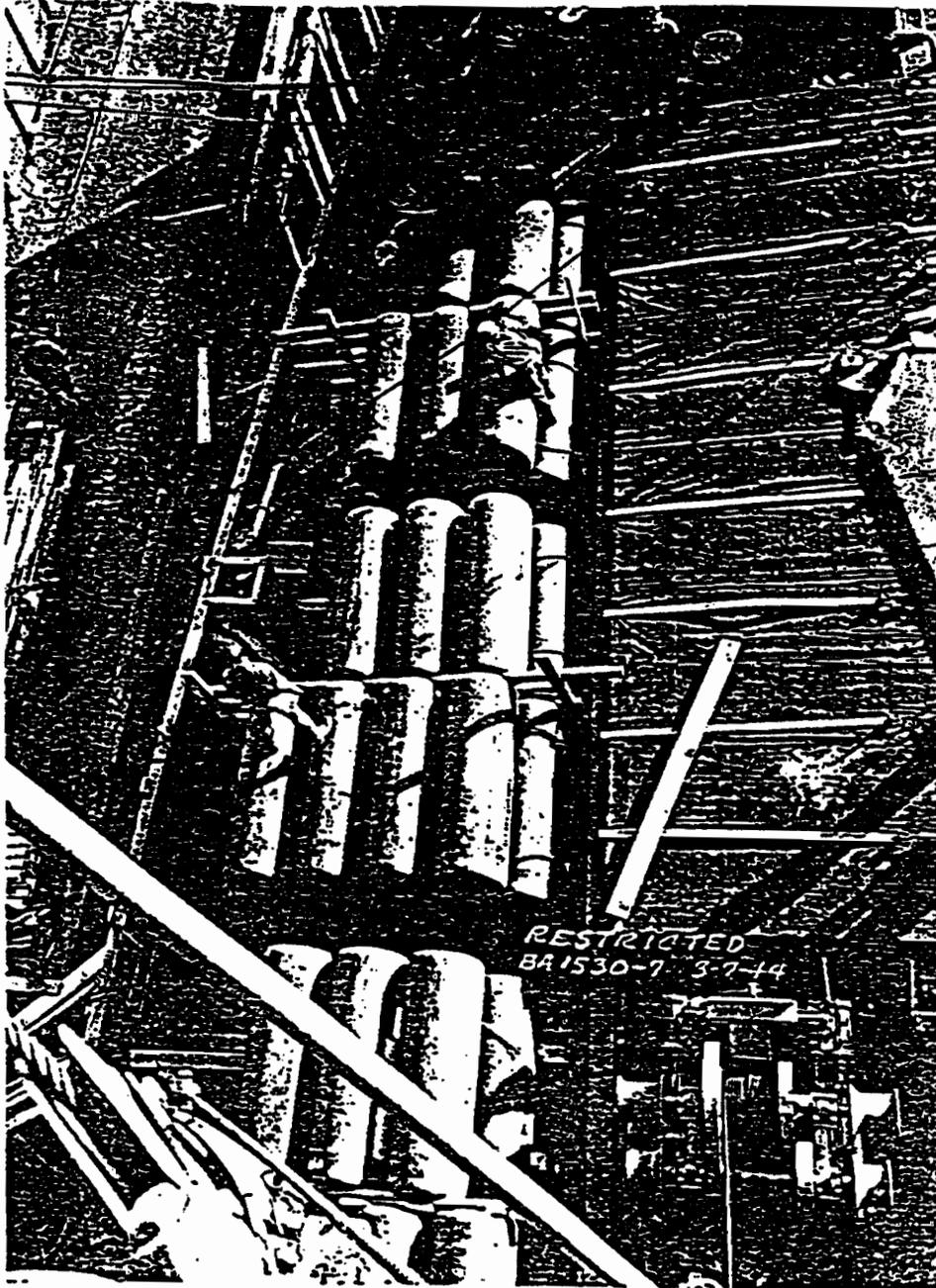
LOADING/UNLOADING OF MUSTARD BOMBS



LOADING/UNLOADING OF MUSTARD BOMBS



115# M70 "H" Bombs Stored in Igloo
at Benicia Arsenal Awaiting Shipment
Overseas.



Loading One Ton Containers of "H" at
Benicia Arsenal. (Note heavy ropes
between layers.)

APPENDIX E
INTERVIEWS

TELEPHONE OR VERBAL CONVERSATION RECORD

DATE 1 December 1993

For use of this form, see AR340-13; the proponent agency is the Adjutant General's Office.

SUBJECT OF CONVERSATION		
Benecia Arsenal		
OUTGOING CALL		
PERSON CALLING	ADDRESS	PHONE NUMBER AND EXT.
Ted Moore	CELMS PM-M	(314) 331-8849
PERSON CALLED	OFFICE	PHONE NUMBER AND EXT.
Ron Rice	Private Individual	(707) 795-0525

SUMMARY OF CONVERSATION:

We were referred to Mr. Rice after a visit to the local fire department. Mr. Rice is associated with the fire department as well as the local museums.

Mr. Rice was not aware of any areas of contamination remaining on the arsenal property. He knew there were instances of ordnance found but could not relate details. He suggested the police department could provide more details.

He asked if we had inspected the artillery test tunnels. He seemed surprised when I told him we had no idea they existed or where they were located. He was not able to give us an exact location but said we would find the tunnels in the valley above former the open storage area.

TELEPHONE OR VERBAL CONVERSATION RECORD

DATE 22 November 1993

For use of this form, see AR340-15; the proponent agency is the Adjutant General's Office.

SUBJECT OF CONVERSATION		
Benicia Arsenal		
OUTGOING CALL		
PERSON CALLING	ADDRESS	PHONE NUMBER AND EXT.
Ted Moore	PM-M	(314) 331-8849
PERSON CALLED	OFFICE	PHONE NUMBER AND EXT.
Dan Schiada	Publics Works Office Benicia, CA	(707) 746-4240

SUMMARY OF CONVERSATION:

I called Mr. Schiada to make initial contact with the property owner and to schedule a site inspection. Mr. Schiada indicated that the project area is privately owned, but he could help us with a general tour of the area.

He has several maps of the arsenal and seemed interested in taking the time to show us the maps and to study them himself. I asked him if it would be possible to visit questionable areas if we found areas on the maps that looked like potential problem areas. He said he would contact Mr. Phil Plant of Benicia Industries and let him know that we may need to get permission to go on private property to view these areas.

I asked Mr. Schiada if he was aware of any chemical weapons or conventional ordnance found in the area. He described an area that is currently undergoing an environmental cleanup. During excavation to encase lead contamination, a shell casing was found. The local EOD unit as well as local authorities were called to deal with the situation. It was determined there was no danger associated with the ordnance item.

I also asked Mr. Schiada if he knew of any individual who might have knowledge of the site going back to World War II. He said one of the city councilman was a life long resident of the area. He will make the contact for us.

We are scheduled to meet with Mr. Schiada at 1:00 p.m. in his office at the City Hall. We will then visit any suspicious sites in the project area.

TELEPHONE OR VERBAL CONVERSATION RECORD

DATE 7 December 1993

For use of this form, see AER340-15; the reporting agency is the Adjutant General's Office.

SUBJECT OF CONVERSATION Incidents where Benecia Police called in EOD.		
INCOMING CALL		
PERSON CALLING Lt. Mortonson	ADDRESS Benecia Police Department	PHONE NUMBER AND EXTENSION 707-745-3412
PERSON CALLED Michael Tarabulski	OFFICE PD-AH	PHONE NUMBER AND EXTENSION 314-331-8794

Lt. Mortonson called around 1400 hrs, looking for Pat O'Donnell. I took the call. Mortonson asked if we just wanted information the incident reports he had gathered or the whole report. I opted for the latter and he said he would fax it as soon as we got off the phone, which he did when we did.

He said, apropos of the incident reports he sent, that they were difficult to find in the department database. Until 1987 such reports were filed under the name of the person who reported the incident. Since 1987, and the installation of a computer automated dispatch system (CAD), call records have only been kept around for two years. He searched the computer for strings like EOD, which gave him the reports at hand and all reports with the name Theodore in them.

From his own experience, though he could not find the report, he recalls an incident in 1988 or 89. Construction workers found a large howitzer shell on the SW corner of Park and Elm. There is now a building on this site.

Mortonson also said that some of his colleagues have told him that ordnance have been found on what rumor has it used to be a firing range across from the Exxon refinery.

Generally, he was curious about our mission, helpful, and apologetic about the inadequacies of their information retrieval system. I explained a little of the purpose of our ASRs, thanked him for his help, and assured him that we had encountered information retrieval set-ups compared to which his was a wonder of modern technology, a tribute to the science of programming, a thing of beauty and a joy forever.

APPENDIX F

NEWSPAPERS/JOURNALS

(NOT USED)

APPENDIX G

PRESENT SITE PHOTOGRAPHS

ORDNANCE AND EXPLOSIVE WASTE
CHEMICAL WARFARE MATERIALS
ARCHIVES SEARCH REPORT
FOR
BENICIA ARSENAL
BENICIA, CALIFORNIA

DERP-FUDS SITE NO. J09CA075600

APPENDIX G

PRESENT SITE PHOTOGRAPHS

Page G-3

PHOTO # 1 - Debris near igloo on Benicia Industries property

PHOTO # 2 - Debris near igloo on Benicia Industries property

Page G-4

PHOTO # 3 - Typical igloo on Benicia Industries property

PHOTO # 4 - Typical igloo on Exxon's property

Page G-5

PHOTO # 5 - Typical igloo on Exxon's property

PHOTO # 6 - Open storage area

Page G-6

PHOTO # 7 - Open storage area

PHOTO # 8 - Firing point for artillery testing (Area 4)

Page G-7

PHOTO # 9 - Impact point for artillery testing (Area 4)

PHOTO # 10 - Hillside behind impact point for artillery testing (Area 4)

**ORDNANCE AND EXPLOSIVE WASTE
CHEMICAL WARFARE MATERIALS
ARCHIVES SEARCH REPORT
FOR
BENICIA ARSENAL
BENICIA, CALIFORNIA**

DERP-FUDS SITE NO. J09CA075600

APPENDIX G

PRESENT SITE PHOTOGRAPHS

Page G-8

PHOTO # 11 - Front of artillery test tunnels (Area 5)

PHOTO # 12 - Side entrance to artillery test tunnel (Area 5)



PHOTO # 1
DEBRIS NEAR IGLOO ON BENICIA INDUSTRIES PROPERTY



PHOTO # 2
DEBRIS NEAR IGLOO ON BENICIA INDUSTRIES PROPERTY



PHOTO # 3
TYPICAL IGLOO ON BENICIA INDUSTRIES PROPERTY



PHOTO # 4
TYPICAL IGLOO ON EXXON'S PROPERTY

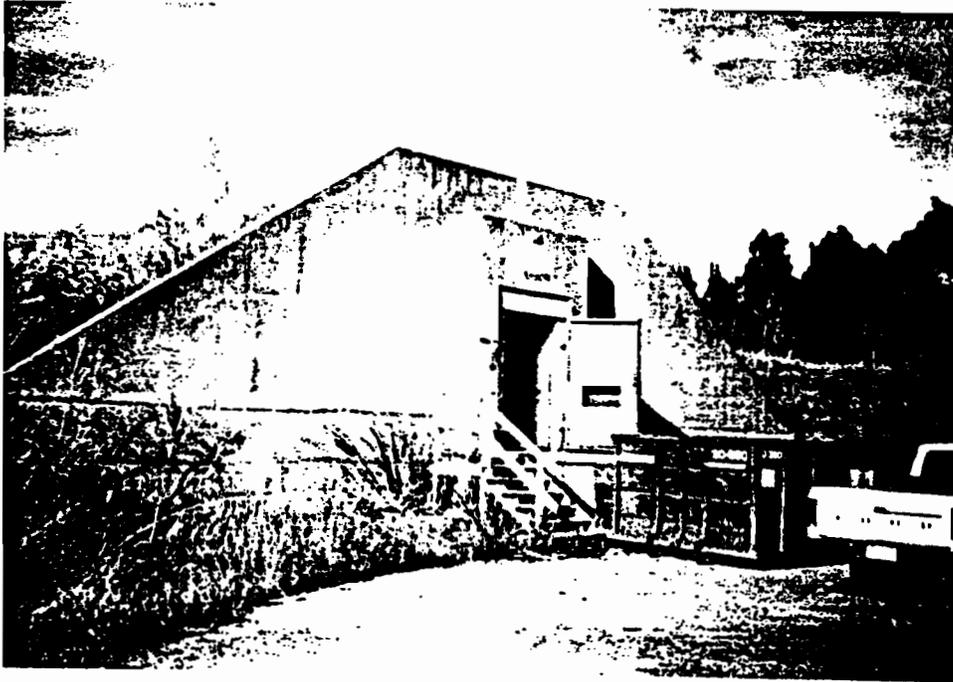


PHOTO # 5
TYPICAL IGLOO ON EXXON'S PROPERTY

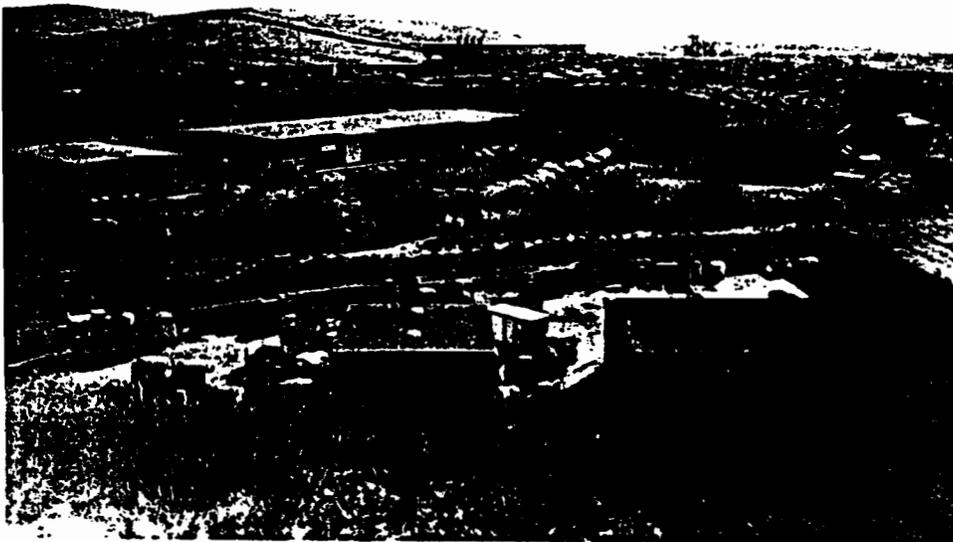


PHOTO # 6
OPEN STORAGE AREA



**PHOTO # 7
OPEN STORAGE AREA**



**PHOTO # 8
FIRING POINT FOR ARTILLERY TESTING
(AREA 4)**



PHOTO # 9
IMPACT POINT FOR ARTILLERY TESTING
(AREA 4)

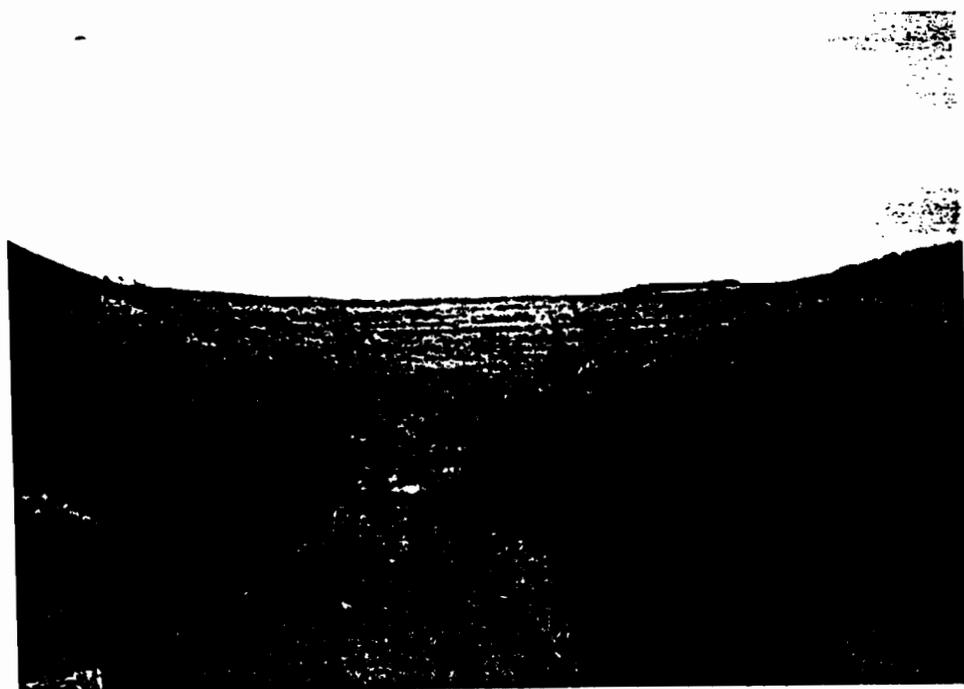


PHOTO # 10
HILLSIDE BEHIND IMPACT POINT FOR ARTILLERY TESTING
(AREA 4)



**PHOTO # 11
FRONT OF ARTILLERY TEST TUNNELS
(AREA 5)**



**PHOTO # 12
SIDE ENTRANCE TO ARTILLERY TEST TUNNEL
(AREA 5)**

APPENDIX H
HISTORICAL MAPS/DRAWINGS
(NOT USED)

APPENDIX I
RISK ASSESSMENT CODE PROCEDURE FORMS

10 Feb 93

**RISK ASSESSMENT PROCEDURE FOR
ORDNANCE AND EXPLOSIVE WASTE (OEW) SITE**

Site Name	<u>Benicia Arsenal</u>	Rater's Name	<u>Ted Moore</u>
Site Location	<u>Benicia, CA</u>	Phone No.	<u>(314) 331-8849</u>
DERP Project#	<u>J09CA075600</u>	Organization	<u>CEHMS-PM-M</u>
Date Completed	<u>January 11, 1994</u>	RAC Score	<u>2</u>

OEW RISK ASSESSMENT:

This risk assessment procedure was developed in accordance with MIL-STD 882B and AR 385-10. The RAC score will be used by CEHND to prioritize the remedial action at this site. The OEW risk assessment should be based upon best available information resulting from records searches, reports of Explosive Ordnance Disposal (EOD) detachment actions, and field observations, interviews, and measurements. This information is used to assess the risk involved based upon the potential OEW hazards identified at the site. The risk assessment is composed of two factors, hazard severity and hazard probability. Personnel involved in visits to potential OEW sites should view the CEHND videotape entitled "A Life Threatening Encounter, OEW."

Part I. Hazard Severity. Hazard severity categories are defined to provide a qualitative measure of the worst credible mishap resulting from personnel exposure to various types and quantities of unexploded ordnance items.

TYPE OF ORDNANCE
(Circle all values that apply)

A. Conventional Ordnance and Ammunition	VALUE
Medium/Large Caliber (20mm and larger)	10
Bombs, Explosive	10
Grenades, Hand and Rifle, Explosive	(10)
Landmines, Explosive	10
Rockets, Guided Missiles, Explosive	10
Detonators, Blasting Caps, Fuzes, Boosters, Bursters	6
Bombs, Practice (w/spotting charges)	6
Grenades, Practice (w/spotting charges)	4
Landmines, Practice (w/spotting charges)	4
Small Arms (.22 cal - .50 cal)	1
Conventional Ordnance and Ammunition (Select the largest single value)	<u>10</u>

What evidence do you have regarding conventional OEW? Local police responded to landscapers who found a hand grenade and a construction site where a shell casing was found.

B. Pyrotechnics (For munitions not described above)

VALUE

Munition (Container) containing White Phosphorus or other Pyrophoric Material (i.e., Spontaneously Flammable)	10
Munitions Containing A Flame or Incendiary Material (i.e., Napalm, Triethylaluminum Metal Incendiaries)	6
Flares, Signals, Simulators	4
Pyrotechnics (Select the largest single value)	<u>0</u>
What evidence do you have regarding pyrotechnics?	<u>None</u>

C. Bulk High Explosives (Not an integral part of conventional ordnance; uncontainerized.)

VALUE

Primary or Initiating Explosives (Lead Styphnate, Lead Azide, Nitroglycerin, Mercury Azide, Mercury Fulminate, Tetracene, etc.)	10
Demolition Charges	10
Secondary Explosives (PETN, Compositions A, B, C Tetryl, TNT, RDX, HMX, HBX, Black Powder, etc.)	8
Military Dynamite	6
Less Sensitive Explosives (Ammonium Nitrate, Explosive D, etc.)	3
High Explosives (Select the largest single value)	<u>0</u>
What evidence do you have regarding bulk explosives?	<u>None</u>

D. Bulk Propellants (Not an integral part of rockets, guided missiles, or other conventional ordnance; uncontainerized)

VALUE

Solid of Liquid Propellants	6
Propellants	<u>0</u>
What evidence do you have regarding bulk propellants?	<u>None</u>

E. Radiological/Chemical Agent/Weapons

	VALUE
Toxic Chemical Agents (Choking, Nerve, Blood, Blister)	25
War Gas Identification sets	20
Radiological	15
Riot Control and Miscellaneous (Vomiting, Tear, incendiary and smoke)	5
Radiological/Chemical Agent (Select the largest single value	<u>0</u>
What evidence do you have regarding chemical/radiological OEW? <u>No evidence of CWM remains on the site.</u>	

Total Hazard Severity Value
(Sum of the Largest Values for A through E--Maximum of 61). 10
Apply this value to Table 1 to determine Hazard Severity Category.

TABLE 1

HAZARD SEVERITY*

Description	Category	Value
CATASTROPHIC	I	≥21
CRITICAL	II	≥10 <21
MARGINAL	III	≥5 <10
NEGLIGIBLE	IV	≥1 <5
**NONE		0

* Apply Hazard Severity Category to Table 3

**If Hazard Severity Value is 0, you do not need to complete Part II. Proceed to Part III and use a RAC Score of 5 to determine your appropriate action.

Part II. Hazard Probability. The probability that a hazard has been or will be created due to the presence and other rated factors of unexploded ordnance or explosive materials on a formerly used DOD site.

AREA, EXTENT, ACCESSIBILITY OF OEW HAZARD
(Circle all values that apply)

A. Location of OEW Hazards

	VALUE
On the surface	5
Within Tanks, Pipes, Vessels or Other confined locations	4
Inside walls, ceilings, or other parts of Buildings and Structures	3
Subsurface	(2)
Location (Select the single largest value)	<u>2</u>
What evidence do you have regarding location of OEW? <u>Police reports documenting OEW found.</u>	

B. Distance to nearest inhabited locations or structures likely to be at risk from OEW hazard (roads, playgrounds, and buildings).

	VALUE
Less than 1250 feet	(5)
1250 feet to 0.5 miles	4
0.5 miles to 1.0 miles	3
1.0 miles to 2.0 miles	2
Over 2 miles	1
Distance (Select the single largest value)	<u>5</u>
What are the nearest inhabited structures? <u>The property has been developed as an industrial park.</u>	

C. Numbers of buildings within a 2 mile radius measured from the OEW hazard area, not the installation boundary.

	VALUE
26 and over	5
16 to 25	4
11 to 15	3
6 to 10	2
1 to 5	1
0	0
Number of Buildings (Select the single largest value)	<u>4</u>

Narrative The former arsenal has been developed into an industrial park. There are also many commercial buildings on the site.

D. Types of Buildings (within a 2 mile radius)

	VALUE
Educational, Child Care, Residential, Hospitals, Hotels, Commercial, Shopping Centers	5
Industrial, Warehouse, etc.	4
Agricultural, Forestry, etc.	3
Detention, Correctional	2
No Buildings	0
Types of Buildings (Select the largest single value)	<u>5</u>

Describe types of buildings in the area. Office and industrial buildings.

E. Accessibility to site refers to access by humans to ordnance and explosive wastes. Use the following guidance:

BARRIER	VALUE
No barrier or security system	5
Barrier is incomplete (e.g. in disrepair or does not completely surround the site). Barrier is intended to deny egress from the site, as for a barbed wire fence for grazing.	4
A barrier, (any kind of fence in good repair) but no separate means to control entry. Barrier is intended to deny access to the site.	3
Security guard, but no barrier	2
Isolated site	1
A 24-hour surveillance system (e.g., television monitoring or surveillance by guards or facility personnel) which continuously monitors and controls entry onto the facility; or An artificial or natural barrier (e.g., a fence combined with a cliff), which completely surrounds the facility; and a means to control entry, at all times, through the gates, or other entrances to the facility (e.g., an attendant, television monitors, locked entrances, or controlled roadway access to the facility).	0
Accessibility (Select the single largest value)	<u>5</u>

Describe the site accessibility. Some fences exist on the site but the only ones that restrict access belong to Exxon.

F. Site Dynamics - This deals with site conditions that are subject to change in the future, but may be stable at the present. Examples would be excessive soil erosion by beaches or streams, increasing land development that could reduce distances from the site to inhabited areas or otherwise increase accessibility.

	VALUE
Expected	5
None Anticipated	0
Site Dynamics (Select largest value)	<u>5</u>

Describe the site dynamics. A large portion of the former arsenal property is vacant and available for development. Industrial is ongoing.

 Total Hazard Probability Value
 (Sum of Largest Values for A through F--Maximum of 30) 26
 Apply this value to Hazard Probability Table 2 to determine
 Hazard Probability Level.

TABLE 2

HAZARD PROBABILITY

Description	Level	Value
FREQUENT	A	≥27
PROBABLE	B	≥21<27
OCCASIONAL	C	≥15<21
REMOTE	D	≥ 8<15
IMPROBABLE	E	<8

* Apply Hazard Probability Level to Table 3.

Part III. Risk Assessment. The risk assessment value for this site is determined using the following Table 3. Enter with the results of the hazard probability and hazard severity values.

TABLE 3

Probability Level		FREQUENT A	PROBABLE B	OCCASIONAL C	REMOTE D	IMPROBABLE E
Severity Category:						
CATASTROPHIC	I	1	1	2	3	4
CRITICAL	II	1	2	3	4	5
MARGINAL	III	2	3	4	4	5
NEGLIGIBLE	IV	3	4	4	5	5

RISK ASSESSMENT CODE (RAC)

- RAC 1 Imminent Hazard - Expedite INPR - Immediately call CEHND-ED-SY--commercial (205) 955-4968 or DSN 645-4968
- RAC 2** High priority on completion of INPR - Recommend further action by CEHND.
- RAC 3 Complete INPR - Recommend further action by CEHND.
- RAC 4 Complete INPR - Recommend further action by CEHND.
- RAC 5 Recommend no further action. Submit NOFA and RAC to CEHND.

Part IV. Narrative. Summarize the documented evidence that supports this risk assessment. If no documented evidence was available, explain all the assumptions that you made.

Records searches and aerial photograph review indicate that large quantities of ordnance and CWM were stored on and shipped from this facility. Police reports document two incidents of ordnance items being dug up on the site. There is anecdotal evidence of several additional ordnance items found on the site. No evidence of OEW or CWM was found during the site inspection.

APPENDIX J
REPORT DISTRIBUTION LIST

ORDNANCE AND EXPLOSIVE WASTE
CHEMICAL WARFARE MATERIALS
ARCHIVES SEARCH REPORT
FOR
BENICIA ARSENAL
BENICIA, CALIFORNIA

DERP-FUDS SITE NO. J09CA075600

APPENDIX J

REPORT DISTRIBUTION LIST

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Commander, U.S. Army Chemical & Biological Defense Command ATTN: AMSCB-CIH, Bldg E5183 Aberdeen Proving Ground, MD 21010-5423	1
Commander, U.S. Army Corps of Engineers, Sacramento District 1325 "J" Street Sacramento, CA 95814-7859	1
CELMS-ED-G	1
-ED-H	1
-PD	1
-PM-M	1

APPENDIX K
ARCHIVE ADDRESSES
(SEE MAIN BODY OF REPORT)