Non-Ordnance and Explosives Remedial Investigation (RI)/ Feasibility Study (FS) Work Plan Tourtelot Cleanup Project Benicia, California

February 15, 2000

Prepared by:

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LIMITATIONS

The Non-OE Remedial Investigation/Feasibility Study (RI/FS) Work Plan presented for the Tourtelot Clean-up Project (Project Site) in Benicia, CA has been developed in accordance with principles and practices generally employed in the environmental consulting profession.

Remedial investigation methodologies designed to be employed on the Project Site are based upon the following: (1) data and literature provided by government and private sources; (2) documentation of prior clearances; (3) field investigations including geophysical mapping and ordnance and explosives (OE) sampling performed by the SECOR and Earth Tech project teams; and (4) observations made and verbal information obtained during site visits. Information developed by other government agencies and independent contractors has been accepted as authentic and true as stated, unless otherwise noted.

The work to be performed shall attempt to determine the lateral and vertical extent of the non-OE contamination present on the Project Site. The non-OE RI/FS is not intended to address unexploded ordnance.

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ACRONYMS/ABBREVIATIONS

AA	atomic absorption
AALA	American Association for Laboratory Accreditation
ACS	American Chemical Standards
AIHA	American Industrial Hygiene Association
AOC	area of concern
AP	anti-personnel
ARAR	applicable or relevant and appropriate requirement
ASR	Archives Search Report
ASTM	American Society of Testing and Materials
BFB	4-bromofluorobenzene
bgs	below ground surface
BPM	beats per minute
BTEX	benzene, toluene, ethylbenzene, xylene
C	Celsius
CAA	Clean Air Act
CAM	California Assessment Manual
CCAL	continuing calibration standard
CCC	Calibration Check Compound
CCR	California Code of Regulations
CCV	continuing calibration verification
CDD/CDF	chlorinated dibenzo-p-dioxin and dibenzofuran
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESPK	U.S. Army Corps of Engineers, Sacramento District
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CLP	contract laboratory program
CN	cyanide
CNDDB	California Natural Diversity Data Base
CO_2	carbon dioxide
COC	chain-of-custody
COI	Contaminant of Interest
COPC	contaminant of potential concern
CPC	chemically protective clothing
CPR	cardiopulmonary resuscitation
C/SS	calibration/service specifications
CVAA	cold vapor atomic absorption
CWA	Clean Water Act
cy	cubic yard
°	degree
dBA	decibel absolute
DEM	Department of Environmental Management
DFTPP	decafluorodiphenylphosphine
DHS	Department of Health Services
DI	deionized
DNB	dinitrobenzene

DNT	dinitrotoluene
DOD	Department of Defense
DOT	Department of Transportation
DQA	Data Quality Assessment
DQCR	Daily Quality Control Report
DQO	Data Quality Objective
DTSC	Department of Toxic Substances Control
DVR	Data Validation Report
DWR	Department of Water Resources
EC	electrical conductivity
EDD	electronic data deliverable
EDL	estimated detection limit
EE/CA	engineering evaluation/cost analysis
EICP	extracted ion current profile
EIR	Environmental Impact Report
ELAP	Environmental Laboratory Accreditation Programs
EM	electromagnetic
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
F	Fahrenheit
FID	flame ionization detector
FS	Feasibility Study
FSP	Field Sampling Plan
FTL	Field Team Leader
FUDS	Formerly Used Defense Site
GC	gas chromatography
GFAA	Graphite Furnace Atom Absorption
Granite	Granite Management Corporation
H_2SO_4	sulfuric acid
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCl	hydrochloric acid
HE	high explosive
Hg	mercury
HNO_3	nitric acid
HPLC	High-Performance Liquid Chromatography
HRGC/HRMS	High-Resolution Gas Chromatography/High-Resolution Mass Spectroscopy
HRMS	High-Resolution Mass Spectrometry
HSA	Hollow-Stem Auger
HSM	Health and Safety Manager
HSO	Health and Safety Officer
HTRW	Hazardous, Toxic, and Radioactive Waste
IC	Ion Chromatography
ICAL	initial calibration
ICP	Inductively Coupled Plasma
ID	inside diameter
IDL	Instrument Detection Limit
IDW	Investigation-Derived Waste
IVC	Independent Viability Check

LCD	Laboratory Control Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LUFT	Leaking Underground Fuel Tank
µg/L	micrograms per liter
µL	microliter
MDL	Method Detection Limit
mg/kg	milligram per kilogram
mg/L	milligram per liter
mL	milliliter
mL/g	milliliter per gram
mm	millimeter
MS	matrix spike
MSA	Method of Standard Additions
MSD	Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
msl	mean sea level
NCR	Nonconformance Report
ND	nondetected
ng/L	nanogram per liter
NIOSH	National Institute of Occupational Safety and Health
NIST	National Institute of Standards and Technology
nm	nanometer
NORCAL	NORCAL Geophysical Consultants, Inc.
NTU	Nephelometric Turbidity Unit
O&M	operations and maintenance
OD	outside diameter
OE	ordnance and explosives
OESM	Ordnance and Explosives Safety Manager
OSHA	Occupational Safety and Health Administration
PAH	polyaromatic hydrocarbon
PC	Project Chemist
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzodioxin
PCDF	polychlorinated dibenzofuran
PDS	post-digestion spike
PETN	pentaerythritol tetranitrate
pg/g	picogram per gram
pg/mg	picogram per milligram
PM	Project Manager
POL	petroleum, oil, and lubricants
PPE	Personal Protective Equipment
ppm	parts per million
ppq	parts per quadrillion
ppt	parts per trillion
PQL	Practical Quantitation Limit
PRG	preliminary remediation goal

psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QCSM	Quality Control Systems Manager
QCSR	Quality Control Systems Report
RAW	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RDX	cyclonite
RF	response factor
RI	Remedial Investigation
RL	reporting limit
RPD	Relative Percent Difference
rpm	revolutions per minute
RRR	Records Research Report
RSD	relative standard deviation
RT	retention time
SAP	Sampling Analysis Plan
SARM	Standard Analytical Reference Materials
SD	serial dilution
SDWA	Safe Drinking Water Act
Sequoia Analytical	Sequoia Analytical Laboratory of Petaluma
SITE	Superfund Innovative Technology Evaluation
S/N	signal-to-noise
SOP	standard operating procedure
SPCC	system performance check compound
SPF	sun protection factor
SSC	Site Safety Coordinator
SSHP	Site-Specific Safety and Health Plan
SSO	Site Safety Officer
SVOC	semivolatile organic compound
TAL	target analyte list
TAT	turnaround time
TBC	To Be Considered
TCDD	tetrachlorodibenzo-dioxin
TCL	target compound list
TDL	target detection limit
TDS	total dissolved solids
TEF	toxicity equivalence factor
TEPH	total extractable petroleum hydrocarbon
TIC	tentatively identified compound
TMI	total magnetic field
TNB	trinitrobenzene
TNT	trinitrotoluene
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TSS	total suspended solids

1.0 INTRODUCTION

This Non-Ordnance and Explosives (OE) Remedial Investigation (RI)/Feasibility Study (FS) Work Plan has been prepared in response to the *Imminent and/or Substantial Endangerment Determination and Remedial Action Order (Docket No. I/SE 98/99-011),* signed June 1, 1999 (the "Order"), issued by the California Department of Toxic Substances Control (DTSC) for the Tourtelot Property (Project Site) in Benicia, California. This RI/FS Work Plan is prepared in accordance with the U.S. Environmental Protection Agency's (EPA's) "*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*" (October 1998). A separate document is currently being prepared to address the characterization and remediation of OE for the Project Site.

The purpose of the RI/FS is to evaluate the nature and extent of potential contaminants (excluding OE) in soil, sediment, surface water, and groundwater at the Project Site. The data collected during this investigation will be used to evaluate the extent of, and assess remedial measures for, potential contaminants found at the Project Site. Additionally, the purpose of the RI/FS is to provide the rationale for using the anticipated remedy of restoring the site to background levels.

The responsible parties for this RI/FS include Granite Management Corporation (Granite), the current owner of the Tourtelot Property, and the U.S. Army Corps of Engineers (USACE), Sacramento District (CESPK). This RI/FS has been developed on behalf of Granite and the CESPK. The RI/FS approach described in this Work Plan is designed to meet the objectives that are stated in Section 5.2.1 of the Order. They include:

- Evaluate the nature and extent of hazardous waste in soil, surface water, and groundwater at the Project Site and contamination from the Project Site, including off-site areas affected by the Project Site.

- Identify all actual and potential exposure pathways and routes through environmental media.

- Determine the magnitude and probability of actual or potential harm to public health, safety, or welfare or to the environment posed by the threatened or actual release of hazardous substances at or from the Project Site.

- Identify and evaluate appropriate response measures to prevent or minimize future releases and mitigate any releases that have already occurred.

- Develop remedial action objectives for soil that are protective of adults and children in a residential exposure scenario.

- Collect and evaluate the information necessary to prepare a Final Remedial Action Plan (RAP) in accordance with the requirements of Health and Safety Code Section 25356.1.

1.1 PROJECT LOCATION AND SITE DESCRIPTION

The Project Site lies completely within the City of Benicia, Solano County, California, approximately 30 miles northeast of San Francisco (Figure 1.1-1). Consisting of approximately 220 acres, it encompasses the Tourtelot Property and is partially within the boundaries of the Former Benicia Arsenal (Figure 1.1-2). The site has rolling topography that includes areas referred to as the "Ridge," which separates the North Valley and the South Valley, both of which have areas of steep terrain (Figure 1.1-3). Both the North and South valleys contain wetlands areas, the one in the South Valley being considerably larger. The site is bordered by the Southampton residential development to the west and south, the Exxon refinery to the south, industrial and commercial facilities to the east and north, and open space to the north and east (see Figure 1.2-3). The elevation of the site varies from 75 feet above mean sea level (msl) in the southern region to 250 feet above msl in the northern region.

1.2 HISTORY OF PROJECT SITE

Between 1849 and 1958, the U.S. Army acquired approximately 2,700 acres of land in Benicia and established the Benicia Arsenal for use as a depot for ordnance. In 1944, the Army leased a 200-acre piece of undeveloped ranchland known as the Tourtelot Property that was situated next to the Benicia Arsenal. Between 1945 and 1947, the Army began developing the Tourtelot Property for a number of different activities in both the North Valley and the South Valley (see Figure 1.1-3). In 1955 and 1960, the Army's leases for the Tourtelot Property terminated, and in January 1962, the Department of Defense (DOD) declared the entire Benicia Arsenal excess.

Portions of the arsenal were developed in the late 1960s. The Tourtelot Property remained under private ownership and was not developed. In 1971, portions of the Tourtelot Property were acquired from Mary Tourtelot by developers, and the remaining 110-acre parcel was acquired from Mary Tourtelot in 1981 as part of the Southampton residential development. In 1989, the City of Benicia approved the Environmental Impact Report (EIR) for residential development of the land. In 1990, grading activities were conducted on the Project Site in support of off-site and on-site residential development. The activities included using the Ridge as a borrow site for soils and construction of the McAllister Drive Land Bridge, which is a fill that crosses the South Valley and provides access to the Ridge from Rose Drive (see Figure 1.1-3). The sewer line along the south side of the South Valley was also installed at this time.

In mid-1996, during preliminary site preparation associated with development of the Project Site, concrete-filled howitzer shells were unearthed, and Granite promptly took several steps to make the Tourtelot Property safe, including stopping the preliminary construction activities, alerting officials about the shells' discovery, putting a fence around the site, and hiring a security service. Granite retained military-trained explosives specialists and initiated preliminary site investigations for affected soils and OE. Part of the investigation included collection of geophysical data across the majority of the Project Site. Plate 1.2-1 depicts the results of the geophysical survey. In late fall 1996, live ordnance was first encountered and reported by Granite to local military personnel for handling. Granite provided its investigation data to the USACE for inclusion in its work. In 1998, the USACE began investigation of the Project Site as part of an arsenal investigation to characterize the area for OE.

The Project Site remains undeveloped, except for one structure, and is currently fenced, and access is controlled. Adjoining land is also enclosed by fencing.

1.2.1 DOD Activities at the Project Site

During the period when the Project Site was used by DOD, it accommodated a range of activities. Based on site inspection, data collected by the USACE for the Former Benicia Arsenal EE/CA Report review of historical aerial photographs, data presented in the Records Research Report (RRR) (Jacobs, 1999), and review of geophysical data collected across the majority of the Project Site, several potential sites have been identified (Plate 1.2-2). The hillside to the north of North Valley was used to dispose of TNT. Approximately 6 acres in the North Valley were developed with roads and structures where the accuracy of locally manufactured howitzer gun barrels were checked, ordnance was inspected and renovated, and primers were destroyed in a "burn cage." A landfill referred to as "the North Valley Military Landfill" was also in the North Valley. In the South Valley, there were at least two demolition sites and a flare site. Demolition activities generally consisted of placing various amounts of out-of-service munitions in a "pit" and placing a countercharge on top of the items and detonating them. Often, these areas were used multiple times, resulting in a deep pit or crater. The type of munitions placed in the demolition sites in the South Valley is unknown. The Flare Site was used to burn old, out-of-service flares. This generally was accomplished by placing a number of flares in a pile and igniting it. Part of the Ridge was used to dispose of aged, out-of-service dynamite. The following subsections provide general information about each of the identified sites.

1.2.1.1 TNT Strips.

The trinitrotoluene (TNT) strips are on the hillside to the north of the North Valley. The RRR and the Archives Search Report (ASR) did not find anything in the available records stating what type of activities may have caused the scarring, now referred to as the "TNT Strips." The strips are clearly visible in a 1947 aerial photograph. Today, the strips are still clearly visible, as is evident by the pronounced lack of vegetation along the strips. There are five strips varying in length from 300 to 800 feet; each is approximately 6 feet wide. Exposed soil in the strips is characterized by a deep red color with crystalline materials observable in the dry season. In fall 1998, field screening samples were collected from the near-surface along the TNT Strips. TNT was detected in the soil samples from the strips (see Section 1.5 for further details). It has been assumed that the burning of explosives, similar to that reported for the Dynamite Burn Site (see Section 1.2.1.9), resulted in the TNT Strips on the hillside above the North Valley.

The only known activity to occur within the TNT Strips is the burning of TNT. Based on this information, there are two categories of contaminants that may have been generated from the burning of TNT: TNT and its breakdown products, and polyaromatic hydrocarbons (PAHs), which can be generated by the burning of organic material.

1.2.1.2 Howitzer Test Facility.

The Howitzer Test Facility consisted of four permanent structures in the North Valley (see Plate 1.2-2). Building 181 consisted of two parallel tunnels; each had a 10-foot by 10-foot opening and extended approximately 100 feet into the hillside. The second structure contained the open firing butts. The third building was a concrete powder loading room, and the fourth building, reported under several names (Nike Test Cell, Calibration Facility, Soil Test Lab, and Cement Block Test Cell [hereafter referred to as Building 540]) was between the firing butts and the test tunnels. This building may have had several uses and is believed to have been built in 1957 or 1958. A disposal area where shell casings, OE scrap, and debris were discarded is believed to have been adjacent to the tunnels. The facility was used to test howitzer barrels and propellant by firing various-sized howitzer projectiles filled with concrete or gravel. This was performed in order to determine if the barrels functioned correctly and whether the propellant was the right mixture. The facility was in operation from approximately 1945 to 1955.

In 1957 or 1958, it is unclear whether one or two buildings were built between the firing butts and the tunnels. One building pad was 12 feet by 20 feet, but there were no records of the size of the second building. Records do not clearly reveal what the building or buildings were used for; however, a former employee interviewed for the RRR referred to this facility as the Calibration Facility (Jacobs Engineering, 1999). A second former employee reported that he had witnessed two men exiting the building (presumed to be Building 540 in the Howitzer Test Facility).

In mid-1996, during preliminary site preparation for development, all the facilities in this area were dismantled, and most of the construction debris was removed from the area. A large number of concrete-filled howitzer shells were unearthed during these activities. The soil that was mounded around the tunnels is currently stockpiled in the North Valley at the east end of the area.

Gravel and soil piles around the howitzer test tunnels were screened under the observation of a qualified unexploded ordnance (UXO) expert. Several howitzer shells were removed from the soils during this operation. An attempt was made to separate soils with a large amount of gravel and inert OE fragments from cleaner soils.

Based on the activities that occurred at the Howitzer Test Facility, the following potential contaminants of concern may have affected the soils and groundwater (if present):

- Solvents present from cleaning and general maintenance activities associated with the facility
- Nitrogen from the black powder used as propellant for the Howitzer rounds
- Diesel and motor oil from any vehicles parked at the facility or used for heating
- Kerosene from the adjacent Primer Destruction Site used to fuel the oil burners
- Explosives from the primers either burned at the adjacent facility or used in the fuze chain to ignite the propellant.
- Nitrogen from the black powder used as propellant for the howitzer rounds
- Pesticides from the soil laboratory
- Rocket fuel (perchlorates) associated with Building 540.

1.2.1.3 Ammunition Renovation/Primer Destruction Site.

The Ammunition Renovation/Primer Destruction Site is in the North Valley adjacent to the Howitzer Test Facility (see Plate 1.2-2). The site consisted of two facilities, the Ammunition Renovation Site and the Primer Destruction Facility. Typically, at the facility, primers were destroyed by dumping them into a "squirrel cage" or metal tank. Primers for various munitions were pulled out and placed onto a conveyor belt, then dropped into a cage and burned. An oil burner was usually attached to the cage or tank and was left running constantly in order to ignite the primers. The burned primers, now inert scrap metal, were removed from the cage and recycled. The Primer Destruction Facility was used from 1945 to 1947.

The Ammunition Renovation Site consisted of two wooden buildings and two canvas shelters (Jacobs Engineering, 1999), which were used to inspect and refurbish ordnance items stored at the arsenal. The RRR stated that a canvas structure in the middle of the area was used for breakdown operations, cleaning, and processing of ammunition casings in preparation for painting. The Ammunition Renovation/Primer Destruction Site was constructed in 1950. It is uncertain how long the area was in operation.

Both of these facilities, the Ammunition Renovation Site and the Primer Destruction Facility, were removed during preliminary site development in 1996. During the removal of the foundations for the various facilities, soils in the area were disturbed. Some of the soils disturbed during the demolition of structures associated with the Ammunition Renovation/Primer Destruction Site were also stockpiled in the North Valley.

Based on the activities that occurred at the Ammunition Renovation/Primer Destruction Site, the following potential contaminants of concern may have affected the soils and groundwater (if present):

- Solvents that may be present from the cleaning and general maintenance activities associated with the facility
- PAHs from the burning of primers
- Diesel and motor oil from any vehicles parked at the facility or used for heating
- Kerosene from the Primer Destruction Facility used to fuel the oil burners
- Explosives from the primers either burned at the facility or mishandled during ammunition renovation activities.

1.2.1.4 North Valley Military Landfill.

The landfill is in the North Valley, just east of the Howitzer Test Facility (see Plate 1.2-2). The RRR indicated that there was a disposal area associated with the Howitzer Test Tunnels. It is believed that this disposal area was immediately adjacent to the tunnels and may have been the debris cleaned out from around the test tunnels during initial site preparation performed by Granite. This debris consisted of gravel and howitzer shells filled with pea gravel or plaster and inert OE scrap. This debris was screened for OE, and as much as possible was sorted into two soils stockpiles. One stockpile was relatively free of OE scrap, and the other stockpile had gravel and small fragments of OE scrap. The areas where the soils piles were placed were geophysically mapped and any identified anomalies removed. During the removal activities, a landfill, now referred to as the "North Valley Military Landfill," was encountered to the east of the soil stockpiles. The debris initially uncovered in the landfill was mainly wood crates, pallets, and packing material. Some inert ordnance was recovered from this area, including practice 155 millimeter (mm) howitzer rounds (gravel or plaster filled). Only a small portion of the landfill was removed at this time. The debris encountered varied in depth up to 5 feet.

Data collected from a geophysical survey conducted over the majority of the Project Site indicate the presence of several anomalies within the landfill (see Plate 1.2-1). However, because of the type of material expected in the landfill (wood debris), the aerial extent of the landfill would not be readily evident in magnetometer survey data (geophysical data) (see Section 2.4 for details regarding the quality of the geophysical data). Review of historical aerial photographs indicates that the ground in the general vicinity of the suspected landfill appears disturbed. Based on review of the above data, the extent of the landfill has been estimated (see Plate 1.2-2).

Activities at the Ammunition Renovation/Primer Destruction Site and the Howitzer Test Facility may have contributed to debris in the landfill. Based on this assumption, the following potential contaminants of concern may have affected the soils and groundwater near the North Valley Military Landfill (if present):

- Solvents from the cleaning and general maintenance activities associated with the facility
- PAHs from the burning of primers
- Diesel and motor oil from any vehicles parked at the facility or used for heating
- Kerosene from the Primer Destruction Facility used to fuel the oil burners
- Explosives from the primers either burned at the facility or mishandled during ammunition renovation activities
- Nitrogen from the black powder used as propellant for the howitzer rounds
- Pesticides from the soil laboratory
- Rocket fuel (perchlorates) associated with the Nike Test Cell.

1.2.1.5 Flare Site.

The Flare Site is in the South Valley and is evident by the ash, OE scrap, and fragments recovered from the site (see Plate 1.2-2). The Flare Site was used to burn and dispose of flares. This usually consisted of placing flares on the ground in rows and igniting them. It is uncertain if the Flare Site was used to dispose of ordnance. A relatively large number of anomalies is evident in the geophysical data, and the site is clearly visible in a number of the historical aerial photographs reviewed. All sites within the Demolition and Flare Site have had soil samples collected from the periphery or near-surface (see Section 1.5 for results).

Based on the activities that occurred at the Flare Site, the following potential contaminants of concern may have affected the soils and groundwater (if present):

- Various types of metals, including phosphorus
- PAHs from the burning of flares
- Explosives, if the site was used for demolition.

1.2.1.6 Demolition Site #1.

Demolition Site #1 is near the bottom of the South Valley on the south side of the wetlands. A smaller drainage running down the South Valley wall is immediately to the east of the suspected demolition site. The site is clearly visible in a number of the historical aerial photographs reviewed and first appears circa 1945. No live ordnance items have been recovered from this site during previous investigations. However, OE scrap and fragments have been recovered around and near the site. The majority of the site has been geophysically mapped. A large anomaly is evident in the data at the south end of the suspected site. A couple of smaller anomalies are visible in the data in the north portion of the site.

Based on the activities that occurred at Demolition Site #1, the following potential contaminants of concern may have affected the soils and groundwater (if present):

- Various types of metals that may have been used in the body of the destroyed ordnance items
- PAHs from the burning of organic material that may have been present
- Explosives from the various OE items destroyed.

1.2.1.7 Demolition Site #2.

The suspected demolition site shows relatively little evidence of use. This site is on the south side of the South Valley between the Flare Site and the eastern portion of Demolition Site #1 (see Plate 1.2-2). The site is suspected because it appears disturbed or barren in several of the historical aerial photographs. Review of geophysical data does not indicate that the site has a high anomaly count similar to those of Demolition Sites #1 and #3, and large amounts of OE scrap or fragments have not been observed during site visits.

Based on the activities that occurred at Demolition Site #2, the following potential contaminants of concern may have affected the soils and groundwater (if present):

- Various types of metals that may have been used in the body of the destroyed ordnance items

- PAHs from the burning of organic material that may have been present

- Explosives from the various OE items destroyed.

1.2.1.8 Demolition Site #3.

Several ordnance items were recovered from this site both by Granite and the USACE (see Plate 1.2-2). Also, an armored personnel vehicle was removed from this site, hauled up the north slope of the South Valley, and cut into pieces that were recycled at a local metal fabrication shop. The site is evident in the geophysical data.

Based on the activities that occurred at Demolition Site #3, the following potential contaminants of concern may have affected the soils and groundwater (if present):

- Various types of metals that may have been used in the body of the destroyed ordnance items

- PAHs from the burning of organic material that may have been present

- Explosives from the various OE items destroyed.

1.2.1.9 Dynamite Burn Site.

On the Ridge, aged, out-of-service dynamite was reportedly disposed of through burning (see Plate 1.2-2). Aged dynamite was burned by placing multiple sticks of dynamite in rows up to 100 feet long on a piece of paper and igniting the paper. This area is believed to have been used from 1947 to 1948. The area used for burning of dynamite was approximately one-half the size of a football field. The ridge used for the Dynamite Burn Site was used as a borrow site for soils during grading activities associated with the Southampton development in 1990 (see Section 1.2.2 regarding grading activities). Based on the analysis of past grading activities, as discussed below, soils from the historical location of the Dynamite Burn Site may have been moved and placed as fill in the McAllister Drive Land Bridge.

Based on the activities that occurred at the Dynamite Burn Site, nitroglycerin may be a potential contaminant of concern. Although nitroglycerin may be present in the fill soils for the McAllister Drive Land Bridge, because of the mass excavation that occurred in this area, it is highly unlikely that any nitroglycerin will be present in the currently exposed bedrock at the site.

1.2.2 Past Grading Activities

Development of the area adjacent to the Project Site started in 1990. A review of rough grading plans, preliminary soils reports, testing and observation service reports, notes from the grading subcontractor, and historical aerial photographs provides a good insight into where the material was placed as fill. The basic assumption used to determine where soils were placed is that standard grading techniques call for establishing the shortest haul routes between cut-and-fill areas. Based on this assumption, review of available documents, professional judgment, and understanding of standard mass grading techniques, soils within the affected area were most likely moved as follows:

- Rough grading for the Southampton development began in April 1990. Grading began in the area referred to as D-1 and D-2 on the grading plans (Plate 1.2-3). The majority of D-1 was a cut area; the majority of D-2 was a fill area. Standard grading techniques and aerial photographs and grading observation records confirm that the initial cut materials from D-1 most likely were placed in the D-2 fill sites.

- The other major fill areas in the development are along the Rose Drive/Panorama Drive fill sites, south of Kearney Street (see Plate 1.2-3). Fill for this area was most likely derived from the adjacent cut area to the east. Cutting and filling for this area appear to have begun shortly after D-1/D-2. The D-1/D-2 area continued to be active after grading began in this area.

- There is an area referred to as the "East Crossing" in the final testing and observation reports for the Southampton development. Elevation of the compaction tests taken here, as well as the geography of the development, suggest that the East Crossing was the "McAllister Drive Land Bridge." Based on this assumption, preparatory work for the land bridge began as early as June 1990. However, the majority of the fill was placed in mid- to late August 1990.

- The Ridge between the North and South Valleys was used as a soils borrow area (see Plate 1.2-3). An estimated 600,000 cy of soil, resulting in approximately 40 to 50 feet in elevation loss, was removed. The May 13, 1990, aerial photograph indicates that the soils borrow area is relatively undisturbed. The September 1990 aerial photograph shows that the soils from the Ridge down to approximately the 260-foot contour line had been removed, approximately the eastern two thirds of the aerial extent. It is evident from the aerial photographs that the removed soils were used to construct the McAllister Drive Land Bridge. Figure 1.2-1 shows topography changes at the Ridge and the McAllister Drive Land Bridge areas disturbed by cut-and-fill grading activities between May 1990 and September 1990. According to construction drawings, the land bridge required approximately 200,000 cy of soil. The observation and test results report indicates that during the construction of the land bridge, most of the other fill areas received little or no fill. Once the land bridge was completed, the D-2 and Rose Drive/Panorama Drive/McCall Street fill sites became active again. The remaining cut from the Ridge soils borrow area may have been used in these areas. After February 1991, the maximum extent of the Ridge borrow site appears to have been reached.

- Grading activities along the Kearney Street lots were completed between June 21, 1991, and September 3, 1993, based on an aerial photography review.

- In September 1993, stockpiled soils appear on the Ridge borrow site. The stockpiled soil on the Ridge borrow site appears to have been generated from development activities associated with the development of the Kearney Street lots.

- The structures in the North Valley were removed in 1996 during preliminary site construction activities. Recyclable material, such as the concrete, culverts, and rebar from the buildings, was temporarily stockpiled in the area and hauled away. Disturbed soils are currently stockpiled in the North Valley.

1.3 PROJECT SITE GEOLOGY

1.3.1 Geomorphic Setting

The Project Site and surrounding area lies within the Coast Ranges Geomorphic Province. The Coast Ranges are a series of north-to-south-oriented mountains extending from the southern limit of the Klamath Mountain block in Oregon to the northern boundary of Santa Barbara County. The Sulphur Springs Mountains begin at Benicia and stretch northwest, forming a ridge that defines the eastern flank of the Napa Valley. Lake Herman is situated along the northwestern boundary of the Project Site at the southern terminus of the Sulphur Springs Mountains. The nearby Carquinez Strait, south of the Project Site, is a submerged canyon cutting through the Coast Ranges formed by the ancestral flow of the Sacramento and San Joaquin River drainages. The strait is a narrow, deep channel cut simultaneously with the uplift and folding of the Coast Ranges. Connecting the Sacramento and San Joaquin Rivers with the San Francisco Bay, the strait is tidally influenced, and there is a gradual change from seawater in the San Francisco Bay to the west to brackish water in the Sacramento delta to the east.

1.3.2 Regional Geologic Setting

The oldest geologic formation present in the Benicia area is the sedimentary rocks of the Upper Jurassic to Upper Cretaceous Great Valley Sequence. The Great Valley Sequence accumulated in a forearc basin between the Sierran arc and the Mesozoin subduction zone (Harden, 1998). Sediments of the Great Valley Sequence continued to be deposited in the forearc basin in early Cenozoic time. The Great Valley Sequence consists of sandstone, shale, and conglomerate, in a stratified thickness up to approximately 19,000 feet (U.S. Army Corps of Engineers, 1997). The older, lower formations of the Great Valley Sequence consist of sandstone rich in volcanic rock fragments that eroded from the volcanoes of the Jurassic and early Cretaceous Sierran arc. The younger formations of the Great Valley Sequence consist of sandstones that are rich in feldspar and quartz eroded from the granitic pluton. Fossils and sedimentary features show the western side of the ancestral Great Valley to consist of deeper ocean sediments deposited by turbidity currents. The eastern side of the ancestral Great Valley consists of deltaic and shallow ocean water deposits. The structural basement in this area of the Coast Ranges is characterized by metasedimentary rocks of the Franciscan Formation. The major structural feature of the Benicia area is the Southampton fault, shown on Figure 1.3-1, and the Concord-Green Valley fault (approximately 2 miles east of the site). These faults are considered to be active. Other active faults in the region include the Calaveras-Franklin (6 miles southwest), the Hayward (12 miles west), the Rogers Creek (18 miles northwest), the Antioch (18 miles southeast), and the San Andreas (30 miles west). There are no known active faults crossing the site (Engeo, 1989).

1.3.3 Site Geology

The Great Valley Sequence (bedrock) underlies the entire Project Site. The bedrock at the site, as observed in several test pits throughout the Project Site (see Plate 1.2-3), is weathered and fractured and consists mostly of claystone with various interbedded deposits of sandstone and siltstone. Bedding units generally strike to the northwest and dip to the south. However, bedding strike-and-dip near faults varies.

There are numerous faults mapped within Benicia, including four on or adjacent to the site. There is no evidence that these four faults are active or potentially active. Engeo located several exploratory trenches across these faults and observed bedrock faulting. Appendix A provides copies of all Engeo geotechnical logs, including exploratory trenches across the faults. However, none of the faults observed appeared fresh, contained preserved slickensides, or offset the uppermost soils.

Quaternary alluvium is present in the bottom of the North and South valleys. The total thickness of the alluvium in these valleys is uncertain, but it may be as deep as 30 feet or more. Various amounts of colluvium blanket the slopes of the hills.

The colluvium is generally a silty or sandy clay and ranges in thickness from a few feet to over 12 feet in thickness.

Shallow, seated slides are common throughout the Benicia area. Several slides were observed and mapped along the slopes of the South Valley by Engeo during their preliminary soils investigation. During grading activities associated with the Southampton development, several slides were removed, and other slides were mitigated. The locations of any remaining slides and mitigated landslides are shown on Plate 1.2-3.

Artificial fill, both engineered and stockpiled, is present at the site. The engineered fill is associated with placement of a sewer line along the south wall of the South Valley, repair of surficial landslides, the graded house pads along the top of the south rim of the South Valley, and the McAllister Drive Land Bridge (see Plate 1.2-3). The stockpiled fill is situated mainly along the top of the Ridge between the North and South valleys (see Plate 1.2-3). Minor amounts of stockpiled fill are also present in the North Valley.

The soils encountered in borings and test pits on the site were found to consist mostly of brown to dark brown silty and sandy clays. Depth of soil deposition varies from a few feet on hillsides to in excess of 20 feet in the major swales. Copies of the boring and test pit logs from the Preliminary Soils investigation conducted by Engeo in 1989 and 1990 are included in Appendix A.

In May 1999, Earth Tech located 12 test pits in the South Valley to determine depths to weathered bedrock at the Project Site. This investigation revealed that the depth to weathered bedrock ranged from approximately 8 feet below ground surface (bgs) to 12 feet bgs on the south slope of the South Valley, while the depth to weathered bedrock ranged from approximately 2.5 feet bgs to 6 feet bgs on the north slope of the South Valley. The shallow soil depths on the north slope were found at the top of the slope. Copies of the test pit logs for this investigation are included in Appendix B. Additionally, a seismic refraction survey of the South Valley was conducted by Norcal Geophyisical Consultants, Inc. A letter report documenting the findings of the seismic refraction survey is in Appendix C. The results of the survey were consistent with both the test pits excavated by Earth Tech and the data collected by Engeo.

1.3.4 Hydrology and Hydrogeology

An unnamed creek flows through the South Valley from west to east and exits the Project Site through the McAllister Drive Land Bridge. This area is commonly referred to as the "wetlands." The west end of the wetlands is very broad, was modified during construction of the Southampton development, and has several beaver dams that create small ponds. The east end of the wetlands is much narrower with little or no ponding. The land bridge at the east end of the wetlands is designed to restrict flow during periods of heavy precipitation in order to prevent rain flooding down stream. The wetlands receives runoff from the seeps and springs and storm drains, both on and off site, as well as natural runoff from the hillsides upstream. The majority of springs generally flows only during or after it has rained.

There is a small area at the east end of the North Valley that remains wet most of the year and is recharged by springs on the hillside above. No other surface water is present in the North Valley. Surface water from the site flows down to the Sulphur Springs Creek Canal and generally runs from north to south through the industrial park in Benicia, eventually exiting into the Carquinez Strait near the Benicia-Martinez bridge.

The location, quality, and quantity of groundwater beneath the Project Site and surrounding area are not well known. In 1872, a well was drilled in the southern portion of the arsenal. Groundwater in this well was first encountered at a depth of 960 feet. The water in this well contained organic matter and was determined to be unfit for human consumption. The well was blocked off to a depth of 960 feet using cement, sand, and grain sacks (Cowell, 1963). Since this time, several monitoring wells have been installed at the Former Benicia Arsenal by private parties for the purposes of environmental investigation. The wells have indicated water-bearing strata at shallower depths.

As stated previously, in 1988/1989, during the process of conducting a soils exploration, Engeo drilled 22 borings and encountered groundwater in three of the borings. Two borings, B-8 and B-9 (see Appendix A), in which groundwater was encountered were situated at the west end of the South Valley (see Plate 1.2-3). The static level of groundwater in Boring B-9 was approximately 7 feet bgs within the alluvial material; weathered bedrock was encountered at approximately 22 feet bgs. Boring B-8 was situated approximately 400 feet upstream of Boring B-9. Static groundwater level was reported at 10 feet bgs, with weathered bedrock encountered at approximately 15 feet bgs. Four other borings were advanced into bedrock in the South Valley by Engeo, none of which encountered groundwater, according to reports. However, these borings were not situated in the bottom of the valley.

Two borings, B-17 and B-18 (see Appendix A), were situated in the bottom of the North Valley. Boring B-18 (see Plate 1.2-3) encountered groundwater at approximately 21 feet bgs (total depth of boring). Weathered bedrock was encountered at approximately 8 feet bgs in this boring. Boring B-17 was situated at the east end of the North Valley. The boring was advanced to approximately 25 feet bgs, with weathered bedrock encountered at approximately 8 feet bgs. Groundwater was not encountered in this boring. However, the alluvial/colluvial soils in the boring are reported as being wet. Two other borings were advanced in the North Valley by Engeo. These borings were situated approximately 20 to 25 feet above the valley floor, with no reports of encountered groundwater. Shallow groundwater recharge at the Project Site is via precipitation. Once at the ground surface, precipitation will naturally take the flow path of least resistance. Given the topography and geologic conditions at the Project Site, the preferential flow path on the slopes is via surface runoff from the topographic highs (ridges) toward the topographic lows (valleys). Therefore, much of the precipitation flows via the surface toward, and accumulates in, the floors of the North and South valleys. Once the precipitation has flowed to the lowest point, preferential infiltration into the valley alluvium and underlying weathered bedrock zone will occur. Given the low permeability of the alluvium and weathered bedrock materials (typically clay to silty clay), groundwater flow within the alluvium and weathered bedrock is anticipated to be relatively slow. If groundwater movement within the alluvium/weathered bedrock is slow and sufficient water accumulates in the valley floors (via either subsurface runoff or subsurface groundwater migration), and if downward infiltration beyond the weathered bedrock zone into the underlying competent bedrock is limited, wetlands will be created, as observed in the South Valley, and to a lesser extent, in the North Valley.

Given the lack of ground water encountered in borings advanced into the shallow bedrock at the Project Site, water infiltrating the ground surface may be unable to infiltrate beyond the weathered bedrock zone.

According to the Groundwater Basin Plan (Regional Water Quality Control Board, 1995), the shallow groundwater beneath the Project Site is considered to be a potential source of drinking water; however, it is not actually expected ever to be used for drinking water purposes due to its overall quality, which is considered brackish. The majority of drinking water for the City of Benicia is currently obtained from the Sacramento River via the North Bay Aqueduct. Some water for the city is obtained from Lake Herman (approximately 10 percent).

1.3.5 Historical Aerial Photograph Analysis

Available historical aerial photographs were reviewed to identify areas of disturbance within the Project Site. A total of 39 photographs, comprising 17 vintages or sets of photographs, including stereoscopic pairs, were reviewed with a stereoscope equipped with 10-power magnifying binoculars. The aerial photographs reviewed were taken between 1937 and 1997. The following sections present a summary of the results of this review. A complete aerial photograph analysis report with scanned copies of the photographs is presented in Appendix D.

1.3.5.1 TNT Strips.

The TNT Strips in the North Valley are not visible in the 1937 and 1945 aerial photographs, but four strips become clearly visible in 1947. By 1952, there are five TNT Strips visible but faded, and four of the five strips become clearer in 1960. The 1962 aerial photographs show four of five of the TNT Strips, along with a light, contrasting area noted to the east of the strips. The 1973 aerial photograph shows a faded area similar to a TNT Strip between TNT Strips 3 and 4; it is not visible on any later photographs. A building to the south of the TNT Strips was also observed in the 1973 aerial photograph along Midway Road. All five TNT Strips are clearly visible in the 1983, 1988, 1989, and 1990 aerial photographs. Although numerous ground disturbance activities have occurred around the TNT

Strips, they are still visible, although faded, in the 1991, 1993, 1996, and 1997 aerial photographs.

1.3.5.2 North Valley (Howitzer Test Facility and Ammunition Renovation/Primer Destruction Site).

This area includes Buildings 181, 182, 183, 540, 542, and the North Valley Military Landfill. Buildings 182 and 183 become clearly visible in the 1947 aerial photograph. Buildings 181, 540, and 542 are first seen in the 1962 aerial photographs. These buildings in this area are visible off and on throughout the aerial photograph analysis period between 1947 to 1997.

There is some ground disturbance observed in the 1945 aerial photographs south of the east-west-trending tree line in the southeastern portion of the North Valley. The 1952 aerial photograph shows Buildings 182 and 183, and the roads leading to this area are clearly visible. The 1960 aerial photograph shows ground disturbance activities surrounding Buildings 540 and 542, and the North Valley Military Landfill. Ground disturbance can be seen in the 1962 aerial photographs around the Ammunition Renovation/Primer Destruction Site. The 1983 to May 1990 aerial photographs indicate substantial off-highway recreational vehicle ground disturbance around the Ammunition Renovation Area/Primer Destruction Site and the area of North Valley Military Landfill. The 1988, 1989, and May 1990 aerial photographs indicate that there are no other major changes to this area. In the September 1990 aerial photograph, grading activities are visible, and several structures and features previously observed in this area are no longer visible. By 1991, the aerial photographs show numerous roads and grading activities around the Howitzer Test Facility. The 1993, 1996, and 1997 aerial photographs show extensive grading to this area. By 1997, the Ammunition Renovation/Primer Destruction Site is totally gone.

1.3.5.3 Ridge Area (Dynamite Burn Site).

The Ridge, on which the Dynamite Burn Site is situated, is relatively undisturbed in the 1945 aerial photograph. By 1947, a "J"-shaped road leads to the top of the ridge, which has been leveled off and shows signs of ground disturbance and has numerous vehicle tracks in the area. The 1952 aerial photograph shows increased vehicular activity around the Dynamite Burn Site, including the"J"-shaped road that links the Dynamite Burn Site to the facilities in the North Valley. From 1960 on, there is a light, contrasting area in the vicinity of the roads and trails. Also, the 1960 aerial photograph shows an increase in size of the area involving ground disturbance activities in the Dynamite Burn Site. In the 1962 aerial photographs, there is some dark, contrasting area on the eastern side of the Ridge, along with some ground disturbance activities on top of the Ridge. This discoloration is much darker than the surrounding land. In 1973, there is ground disturbance on top of the Ridge around the Dynamite Burn Site. A gully runs from this disturbance toward the northern side of the South Valley. An extensive network of dirt roads and trails typically associated with off-highway recreational vehicles was observed in the Ridge area aerial photograph from the 1983 to 1990 vintage photographs. In 1988, an area in the western portion of the Ridge was observed to have some evidence of clearing. In 1989, there is a small area of disturbance in the area of the soil/debris piles.

Grading in the Dynamite Burn Site (Ridge borrow site) began between May and September 1990. By September 1990, much of the Ridge was leveled out, although there was little to no activity on the westernmost section of the Ridge. The resulting fill appears to have been used to develop the McAllister Drive Land Bridge. By 1991, the western portion of the Ridge was graded and is lighter than the surrounding area. Many soil piles are visible in the graded area. In the 1993 aerial photographs, there is a square-shaped enclosure on the west end of the Ridge and a dark, contrasting, circular area, possibly a naturally occurring spring. The 1996 and 1997 photographs show great numbers of aligned soil piles within the Ridge area. The outline of the cut area is visible, although there is little discoloration of the borrow site due to the great number of soil piles.

1.3.5.4 South Valley (Demolition Sites #1, #2, #3, and Flare Site).

The Demolition Sites and Flare Site are not visible on the 1937 or 1945 aerial photographs. On the 1947 aerial photograph, the Flare Site and Demolition Sites #1 and #2 on the southern side of the South Valley are visible. There is a road leading to these sites. Demolition Site #3, on the northern side of the South Valley, is not clearly discernible. This site may not have existed in 1947; however, there is a road leading to the general area of Demolition Site #3.

By 1952, only the Flare Site and Demolition Site #2 on the southern side of the South Valley are discernible; the road leading to these sites can still be seen. This road appears to have been partially destroyed between 1952 and 1960.

The 1960 aerial photographs show ground disturbance in the area of the Flare Site, on the southern side of the South Valley, and Demolition Site #3, on the northern side of the South Valley. The road leading to this site is visible in 1960 and 1962. In 1962, there are only traces of Demolition Sites #1 and #2 and the Flare Site on the southern side, and the road leading to the sites is not visible. The ground surface topography over the entire area is hummocky.

It appears that the roads leading to these sites were rebuilt or improved by 1973. Traces of Demolition Sites #1, #2, #3, and the Flare Site are not visible. There are a number of dirt roads and trails from the Ridge to the South Valley area that are visible in the 1983 aerial photographs. Between May and September 1990, the McAllister Drive Land Bridge was constructed in the southern portion of the South Valley. It includes a network of off-highway recreational vehicle dirt roads. In 1991, these features are still visible, although there has been considerable development (i.e., structures and roads) around the Demolition and Flare Sites. By 1997, the features are less visible, and vegetation in the area has increased.

1.3.5.5 Southampton Development Area.

The area around Rose Drive was cut by May 1990. The resulting fill appears to have been moved to the lots south of Rose Drive. By September 1990, grading activities had occurred over most of the subdivision, and Rose Drive, McCall Drive, and the east side of Panorama Drive were paved. The other roads and lots were marked out, but not developed. The beginnings of the McAllister Drive Land Bridge are visible in the September 1990 photograph. Also, an east-west-trending runoff control ditch built along the south side of the South Valley hillside is visible from the September 1990 to 1997 photographs. All of the roads in the Southampton subdivision were paved, although most lots remained undeveloped by 1993, except for lots on Casey Court. Cut-and-fill activities appear to be complete. Photographs from 1996 and 1997 show increased residential development, although the lots north of McCall Drive were still devoid of homes.

Grading activities in the Kearney Street lots area began between 1991 and 1993. The photograph from 1993 shows the first cutting activities and the demarcation of roads and lots. The area is more defined in the 1997 aerial photograph; a fill slope on the northeastern side of the area was built. The roads in this area are paved, although no homes have been constructed.

1.4 BIOLOGICAL RESOURCES

The Project Site and surrounding area supports a number of biological resources. The following sections provide information pertaining to vegetation, wildlife, and sensitive species that may occur on or near the Project Site.

Vegetation. The Project Site and surrounding area are characterized primarily by nonnative grasslands. This disturbed habitat contains a high percentage of nonnative, introduced weedy species. A creek flows west to east through the southern portion of the Project Site, supporting areas of willow riparian and freshwater marsh vegetation. Additionally, several seeps are present on some of the hillsides; these feed into the creek and also support limited wetland vegetation.

Nonnative grasslands. The majority of the Project Site is covered with nonnative annual grassland vegetation. Present on the hillsides, ridgetops, and some of the valley floor areas of the Project Site, this habitat is dominated by weedy introduced plant species such as slender wild oats (*Avena barbata*), ripgut brome (*Bromus diandrus*), red brome (*Bromus madritensis* ssp. *rubens*), foxtail barley (*Hordeum jubatum*), wild radish (*Raphanus sativus*), fennel (*Foeniculum vulgare*), cheeseweed (*Malva parviflora*), and cardoon (*Cynara cardunculus*). Some native plant species are present, including California wild poppy (*Eschscholzia californica*), various lupines (*Lupinus* sp.), blue dicks (*Dichelostemma capitatum*), and coyote brush (*Baccharis pilularis*) (U.S. Army Corps of Engineers, Sacramento District, 1997).

Willow Riparian and Freshwater Marsh Areas. The creek that crosses the southern portion of the Project Site supports both willow riparian and freshwater marsh vegetation. This creek seems to originate from precipitation, surface runoff, seasonal water flow from off-site sources, and possibly from the hillside seeps. It is not connected with Lake Herman. The creek flows east from a culvert near the southwestern boundary of the Project Site to a culvert under McAllister Drive. Wetland vegetation occurs along the creek and in seep areas on the hillsides. Creek wetlands consist mainly of freshwater marsh species such as narrow-leaved cattail (*Typha angustifolia*), Olney's bulrush (*Scirpus americanus*), and tule (*Scirpus acutus* var. *occidentalis*). Scattered arroyo willows (*Salix lasiolepis*) occur along the length of the creek. Plant species present in the seep areas include iris-leaved rush (*Juncus xiphioides*), creeping wild rye (*Leymus triticoides*), narrow-leaved cattail, and common velvet grass (*Holcus lanatus*).

Wildlife. Habitat for wildlife at the Project Site includes disturbed areas, nonnative grasslands, freshwater marsh, and willow riparian communities.

Portions of the site have been disturbed. Such areas may support species tolerant of disturbance. Common species observed in these areas include northwestern fence lizard (*Sceloporus occidentalis occidentalis*), house finch (*Carpodacus mexicanus*), Brewer's blackbird (*Euphagus cyanocephalus*), American crow (*Corvus brachyrhynchos*), house sparrow (*Passer domesticus*), and California ground squirrel (*Spermophilus beecheyi*).

The nonnative grassland areas present on the Project Site provide habitat for several reptiles, birds, and mammals. Common species present include northwestern fence lizard, Pacific gopher snake (*Pituophis melanoleucus catenifer*), lesser goldfinch (*Carduelis psaltria*), western meadowlark (*Sturnella neglecta*), ring-necked pheasant (*Phasianus colchicus*), California towhee (*Pipilo crissalis*), Botta's pocket gopher (*Thomomys bottae*), coyote (*Canis latrans*), and mule deer (*Odocoileus hemionus*). Several raptor species most likely utilize the site for foraging, and species observed included red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and northern harrier (*Circus cyaneus*).

The wetland present on the site provides habitat for a variety of species including Pacific treefrog (*Hyla[Pseudacris] regilla*), California newt (*Taricha torosa*), red-winged blackbird (*Agelaius phoeniceus*), common yellowthroat (*Geothlypis trichas*), and beaver (*Castor canadensis*).

Sensitive Species. The majority of sensitive species listed on the California Natural Diversity Data Base (CNDDB) as occurring in the Project Site and surrounding area are associated with northern coastal salt marsh habitats, which are well south and east of the Project Site. No habitat exists for these species on the Project Site. Specific surveys were performed for California red-legged frog (*Rana aurora draytonii*) during July 1998 by Wetlands Research Associates, Inc., and in July 1999 by Earth Tech. California red-legged frogs were not observed during either survey and have not been recorded on the site historically. Similarly, no giant garter snakes (*Thamnophis couchii gigas*) have been observed on the Project Site during surveys. The Suisun song sparrow (*Melospiza melodia maxillaris*), a federal Species of Concern, has been observed in the immediate Project Site vicinity and may occur on the Project Site. The federally listed endangered American peregrine falcon (*Falco peregrinus anatum*) may forage over the Project Site but would not be expected to nest in the area because of the lack of suitable cliff sites.

1.5 PAST INVESTIGATIONS

There have been several investigations of the Project Site for both ordnance and non-ordnance issues. A complete summary of past ordnance investigations will be presented in the Removal Action Work Plan (RAW), which is scheduled for agency and public review from early February through early March. There have been two separate non-UXO investigations of the Project Site. The first was conducted in late 1998 by SECOR International; the second by Earth Tech in June of 1999.

SECOR conducted the initial investigations on portions of the Project Site in 1998. Eighty-four soil samples were collected from selected areas on the Project Site during this investigation. Figures 1.5-1, 1.5-2, and 1.5-3 show the sampling location and the areas of concern identified during this investigation. The majority of the samples were collected at approximately 2 to 5 inches bgs. Two sets of samples were collected: SS series soil samples that were provided to a laboratory for analysis, and FSS series samples that were field screening samples for TNT. Most of the SS series samples were analyzed for metals (EPA Method 6010A/7000 series), explosive compounds (EPA Method SW8330), phosphate (EPA Method 365.3), and nitrate and nitrate/nitrite as nitrogen (EPA Method 353.2) by California-certified Sequoia Analytical Laboratory of Petaluma (Sequoia Analytical). The FSS Series samples were analyzed for TNT and cyclonite (RDX) using the Ensys® Soil Test System, a field testing method. Confirmation analysis for TNT and RDX was also performed in the laboratory for selected samples for which the field test method was utilized. In addition, two surface water samples were collected from the wetlands. Water samples were analyzed for total and dissolved metals (EPA Method SW6010A), explosive compounds (EPA Method SW8330), and nitrate and nitrate/nitrite as nitrogen (EPA Method 353.2) by Sequoia Analytical.

Earth Tech performed follow-on environmental sampling in June 1999, reviewed the previous collected data, and designed a sampling program to further identify contaminants of concern and to try to define the lateral extent of contaminants at known sites. A total of 120 soil samples were collected during this investigation. Sampling locations are shown on Figures 1.5-1, 1.5-2, and 1.5-3. The samples were analyzed for metals (EPA Method SW6010B/7000), PAHs (EPA Method SW8310), explosive compounds (EPA Method SW8330), and, in some instances, for dioxins/furans (EPA Method SW8290) and semivolatile organic compounds (SVOCs) (EPA Method 8270C). The samples were obtained at various depths: surface to 0.5 feet bgs; 0.5-1.0 feet bgs; 1.0-1.5 feet bgs; 2.0-2.5 feet bgs; 3.5-4.0 feet bgs; 3.75-4.25 feet bgs; and 4.0-4.5 feet bgs. The sampling was performed at the Demolition Sites and Flare Site, the TNT Strips, the stockpiles in the North Valley, and at the wetlands.

A summary of the previous investigation results by site is provided in Tables 1.5-2 through 1.5-22.

1.5.1 Preliminary Remediation Goals and Background Metals Ranges

Site cleanup criteria will be to background levels as determined by data analyses obtained from field samples collected as described for this Work Plan, and in accordance with the appropriate federal, state, and local regulatory agencies. Background metals data have been collected from two separate sources to date. One set of background metals data has been collected from the Former Solano County Sanitary Landfill (also known as the Rose Drive site), approximately 2 miles west of the Project Site (see Figure 1.3-1). The other set of background metals data has been collected from the Project Site outside of any identified areas of concern. Both the Former Solano County Sanitary Landfill and the Project Site are situated in similar geologic settings.

A baseline health risk assessment, prepared for the North Canyon Operable Unit, Former Solano County Sanitary Landfill (McLaren/Hart Chemrisk, 1997), established background ranges for metals in soil for that project. Table 3-1 of the referenced health risk assessment provided maximum background and background ranges for 16 metals (antimony, arsenic, barium, beryllium, cadmium, total chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, vanadium, and zinc) in soils for the Former Solano County Sanitary Landfill project. This table has been provided as Table 1.5-1 of this report.

During the 1998 SECOR investigation, approximately one-half of the SS series sampling locations (26 of the 43) at the Project Site were situated outside the known areas of concern, as shown on Plate 1.2-2. Soil samples from these locations were analyzed for 19 metals (antimony, arsenic, barium, beryllium, cadmium, total chromium, cobalt, copper, lead, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, thallium, vanadium, and zinc). These results are summarized in Table 1.5-2. Of those metals listed above, only arsenic appears to exceed the EPA Region IX residential Preliminary Remediation Goals (PRGs), dated October 1, 1999 (see Appendix E). There has been no evaluation of the Project Site background metals data to date. Both the SECOR and Former Solano County Sanitary Landfill data will be evaluated, along with the metals data collected in the remedial investigation field sampling program outlined in Section 2.2. At that time, it will be determined whether sufficient background data are available to establish acceptable background levels for arsenic and any other metals. Upon completion of the remedial investigation, if necessary, supplemental background samples will be collected.

data are available to establish acceptable background levels for arsenic and any other metals. Upon completion of the remedial investigation, if necessary, supplemental background samples will be collected.

1.5.2 Summary of Past Sampling Results

The following sections present a summary of the previous investigation analytical results for the Project Site. All compounds detected (excluding metals) are considered to be contaminants of concern resulting from the ordnance-related activities at each site, which will be further investigated (see Section 2.2). Metals were detected at varying concentrations at all previous sampling locations. For the purposes of evaluating the previous investigation metals data, the results have been compared to Residential PRGs. However, until reliable background data have been established for the Project Site (see Section 2.1), it is unknown whether the metals shown as exceeding their Residential PRG will remain contaminants of concern.

1.5.2.1 TNT Strips.

Surface soil samples were collected from 11 field screening locations (FSS-10, FSS-31, FSS-33, FSS-34, FSS-35, FSS-36, FSS-37, FSS-38, FSS-39, FSS-41, and FSS-40) and 28 shallow boring locations across the TNT Strips area (see Figure 1.5-1). Field screening samples FSS-34, FSS-36, FSS-39, and FSS-41 were collected from the visible strips; the seven other field screening samples were collected near, but not on, the visible strips. Field screening surface samples were tested for TNT and RDX. RDX was detected at 3.1 mg/kg and 3.4 mg/kg at field screening locations FSS-10 and FSS-41. TNT was detected at the same locations at 5,400 mg/kg and 789.5 mg/kg, respectively.

Twenty-seven shallow soil borings (TNT-1A,-1B,-1C; TNT-2A,-2B,-2C,-2D,-2E; TNT-3A,-3B,-3C; TNT-4A,-4B,-4C; TNT-5A,-5B,-5C,-5D,-5E; SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, SS-37, and SS-38) were advanced into the TNT Strips. With the exception of the soil samples from boring locations SS-6, SS-37, and SS-38, all other soil samples were collected from, or immediately adjacent to, the easily identifiable portions of the strips. Soil samples from the shallow boring locations were collected up to a maximum depth of 4.5 feet bgs. Soil samples from these borings were analyzed for explosives, PAHs, and metals. One sample from TNT-5 was also analyzed for dioxins/furans. Sampling locations are shown on Figure 1.5-1. Soil sample analytical results from the TNT Strips are summarized in Tables 1.5-3 through 1.5-8.

Within the TNT Strips area, the following metals were consistently detected at concentrations above their respective Residential PRGs: arsenic (detected up to 23 milligrams per kilogram [mg/kg]) exceeds the Residential PRG of 0.39 mg/kg, and iron (detected up to 50,000 mg/kg) exceeds the Residential PRG of 23,000 mg/kg.

The results by individual strips are summarized below.

TNT Strip #1: Soil samples were collected from shallow borings at the northwesternmost extent of the strip at 1 foot and 2 feet bgs; at the southeasternmost extent of the strip at 1 foot, 2 feet, and 4 feet bgs; and at the midpoint of the strip at 0.5 foot, 1 foot and 2 feet bgs. All samples were analyzed for explosives, PAHs, and metals. Soil sample analytical results for TNT Strip #1 are summarized in Table 1.5-5.

TNT was detected at 8,300 mg/kg at 1 foot bgs, decreasing to 1,600 mg/kg at 2 feet bgs at the northwestern end of the strip. At the midpoint of the strip, TNT was detected at 750 mg/kg at 0.5 foot bgs, decreasing to 360 mg/kg at 1 foot bgs and 68 mg/kg at 2 feet bgs. At the southeasternmost end of the strip, TNT was detected at 380,000 mg/kg at 1 foot bgs, decreasing to 110,000 mg/kg at 2 feet bgs and 11 mg/kg at 4 feet bgs. Six samples collected from TNT Strip #1 exceed the Residential PRG for TNT of 16 mg/kg.

Trinitrobenzene (TNB), which is a breakdown product of TNT, was detected in all samples from TNT Strip #1 at concentrations ranging from 32 mg/kg (TNT-1C at 4 feet bgs) to 150 mg/kg (TNT-1C at 2 feet bgs). Other explosives detected at trace concentrations include: 2,4-dinitrotoluene (5 mg/kg to 100 mg/kg) and 2-amino-4,6-dinitrotoluene (0.61 mg/kg to 3.2 mg/kg).

Trace concentrations of six PAHs (benzo[a]anthracene, chrysene, fluoranthene, naphthalene, phenanthrene, and pyrene) were identified at 0.5 foot bgs at the midpoint of the strip, and two PAHs (fluoranthene and phenanthrene) at 1 foot and 2 feet bgs at the southeasternmost extent of the strip.

In addition to arsenic and iron exceeding Residential PRGs, manganese was detected up to 3,800 mg/kg at 4 feet bgs at the southeasternmost extent of the strip; this value exceeds the Residential PRG for manganese of 1,800 mg/kg.

TNT Strip #2: Soil samples were collected from shallow borings situated at the northwesternmost extent of the strip at 1 foot and 2 feet bgs; at the midpoint of the strip at 0.5 foot, 1 foot, 2 feet, and 4 feet bgs; and at the southeasternmost extent of the strip at 1 foot and 2 feet bgs. Soil samples were also collected 2 feet upslope and downslope of the midpoint of the strip at 1 foot and 2 feet bgs. All samples were analyzed for explosives, PAHs, and metals. Soil sample analytical results for TNT Strip #2 are summarized in Table 1.5-5.

TNT was detected at 13,000 mg/kg at 1 foot bgs, increasing to 25,000 mg/kg at 2 feet bgs at the northwestern end of the strip. At the midpoint of the strip, TNT was detected at 190 mg/kg at 0.5 foot bgs, 92,000 mg/kg at 1 foot bgs, 24 mg/kg at 2 feet bgs, and 180 mg/kg at 4 feet bgs. At the southeastern end of the strip, TNT was detected at 42 mg/kg at 1 foot bgs and 9,500 mg/kg at 2 feet bgs. TNT appears to decrease in concentrations at relatively short distances from the visible portions of the strip. TNT concentrations upslope and downslope of the midpoint of the strip ranged from 11 mg/kg to 37 mg/kg at 1 foot bgs and 2.5 mg/kg to

210 mg/kg at 2 feet bgs. Ten samples, collected from TNT Strip #2, exceed the Residential PRG for TNT of 16 mg/kg.

TNB was detected in all samples, ranging in concentration from 0.41 mg/kg to 230 mg/kg. Other explosives detected at trace concentrations at TNT Strip #2 include 2,4-dinitrotoluene (3.3 mg/kg to 64 mg/kg), 2,6-dinitrotoluene (0.4 mg/kg), 2-amino-4,6-dinitrotoluene (1.3 mg/kg to 9.1 mg/kg), 4-amino-2,6-dinitrotoluene (3.1 mg/kg to 8.7 mg/kg), and nitroglycerin (0.24 mg/kg to 0.48 mg/kg).

Trace concentrations of PAHs (fluoranthene and phenanthrene) were detected at 1 foot and 2 feet bgs at the northwestern end of the strip, at 1 foot bgs at the southeasternmost extent of the strip, and at 2 feet bgs and 1 foot bgs upslope and downslope from the midpoint, respectively.

In addition to arsenic and iron exceeding Residential PRGs, manganese was detected up to the Residential PRG value of 1,800 mg/kg at 2 feet bgs at the northwesternmost extent of the strip.

TNT Strip #3: Soil samples were collected from shallow borings situated at the northwesternmost extent of the strip at 1 foot and 2 feet bgs; at the southeasternmost extent of the strip at 0.5 foot, 1 foot, and 2 feet bgs; and at the midpoint of the strip at 1 foot, 2 feet, and 4 feet bgs. All soil samples were analyzed for explosives, PAHs, and metals. Soil sample analytical results for TNT Strip #3 are summarized in Table 1.5-6.

TNT was detected at 51,000 mg/kg at 1 foot bgs, decreasing to 28,000 mg/kg at 2 feet bgs at the northwestern end of the strip. TNT was detected at 83 mg/kg at 2 feet bgs, decreasing to 10 mg/kg at 4 feet bgs at the midpoint of the strip, and at 16,000 mg/kg at 0.5 foot bgs, decreasing to 31 mg/kg at 1 foot bgs and 15 mg/kg at 2 feet bgs at the southeasternmost end of the strip. Five samples, collected from TNT Strip #3, exceed the Residential PRG for TNT of 16 mg/kg.

TNB was detected in all but one sample at concentrations ranging from 96 mg/kg to 210 mg/kg. Other explosives detected at trace concentrations at TNT Strip #3 include 2,4-dinitrotoluene (0.25 mg/kg to 12 mg/kg), 2-amino-4,6-dinitrotoluene (0.21 mg/kg to 12 mg/kg), 4-amino-2,6-dinitrotoluene (9.9 mg/kg), and nitroglycerin (0.24 mg/kg).

Trace concentrations of two PAHs (fluoranthene and phenanthrene) were detected at 2 feet bgs at the northwesternmost extent of the strip.

In addition to arsenic and iron exceeding Residential PRGs, manganese was detected up to 1,900 mg/kg at 2 feet bgs at the midpoint of the strip; this value exceeds the Residential PRG for manganese of 1,800 mg/kg.

TNT Strip #4: Soil samples were collected from shallow borings situated at the westernmost extent of the strip at 1 foot and 2 feet bgs; at the southeasternmost extent of the strip at 1 foot and 2 feet bgs; and at the midpoint of the strip at

0.5 foot, 1 foot, 2 feet, and 4 feet bgs. All soil samples were analyzed for explosives, PAHs, and metals. Soil sample analytical results for TNT Strip #4 are summarized in Table 1.5-7.

TNT was detected at 150 mg/kg at 1 foot bgs, decreasing to 18 mg/kg at 2 feet bgs at the western end of the strip. TNT was detected at 52 mg/kg at 0.5 foot bgs, at 14 mg/kg at 1 foot bgs and at 660 mg/kg at 2 feet bgs, decreasing to 240 mg/kg at 4 feet bgs at the midpoint of the strip. TNT was detected at 20,000 mg/kg at 1 foot bgs, decreasing to 2 mg/kg at 2 feet bgs at the southeasternmost end of the strip. Six samples collected from TNT Strip #4 exceed the Residential PRG for TNT of 16 mg/kg.

TNB was detected in all samples at concentrations ranging from 0.6 mg/kg to 200 mg/kg. Other explosives detected at trace concentrations at TNT Strip #4 include 2,4-dinitrotoluene (1.3 mg/kg to 2.4 mg/kg), 2-amino-4,6-dinitrotoluene (1.1 mg/kg to 6 mg/kg), and 4-amino-2,6-dinitrotoluene (5.3 mg/kg to 5.4 mg/kg).

Trace concentrations of one PAH (phenanthrene) were detected at 0.5 foot bgs at the midpoint of the strip and at 1 foot bgs at the southeasternmost extent of the strip.

TNT Strip # 5: Soil samples were collected from shallow borings at the westernmost extent of the strip at the surface, 1 foot, and 2 feet bgs; at the easternmost extent of the strip at 1 foot and 2 feet bgs; and at the midpoint of the strip at 0.5 foot, 1 foot, and 2 feet bgs. Soil samples were also collected from borings advanced 2 feet downslope at the western end of the strip at 1 foot and 2 feet bgs, and 2 feet downslope (approximately 10 feet) east of the western end of the strip at 1 foot and 2 feet bgs. All samples were analyzed for explosives, PAHs, and metals. Additionally, one sample collected at 1 foot bgs at the western end of the strip was analyzed for dioxins/furans. Soil sample analytical results for TNT Strip #5 are summarized in Table 1.5-8.

TNT was detected at 1,500 mg/kg at the surface, at 10,000 mg/kg at 1 foot bgs, decreasing to 12 mg/kg at 2 feet bgs at the western end of the strip. TNT was detected at 4,200 mg/kg at 0.5 foot bgs, at 21,000 mg/kg at 1 foot bgs, decreasing to 7,500 mg/kg at 2 feet bgs at the midpoint of the strip. TNT was detected at 3.1 mg/kg at 1 foot bgs and at 460 mg/kg at 2 feet bgs at the eastern end of the strip. TNT appears to decrease in concentrations at relatively short distances from the visible portions of the strip. TNT was detected at the western end of the strip at two downslope locations at the following concentrations: 1.7 mg/kg at 1 foot bgs and 750 mg/kg at 2 feet bgs; and 1.6 mg/kg at 1 foot bgs and 0.69 mg/kg at 2 feet bgs. Seven samples collected from TNT Strip #5 exceed the Residential PRG for TNT of 16 mg/kg.

TNB was detected in all samples, except three, at concentrations ranging from 0.59 mg/kg to 200 mg/kg. Other explosives detected at trace concentrations at TNT Strip #5 include 2,4-dinitrotoluene (0.55 mg/kg to 15 mg/kg), 2-amino-

4,6-dinitrotoluene (0.46 mg/kg to 5.4 mg/kg), 4-amino-2,6-dinitrotoluene (0.57 mg/kg to3.6 mg/kg), and nitroglycerin (0.3 mg/kg to 0.6 mg/kg).

The following dioxin/furans were detected at TNT Strip #5: total pentachlorinated dibenzofurans (4.3 picograms per gram [pg/g]), total tetrachlorinated dibenzo-p-dioxins (0.94 pg/g), and total tetrachlorinated dibenzofurans (13 pg/g). No Residential PRGs have been established for these compounds.

A trace concentration of one PAH (phenanthrene) was detected at 0.0072 mg/kg in the surface sample collected at the western end of the strip.

1.5.2.2 Howitzer Test Facility.

No field screening surface samples were collected, and no shallow borings were advanced at the Howitzer Test Facility. Discrete soil samples were collected at five locations (SS-19, SP3-1, SP3-2, SP3-3, and SP3-4) from a stockpile (Stockpile #3) situated along the eastern boundary of the Howitzer Test Facility (see Figure 1.5-2). It is believed that this stockpile resulted from the dismantling of the Howitzer Test Facility. One of the stockpile soil samples (SS-19) was analyzed for explosives and metals; the remaining stockpile soil samples were analyzed for explosives, PAHs, metals, and SVOCs. Soil sample analytical results for the Howitzer Test Facility are summarized in Tables 1.5-9 and 1.5-10.

No explosives or SVOCs (excluding the PAHs noted below) were detected in the soil samples collected from Stockpile #3. Trace concentrations of two PAHs (chrysene and pyrene) were detected at 0.077 mg/kg and 0.033 mg/kg, respectively. The following metals were detected at concentrations above their respective Residential PRGs in Stockpile #3: arsenic (detected up to 17 mg/kg) exceeds the Residential PRG of 0.39 mg/kg, and iron (detected up to 47,000 mg/kg) exceeds the Residential PRG of 23,000 mg/kg.

1.5.2.3 Ammunition Renovation/Primer Destruction Site.

One field screening surface sample (FSS-32) was collected near two soil stockpiles at this site (see Figure 1.5-2). The field screening sample was tested for TNT. Soil sample analytical results for the field screening sample are summarized in Table 1.5-11. No TNT was detected in the field screening sample. No shallow soil borings have been advanced at the Ammunition Renovation/Primer Destruction Site.

Two discrete soil samples were collected from each of two soil stockpiles (Stockpile #1 and Stockpile #2) within the Ammunition Renovation/Primer Destruction Site (see Figure 1.5-2). These soil stockpiles are believed to have resulted from dismantling the facilities within this area. The stockpile soil samples (SP1A, S1B, SP2A, and SP2B) were analyzed for explosives, PAHs, and metals. In addition, one of the samples from each stockpile was also analyzed for SVOCs. Soil sample analytical results for the stockpile samples are summarized in Table 1.5-12.

TNT and phenanthrene were detected in the soil sample collected from Stockpile #1 at 0.67 mg/kg and 0.0078 mg/kg, respectively. No explosives were detected in the soil sample collected from Stockpile #2. Nine PAHs were detected at concentrations ranging from 0.044 mg/kg to 0.11 mg/kg. Of the nine PAHs detected, only one, benzo(a)pyrene, detected at 0.11 mg/kg, exceeds its respective Residential PRG of 0.062 mg/kg.

The following metals were detected at elevated concentrations above their respective Residential PRGs in both stockpiles: arsenic (detected up to 16 mg/kg) exceeds the Residential PRG of 0.39 mg/kg, and iron (detected up to 44,000 mg/kg) exceeds the Residential PRG of 23,000 mg/kg.

1.5.2.4 Flare Site.

Soil samples were collected from two surface field screening locations (FSS-21 and FSS-29) and from four shallow boring locations (SS-22, FA-1, FA-2, and FA-3) within, and in the immediate vicinity of, the Flare Site. Field screening was conducted upslope and toward the downslope periphery of the Flare Site. Two of the soil borings (SS-22 and FA-3) were advanced toward the center of the Flare Site; the remaining two soil borings (FA-1 and FA-2) were advanced toward the periphery of the Flare Site in a generally upslope and downslope direction, respectively. Soil samples from the periphery boring locations were collected to a maximum depth of 2.5 feet bgs. Soil samples from the central boring locations were collected only at the surface. Sampling locations are shown on Figure 1.5-3. Soil sample analytical results for the Flare Site are summarized in Tables 1.5-13 and 1.5-14.

Field screening samples were tested for RDX and TNT. RDX was detected at 2.6 mg/kg at the downslope periphery field screening sampling location (FSS-29). Soil samples from the shallow borings were analyzed for explosives, PAHs, and metals. No other explosives or PAHs were detected in the soil samples. The following metals were detected at elevated concentrations above their respective Residential PRGs: antimony (detected up to 1,470 mg/kg) exceeds the Residential PRG of 31 mg/kg; arsenic (detected up to 18 mg/kg) exceeds the Residential PRG of 0.39 mg/kg; barium (detected up to 76,600 mg/kg) exceeds the Residential PRG of 5,400 mg/kg; copper (detected up to 24,200 mg/kg) exceeds the Residential PRG of 2,900 mg/kg; iron (detected up to 66,000 mg/kg) exceeds the Residential PRG of 23,000 mg/kg; and lead (detected up to 46,600 mg/kg) exceeds the Residential PRG of 400 mg/kg.

The surface sample collected from the center of the Flare Site was analyzed for dioxins/furans, which were detected at various concentrations ranging up to 490 pg/g (total tetrachlorinated dibenzofurans). Two of the dioxins, 2,3,7,8-tetrachlorodibenzo-p-dioxin and total hexachlorinated dibenzo-p-dioxins, detected at 1.5 pg/g (0.0015 mg/kg) and 110 pg/g (0.11 mg/kg), exceed the Residential PRGs of 0.0000039 mg/kg and 0.000078 mg/kg, respectively.

1.5.2.5 Demolition Site #1.

Soil samples have been collected within, and in the immediate vicinity of, Demolition Site #1 at four field screening surface sampling locations (FSS-24, FSS-25, FSS-26, and FSS-27) and three shallow boring locations (SS-24, DA1-1 and DA1-2). Field screening was conducted between approximately 100 and 150 feet from Demolition Site #1, in an upslope, downslope and cross-slope direction. One of the soil borings (SS-24) was advanced toward the center of Demolition Site #1; the remaining two borings (DA1-1 and DA1-2) were advanced toward the periphery of Demolition Site #1. Soil samples from the boring locations were collected to a maximum depth of 4 feet bgs. The locations of the sampling points are shown on Figure 1.5-3. Soil sample analytical results for Demolition Site #1 are summarized in Tables 1.5-15 and 1.5-16.

Field screening samples were tested for RDX and TNT. RDX was detected at 1.4 mg/kg in the westernmost field screening sample (FSS-26). The remaining soil samples were analyzed for explosives, PAHs, and metals. No other explosives or PAHs were detected in the soil samples. The following metals were detected at elevated concentrations above their respective Residential PRGs: arsenic (detected up to 18 mg/kg) exceeds the Residential PRG of 0.39 mg/kg, and iron (detected up to 48,000 mg/kg) exceeds the Residential PRG of 23,000 mg/kg.

OE may be present in such quantities at this site that standard OE avoidance techniques cannot be used for the safe collection of environmental samples. Therefore, this site will be characterized based on the existing sample data and site characterization of Demolition Site #3. The inferred results of the investigation of this site will be presented in the site Remedial Investigation Report. No further site characterization for non-OE contaminants is planned for this area.

1.5.2.6 Demolition Site #2.

Soil samples were collected from within, and in the general vicinity of, Demolition Site #2 at three field screening surface locations (FSS-23, FSS-22, and FSS-28) and three shallow soil boring locations (SS-23, DA2-1, and DA2-2). Field screening samples were collected approximately 150 feet upslope, immediately east of the site, and approximately 75 feet downslope, respectively, of Demolition Site #2. The shallow soil borings were advanced toward the periphery of Demolition Site #2. Soil samples from the shallow borings were collected to a maximum depth of 4.5 feet bgs. The locations of the sampling points are shown on Figure 1.5-3. Soil sample analytical results from Demolition Site #2 are summarized in Tables 1.5-17 and 1.5-18.

No TNT was detected in the field screening samples conducted at this site. The remaining soil samples were analyzed for explosives, PAHs, and metals. No other explosives or PAHs were detected in the soil samples. The following metals were detected at elevated concentrations above their respective Residential PRGs: arsenic (detected up to 17 mg/kg) exceeds the Residential PRG of 0.39 mg/kg, and iron (detected up to 47,500 mg/kg) exceeds the Residential PRG of 23,000 mg/kg.

Since no physical evidence (e.g., live ordnance, magnetic anomalies) of ordnance-related activities has been found at Demolition Site #2, the site is being eliminated from any further field investigation activities.

1.5.2.7 Demolition Site #3.

Soil samples were collected from within, and in the general vicinity of, Demolition Site #3 at two field screening surface sampling locations (FSS-3 and FSS-11) and seven shallow soil boring locations (SS-22, SS-26, SS-27, SS-28, SS-29, DA3-1, and DA3-2) (see Figure 1.5-3). Field screening samples were collected toward the upslope periphery and approximately 75 feet west of the site of Demolition Site #3. Two of the seven shallow soil borings (SS-22 and SS-29) were advanced outside the suspected limits of Demolition Site #3. The remaining shallow soil borings (SS-26, SS-27, SS-28, DA3-1, and DA3-2) were advanced either toward the center or on the periphery of the site. Soil samples from the shallow soil borings were collected up to a maximum depth of 4.5 feet bgs. The locations of the sampling points are shown on Figure 1.5-3, and the soil sample analytical results are summarized in Tables 1.5-19 and 1.5-20.

No TNT was detected in the field screening samples conducted at this site. The remaining soil samples were analyzed for explosives, PAHs, and metals. No other explosives or PAHs were detected in the soil samples. The following metals were detected at concentrations above their respective Residential PRGs: arsenic (detected up to 19.1 mg/kg) exceeds the Residential PRG of 0.39 mg/kg, and iron (detected up to 48,000 mg/kg) exceeds the Residential PRG of 23,000 mg/kg.

1.5.2.8 Wetlands.

Two surface samples (WS-1 and WS-2) were collected from the wetlands, upgradient and downgradient of the Flare Site and Demolition Sites, respectively (see Figure 1.5-3). No explosives were detected in the surface water samples. Surface water analytical results for the wetlands are summarized in Table 1.5-21. Manganese (22.6 to 377 microgram per liter [μg/L]), barium (9.24 to 82.3 μg/L), copper (11.8 to 17.8 μg/L), vanadium (11.1 μg/L), and zinc (26.0 to 61.5 μg/L) were detected in the surface water samples. With the exception of the zinc results, the concentrations tended to be higher in the upgradient sample than in the downgradient sample.

One sediment sample (WET-1) was also collected from the wetlands from the surface to 0.5 foot bgs (see Figure 1.5-3). The sample was analyzed for metals, PAHs, and explosives. Sediment sample analytical results for the wetlands are summarized in Table 1.5-2. No explosives or PAHs were detected in the sediment sample. The following metals were detected at concentrations above their respective Residential PRGs: arsenic (detected up to 15 mg/kg) exceeds the concentrations tended to be higher in the upgradient sample than in the downgradient sample.

One sediment sample (WET-1) was also collected from the wetlands from the surface to 0.5 foot bgs (see Figure 1.5-3). The sample was analyzed for metals, PAHs, and explosives. Sediment sample analytical results for the wetlands are summarized in Table 1.5-2. No explosives or PAHs were detected in the sediment sample. The following metals were detected at concentrations above their respective Residential PRGs: arsenic (detected up to 15 mg/kg) exceeds the Residential PRG of 0.39 mg/kg, and iron (detected up to 44,000 mg/kg) exceeds the Residential PRG of 23,000 mg/kg.

1.6 CONCEPTUAL SITE MODELS

This section presents the Conceptual Site Models for each of the sites. This information, coupled with the results of past investigations, can be used to assess whether any additional information is necessary to adequately define the extent of contamination at each of the sites.

Contaminants of concern have been detected during previous sampling events; potential contaminants of concern are those contaminants likely to be associated with the types of past activities being conducted at the various areas of concern as detailed in Section 1.2.

The hydrogeologic model for the Project Site is presented in Section 1.3.4 and is generally applicable for all of the sites, unless otherwise stated.

1.6.1 TNT Strips

The TNT Strips are on the northern slope and crest of the North Valley. There are five strips within the TNT Strips area; it is assumed that these were used for burning TNT. The burning activities were confined to the ground surface. The surficial extent of the burning activities is believed to generally correspond to the areas that currently lack vegetation.

The TNT Strips are underlain by a surficial layer of brown to dark brown clay with increasing angular rock fragments with depth, which grades into a brown to brown-gray claystone that weathers to a silty clay (weathered bedrock zone). The surficial layer is prone to raveling, slumping and sliding, especially on the steeper valley slopes. Beneath the weathered bedrock zone is more competent bedrock, which consists predominantly of claystone (Figure 1.6-1).

Contaminants of Concern

TNT has been identified in the near-surface and shallow subsurface soil (to 4 feet bgs). The highest concentration of TNT detected to date is at the southeastern end of TNT Strip #1, where 380,000 mg/kg of TNT was detected at 1 foot bgs. At potential contaminant of concern. Dioxins/furans have also been detected at the TNT Strips; however, no Residential PRGs have been established for the compounds detected.

The majority of the soil samples collected in previous investigations at the TNT Strips have been collected within the strips themselves in the areas where vegetation is lacking. A few samples have been collected in the vegetated areas adjacent to the strips (see Figure 1.5-1). Data collected from these adjacent locations indicate that the TNT concentrations in the subsurface soil (up to 2 feet bgs) decrease significantly at relatively short lateral distances from the strips. This would appear to confirm the lack of vegetation as being a good indication of the approximate extent of the TNT surface contamination, and indicates that the subsurface contamination likely does not extend great lateral distances beyond the strips at depth.

Potential Pathways

The following potential contaminant transport pathways have been identified for the TNT Strips, given that the location of the TNT Strips are on the crest and sideslope of a hill above the North Valley:

- Precipitation runoff
- Precipitation infiltration into subsurface soils and groundwater
- Transport of surficial soil via gravity downslope or possibly as a result of site grading activities.

These potential transport pathways may have resulted in contaminant migration away from the source area.

Data obtained to date show that the shallow soil has probably been affected through precipitation infiltration, which has caused contaminants originating at the surface to leach into the subsurface soils. The data also indicate that the TNT concentrations, for the most part, appear to decrease rapidly with depth; however, the extent to which the contamination has leached into the subsurface soil beyond 4 feet bgs, and potentially into the groundwater, is unknown. None of the five boreholes (B-15, B-16, B-17, B-18, and B-19) advanced during previous investigations in the North Valley have encountered groundwater, with the exception of boring B-18, where groundwater was encountered at approximately 21 feet bgs. No groundwater samples have been collected in the North Valley; therefore, it is unknown whether groundwater has been affected by activities within the TNT Strips.

One of the most important parameters that allows a quick assessment of an organic chemical mobility in soil and groundwater is Koc, which is a soil adsorption coefficient normalized for a soil organic content (Dragun, 1988). In general, chemicals with a Koc (milliliters per gram [mL/g]) of less than 50 are considered to be very mobile, while those with a Koc of greater than 2,000 are considered to be immobile. Another important parameter to be considered in the assessment of an organic chemical mobility is vapor pressure. Vapor pressure allows an assessment of a chemical's propensity to exist in the atmosphere, as opposed to existing as a pure chemical in liquid or solid form. In general, chemicals with a vapor pressure of less than 10^{-7} mm mercury (Hg) should be present in the atmosphere or soil air in negligible amounts, while those with a vapor pressure greater than 10^{-2} mm Hg should be present primarily in the atmosphere or soil air (Dragun, 1988).

Using these general criteria, explosives can typically be characterized as being somewhat mobile in the soil environment. TNT, with a Koc of 470 mL/g and a vapor pressure of 1.1×10^{-6} mm Hg, appears to be less mobile than its breakdown product TNB, which has a Koc of 77 mL/g and a vapor pressure of 1.0×10^{-4} mm Hg. The chemicals tend not to evaporate and are present in the soil air in negligible amounts; therefore, migration into the ambient air was not considered to be a potential transport pathway for the TNT Strips. Because of its insolubility, TNT is very persistent in the soils. Based on the hydrogeologic model presented in Section 1.3.4, any groundwater that may have been affected by the TNT Strips will, therefore, predominantly migrate to the southwest toward the North Valley, then to the southeast down the North Valley (Figures 1.6-1 and 1.6-2).

Therefore, since the shallow groundwater beneath the site is not currently used for drinking water, but potentially hydrologically connected to the bay, there are only two complete exposure pathways: via dermal contact with the contaminated soil during the planned excavation and removal activities, and via dermal contact with groundwater.

Potential Additional Investigation

Based on the TNT Strips Conceptual Site Model, additional information is needed to further define the lateral and vertical extent of the explosives contamination associated with the TNT Strips at the surface, and in subsurface soil/weathered bedrock as well as the shallow groundwater, and to confirm previous PAHs, metals, and dioxin/furan data.

1.6.2 Howitzer Test Facility

The Howitzer Test Facility is situated toward the top of the North Valley, where the natural topography has been graded to accommodate both the Howitzer Test Facility and the adjacent Ammunition Renovation/Primer Destruction Site (see Figure 1.5-2). The Howitzer Test Facility was used to test howitzer barrels and propellant. Building 540 may have been used for a variety of activities, including as a soils laboratory, or possibly for rocket fuel testing. With the exception of excavating into the hillside in order to construct the test pad and tunnels, activities at the Howitzer Test Facility were confined to the surface.

The Howitzer Test Facility is underlain by artificial fill (associated with test pads/tunnels), then a brown to dark brown clay that grades into a brown to brown-gray claystone that weathers to a silty clay (weathered bedrock zone). Beneath the weathered bedrock zone is more competent bedrock that consists predominantly of claystone (see Figure 1.6-2).

Potential Contaminants of Concern

Other than the sampling of one soil/debris stockpile (Stockpile #3) associated with the dismantling of the howitzer test tunnels, no previous investigations have been conducted in this area. The stockpile is on the eastern portion of the Howitzer Test Facility. A trace concentration of one PAH was detected at Stockpile #3.

Since no investigation has been conducted, the following compounds remain potential contaminants of concern associated with the Howitzer Test Facility activities: explosives (including nitroglycerin and pentaerythritol tetranitrate [PETN]), PAHs, as well as heavy fuels (diesel, kerosene, motor oil), volatile organic compounds (VOCs), perchlorate, pesticides, and nitrate/nitrite.

Potential Pathways

The following potential contaminant transport pathways have been identified for tetranitrate in the Howitzer Test Facility:

- Precipitation infiltration into subsurface soils and groundwater
- Precipitation runoff from the stockpiled soils.

With the exception of the VOCs, most of the potential contaminants of concern are very persistent in soils. Heavy fuels, PAHs, and metals all tend to be immobile. Explosives tend to be somewhat mobile (as discussed in Section 1.6.1) but relatively insoluble, while solvents are considered to be mostly readily soluble and highly mobile. Perchlorate is highly soluble and very mobile in soil. Therefore, only trace amounts of perchlorate would be expected in soil. Pesticides in soil are relatively insoluble and tend to be persistent.

Activities at the Howitzer Test Facility may, therefore, have affected the subsurface soils and groundwater. Surface/near-surface soil has been disturbed through excavation activities at the Howitzer Test Facility; however, soils from stockpiles are likely representative of the surficial soils. Since the Howitzer Test Facility is near the top of the North Valley, any groundwater that may have been affected by the Howitzer Test Facility will predominantly migrate to the southeast down the North Valley.

Since the shallow groundwater beneath the site is not currently used for drinking water, but potentially hydrologically connected to the bay, there are only two complete exposure pathways: via dermal contact with the contaminated soil during the planned excavation and removal activities, and via dermal contact with groundwater.

Potential Additional Investigations

Based on the Howitzer Test Facility Conceptual Site Model, additional information is needed to determine if contamination exists in the subsurface soil/weathered bedrock and shallow groundwater as a result of the activities conducted at the Howitzer Test Facility.

1.6.3 Ammunition Renovation/Primer Destruction Site

The Ammunition Renovation/Primer Destruction Site is situated toward the top of the North Valley where the natural topography site has been graded to accommodate both the Ammunition Renovation/Primer Destruction Site and the adjacent Howitzer Test Facility. The Ammunition Renovation/Primer Destruction Site was used to refurbish ordnance and to burn primers in a "Burn Cage." The Ammunition Renovation/Primer Destruction Site activities were confined to the surface.

The Ammunition Renovation/Primer Destruction Site is underlain by artificial fill (associated with buildings), then a brown to dark brown clay that grades into a brown to brown-gray claystone that weathers to a silty clay (weathered bedrock zone). Beneath the weathered bedrock zone is more competent bedrock, which consists predominantly of claystone (see Figure 1.6-2 and Figure 1.6-3).

Contaminants of Concern

Other than the sampling of two soil/debris stockpiles (Stockpiles #1 and #2) currently situated in this area, no previous investigations have been conducted in this area.

PAHs were detected in samples collected from the two stockpiles. One of the PAHs detected, benzo(a)pyrene at 0.11 mg/kg, exceeds the Residential PRG of 0.061 mg/kg. A low level of TNT (0.67 mg/kg) was also detected at one of the stockpiles at a level well below its Residential PRG of 16 mg/kg.

Since no investigation has been conducted, the following compounds remain potential contaminants of concern associated with the Ammunition Renovation/ Primer Destruction Site activities: explosives as well as PAHs, heavy fuels (diesel, kerosene, motor oil), metals, and VOCs. The following potential contaminant transport pathways have been identified for the Ammunition Renovation/Primer Destruction Site:

- Precipitation infiltration into subsurface soils and groundwater
- Precipitation runoff from the stockpiled soils.

With the exception of VOCs, most of the potential contaminants of concern are very persistent in soils. Heavy fuels, PAHs, and metals all tend to be immobile. Explosives tend to be somewhat mobile (as discussed in Section 1.6.1) but relatively insoluble.

Activities at the Ammunition Renovation/Primer Destruction Site may, therefore, have affected the subsurface soils and groundwater. Since the Ammunition Renovation/Primer Destruction Site is situated at the very top of the North Valley (to the southeast) and another unnamed valley (to the northwest), groundwater from the site could flow in either direction, as a result of the groundwater divide likely created by the mergence of these two valleys.

Since the shallow groundwater beneath the site is not currently used for drinking water, but potentially hydrologically connected to the bay, there are only two complete exposure pathways: via dermal contact with the contaminated soil during the planned excavation and removal activities, and via dermal contact with groundwater.

Potential Additional Investigations

Based on the Ammunition Renovation/Primer Destruction Site Conceptual Site Model, additional information is needed to determine if contamination exists in the subsurface soil/weathered bedrock and shallow groundwater as a result of the activities conducted at this site.

1.6.4 Flare Site

The Flare Site is on the south slope of the South Valley immediately above the wetlands. It was used to burn and dispose of flares. Flare Site activities were confined to the surface. In the field, the Flare Site is readily discernible as an area covered by ash.

The Flare Site is underlain by a brown to dark brown clay that grades into a brown to brown-gray claystone that weathers to a silty clay (weathered bedrock zone). Beneath the weathered bedrock zone is more competent bedrock that consists predominantly of claystone (see Figure 1.6-4).

Contaminants of Concern

Previous investigations conducted at the Flare Site indicate levels of various metals (including antimony, arsenic, barium, copper, iron, and lead) in the surficial soils within the ash area above their respective Residential PRGs. Dioxins and furans have also been detected in the surficial soils at the Flare Site. Explosives (including nitroglycerin and PETN) and PAHs have not been detected during the previous investigations; however, given the limited depth of previous investigations at the Flare Site, they are considered to be a potential contaminant of concern. Phosphorus is also considered to be a potential contaminant of concern, as it is a common constituent of flares.

Potential Pathways

The following potential contaminant transport pathways have been identified for the Flare Site:

- Precipitation runoff
- Precipitation infiltration into subsurface soils and groundwater
- Transport of surficial soil via gravity downslope toward the wetlands.

Most of the contaminants and potential contaminants of concern are very persistent in soils. Metals and PAHs all tend to be immobile. Explosives tend to be somewhat mobile (as discussed in Section 1.6.1) but relatively insoluble.

Previous investigation data show that the surficial soil at the Flare Site has been affected; however, the vertical and lateral extent of the contamination in the subsurface soil/weathered bedrock is unknown. Activities at the Flare Site may also have affected the groundwater and the surface water in the wetlands as a result of the transport pathways listed previously.

As discussed in Section 1.3.4, precipitation will naturally take the flow path of least resistance, which will result in surface water runoff from the Flare Site toward the topographic low of the wetlands. Precipitation that infiltrates into the sideslopes will have likely leached the contaminants into the subsurface soil. Given the proximity of the Flare Site to the wetlands, it is likely that the depth to groundwater in this area is relatively shallow. Any groundwater that may have been affected by the Flare Site will, therefore, predominantly migrate to the north toward the South Valley, then tend to migrate to the southeast down the South Valley beneath the McAllister Drive Land Bridge.

Since the shallow groundwater beneath the site is not currently used for drinking water, but potentially hydrologically connected to the bay, there are only two complete exposure pathways: via dermal contact with the contaminated soil during the planned excavation and removal activities, and via dermal contact with groundwater.

Potential Additional Investigations

Based on the Flare Site Conceptual Site Model, additional information is needed to define the lateral and vertical extent of the observed surficial contamination in the soil/weathered bedrock, the wetlands sediment and surface water, and in the shallow groundwater and to confirm dioxin/furan data.

1.6.5 Demolition Site #3

Demolition Site #3 is situated along the north slope of the South Valley, immediately above the wetlands. Demolition Site #3 is a confirmed ordnance demolition area where out-of-service munitions were placed in a pit and detonated. A half-track armored personnel vehicle was removed from the site in the mid-1990s, and the resulting depression was backfilled with soil. It is thought that approximately 10 feet of fill exists at the site (Figure 1.6-5).

Demolition Site #3 is underlain by fill probably consisting of clay and silt that is likely underlain by brown to dark brown clay that grades into a brown to brown-gray claystone that weathers to a silty clay (weathered bedrock zone). Beneath the weathered bedrock zone is more competent bedrock that consists predominantly of claystone.

Contaminants of Concern

Soil samples from previous investigations at Demolition Site #3 obtained from the periphery and the center of the site and up to 50 feet along the slope have been tested for metals, PAHs, and explosives. All samples showed nondetect for explosives and PAHs. All metals were detected below their respective PRGs, with the exception of arsenic and iron.

Although not detected to date, explosives (including nitroglycerin and PETN) and PAHs, as well as metals, remain potential contaminants of concern.

Potential Pathways

The following potential contaminant transport pathways have been identified for Demolition Site #3:

- Precipitation runoff
- Precipitation infiltration into subsurface soils and groundwater
- Transport of surficial soil via gravity downslope toward the wetlands.

Most potential contaminants of concern are very persistent in soils. Metals and PAHs all tend to be immobile. Explosives tend to be somewhat mobile (as discussed in Section 1.6.1) but relatively insoluble.

According to previous investigation data, the surficial soil at the site does not generally appear to have been affected. Activities at the site may have affected the groundwater and the surface water in the wetlands as a result of the transport pathways listed previously.

As discussed in Section 1.6.1, precipitation will naturally take the flow path of least resistance, which will result in surface water runoff from the site toward the topographic low of the wetlands. Precipitation that infiltrates into the sideslopes may have leached the contaminants into the subsurface soil. Given the proximity of the site to the wetlands, it is likely that the depth to groundwater in this area is relatively shallow. Any groundwater that may have been affected by the site will, therefore, predominantly migrate to the north toward the South Valley, then tend to migrate to the southeast down the South Valley beneath the McAllister Drive Land Bridge.

Since the shallow groundwater beneath the site is not currently used for drinking water, but potentially hydrologically connected to the bay, the only complete exposure pathway is via dermal contact with the contaminated soil during the planned excavation and removal activities and dermal contact with groundwater.

Potential Additional Investigations

Based on the Demolition Site #3 Conceptual Site Model, additional information would be desirable to determine if contamination exists beneath and around the site.

1.6.6 Dynamite Burn Site

The Dynamite Burn Site was situated on the Ridge approximately 700 feet south of the Howitzer Test Tunnels (see Plate 1.2-2). The portion of the Ridge where the burn site was situated has been removed (Figure 1.6-6) as part of the site grading activities (see Section 1.2.2). Soils potentially affected by past site activities may have been transported to the McAllister Drive Land Bridge based on the analysis presented in Section 1.2.2. Furthermore, if the soils were transported to the land bridge, they would most likely be near the base of the land bridge since the top soils removed from the Ridge would have been the first fill soils placed for the land bridge. Additionally, soils directly below the Dynamite Burn Site may have been affected. This leads to two distinct areas to be sampled: the toe of the land bridge and the Dynamite Burn Site.

Contaminants of Concern

No previous soil samples have been collected from this site. Dynamite from the 1940 era mainly consisted of nitroglycerin. Therefore, nitroglycerin remains a potential contaminant of concern.

Potential Pathways

The following potential contaminant transport pathways have been identified for the Dynamite Burn Site:

- Precipitation runoff

- Precipitation infiltration into subsurface soils and groundwater
- Transport of surficial soil via grading activities to the McAllister Drive Land Bridge.

Explosives, including nitroglycerin, tend to be somewhat mobile (as discussed in Section 1.6.1) but relatively insoluble.

There is no previous investigation data available. Surficial soil at the site may have been affected and transported to the land bridge. Because potentially affected soils have been moved to the land bridge, which spans the South Valley, the groundwater and the surface water in the wetlands as a result of the transport pathways listed previously may have been affected.

Since the shallow groundwater beneath the land bridge is not currently used for drinking water, but potentially hydrologically connected to the bay, there are only two complete exposure pathways: via dermal contact with the contaminated soil during the planned excavation and removal activities, and via dermal contact with groundwater.

Potential Additional Investigations

Based on the Dynamite Burn Site Conceptual Site Model, additional information would be desirable to determine if contamination exists beneath and around the Project Site and the land bridge.

1.7 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

All work for this project will be conducted consistent with, or in compliance with, the ARARs described in this section and identified in Table 1.7-1.

1.7.1 Assessment of ARARs

Section 111 of the Comprehensive Environmental Response and Liability Act (CERCLA) requires that site clean-ups comply with federal applicable or relevant and appropriate requirements (ARARs), or state ARARs in cases where these requirements are more stringent than federal requirements. ARARs are derived from both federal and state laws. Under CERCLA Section 111(d)(2), the federal ARARs for a remedial action could include requirements under any of the federal environmental laws (e.g., Clean Air Act [CAA], Clean Water Act (CWA), Safe Drinking Water Act [SDWA]). State ARARs include promulgated requirements under state environmental or facility siting laws that are more stringent than federal ARARs and that have been identified in a timely manner, according to 40 Code of Federal Regulations (CFR) Part 300.400(g)(4). A requirement may be either "applicable" or "relevant and appropriate."

1.7.1.1 Definition of ARARs.

"Applicable" requirements are defined as those cleanup or control standards, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state laws that specifically address a hazardous substance, pollutant, remedial action, location, or other circumstance at a CERCLA site (NCP, 40 CFR Part 300.5). Applicable requirements are identified on a site-specific basis by determining whether the jurisdictional prerequisites of a requirement fully address the circumstances at the site or the proposed remedial activity. All pertinent jurisdictional prerequisites that must be met for the requirement to be applicable are as follows:

- The party must be subject to the law
- The substances or activities must fall under the authority of the law
- The statute must require, limit, or prohibit types of substances or activities
- The time period in which the law is in effect must be defined.

A requirement is applicable if the specific terms (or jurisdictional prerequisites) of the statute or regulation directly address the circumstances at the site.

If not applicable, a requirement may be relevant and appropriate if circumstances at the site, based on best professional judgment, are sufficiently similar to the problems or situations regulated by the requirement. "Relevant and appropriate" refers to those cleanup standards, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not necessarily applicable, address problems or situations sufficiently similar to those encountered at the CERCLA site, and whose use is well suited to the particular site (U.S. Environmental Protection Agency, 1993). The relevance and appropriateness of a requirement can be judged by comparing a number of factors, including the characteristics of the remedial action, the items in question, or the physical circumstances of the site, with those addressed in the requirement. If there is sufficient similarity between the requirement and the circumstances at the site, determination of the requirement as relevant and appropriate may be made.

Determining whether a requirement is both relevant and appropriate is a two-step process. First, to determine relevance, a comparison is made between the remedial action, location, or chemicals covered by the requirement and related conditions at the site, release, or potential remedy. A requirement is relevant if it generally meets these conditions. Second, to determine whether the requirement is appropriate, the comparison is further refined by focusing on the nature of the substances, the characteristics of the site, the circumstances of the release, and the proposed remedial action. The requirement is appropriate if, based on such comparison, its use is well suited to the particular site. The facility must comply with requirements that are determined to be both relevant and appropriate.

In addition to ARARs, nonpromulgated advisories or guidance referred to as "to-be-considered" (TBC) materials may also apply to the conditions found at a site. Although not legally binding, TBCs may be used to determine cleanup levels when ARARs do not exist or when ARARs alone would not be sufficiently protective of human health and the environment. If a TBC is chosen as a cleanup requirement, it becomes a performance standard with which the chosen remedy must comply. The selection of TBCs as performance standards, however, is discretionary and not mandatory. TBCs are not expected to be used in this investigation.

There are certain circumstances under which ARARs may be waived. CERCLA Section 111(d) allows ARARs to be waived if remedial alternatives are selected that meet any of six conditions. However, the selected remedy must be protective even if an ARAR is waived. The conditions for a waiver are as follows:

- The removal action selected is only part of a total remedial action that will attain such level or standard of control when completed.
- Compliance with such requirement at that site will result in greater risk to human health and the environment (e.g., worker safety) than alternative options.
- Compliance is technically impracticable from an engineering perspective.
- Use of another method or approach for the removal action selected will result in a standard of performance that is equivalent to an applicable requirement.
- A state requirement has not been equitably applied in similar circumstances on other removal actions within the state.
- A fund-financed removal action does not provide a balance between available monies and the need for protection of public health and the environment at the sites where the need is more immediate.

1.7.1.2 Types of ARARs.

ARARs that govern actions at CERCLA sites fall into the following three broad categories, based on the chemical contaminants present, site characteristics, and remedial alternatives proposed for cleanup:

- ***Chemical-specific ARARs*** include those environmental laws and regulations that regulate the release to the environment of materials posing certain chemical or physical characteristics or containing specified chemical compounds. These requirements generally set health- or risk-based concentration limits or discharge limits for specific hazardous substances by media (see Preamble to Proposed NCP, 53 Federal Register 51437). Chemical-specific ARARs are triggered by the specific chemical contaminants found at a particular site. The U.S. EPA presently considers standards developed under the Resource Conservation and Recovery Act (RCRA), the SDWA, the CWA, and federal Ambient Water Quality Criteria for the protection of aquatic life as potential ARARs. A more stringent standard requirement, criterion, or limitation promulgated pursuant to a state environmental statute is also a potential ARAR.

- ***Location-specific ARARs*** govern activities in certain environmentally sensitive areas. These requirements are triggered by the particular location and the proposed activity at the site. An example of a location-specific ARAR is compliance with the Endangered Species Act (ESA), as amended, to avoid sensitive ecosystems or habitats. Location-specific ARARs also focus on wetland or floodplain protection areas or archaeologically significant areas.

- **Action-specific ARARs** are restrictions that define acceptable treatment and disposal procedures for hazardous substances. These ARARs generally set performance, design, or other similar action-specific controls or restrictions on particular kinds of activities related to management of hazardous substances or pollutants. Examples include the Federal Transportation Act requirements for transporting explosives and hazardous materials, and a state Air Quality Management Authority that sets limitations on fugitive dust generated during grading and excavation activities during removal actions.

1.7.1.3 Application of ARARs for the Proposed Actions.

In determining whether a requirement was pertinent to proposed actions at the Project Site, potential ARARs were initially screened for applicability. If determined not to be applicable, the requirement was then reviewed for both relevance and appropriateness. Requirements that are considered to be relevant and appropriate command the same importance as applicable requirements. Potential federal and state ARARs determined to be specific to the Project Site are listed in Table 1.7-1. The table lists the description of the regulation and the rationale for its selection as an ARAR.

Table 1.5-1 Background Concentrations of Metals in Soil (mg/kg)
(Page 1 of 2)

Location	Minimum Depth (ft)	Maximum Depth (ft)	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Total Chromium	Cobalt	Copper
B1	0	0.5	9-Nov-92	<2	3	150	<0.1	<0.2	43	20	53
BG1	0	0.5	12-Jan-93	<2	12	110	<0.2	2.4	20	8.2	49
BG2	0	0.5	12-Jan-93	<2	12	140	<0.2	1.5	29	14	42
BG3	0	0.5	12-Jan-93	<2	12	150	<0.2	0.8	28	13	40
BG4	0	0.5	12-Jan-93	<2	12	180	<0.2	1.1	31	16	58
BG4 (Dup)	0	0.5	12-Jan-93	<2	11	170	<0.2	0.9	30	15	54
BG5	0	0.5	12-Jan-93	<2	10	170	<0.2	0.3	34	19	47
BG6	0	2.5	23-Jul-96	<1	3.9	88	0.1	<0.2	68	15	92
BG7	0	2.5	23-Jul-96	<1	8.7	210	0.3	<0.2	30	17	50
BG8	0	1.5	23-Jul-96	<1	1.1	120	<0.1	<0.2	64	17	28
BG9	0	2.5	24-Jul-96	<1	7.1	150	0.3	<0.2	27	18	48
BG10	0	2.5	24-Jul-96	<1	3.6	170	0.4	<0.2	29	19	58
FE-13	0.5	1	24-Mar-94	<1	6	170	0.2	0.2	31	14	43
FE-14	0.5	1	24-Mar-94	NA	12.4	151	1.07	1.56	48.5	20.6	51
SS-AI-01	0.5	1	9-Oct-91	NA	NA	NA	NA	NA	35.5	NA	NA
SS-CI-01	0.5	1	9-Oct-91	NA	NA	NA	NA	NA	75.1	NA	NA
SS-CI-02	0.5	1	9-Oct-91	NA	NA	NA	NA	NA	40.4	NA	NA
			Background Site Range	<1 - <2	3 - 12.4	88 - 210	<0.1 - <1.07	<0.2 - 2.4	20 - 75.1	8.2 - 20.6	28 - 92
			Average	0.8	8.2	152.1	0.2	0.7	39.0	16.1	50.9
			Maximum	<2	12.4	210.0	1.07	2.4	75.1	20.6	92.0
			Western United States Background(1)	<1.0 - 2.6	<1 - 97	70 - 5,000	<1.0 - 15	ND - 11	3.0 - 2,000	<3 - 50	32 - 300

NA = Not analyzed

(1) Source: Dragun and Chiasson, 1991, and Shacklette and Boemgen, 1984

Table 1.5-1. Background Concentrations of Metals in Soil (mg/kg)

(Page 2 of 2)

Location	Minimum Depth (ft)	Maximum Depth (ft)	Sample Date	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadiu m	Zinc
B1	0	0.5	9-Nov-92	<2	<0.2	31	<2	<0.2	<3	110	84
BG1	0	0.5	12-Jan-93	250	0.7	21	<2	1.4	<3	44	140
BG2	0	0.5	12-Jan-93	94	<0.2	25	<2	0.5	<3	71	100
BG3	0	0.5	12-Jan-93	57	<0.2	23	2	0.3	<3	72	83
BG4	0	0.5	12-Jan-93	68	<0.2	27	<2	0.3	<3	74	110
BG4 (Dup)	0	0.5	12-Jan-93	58	<0.2	26	<2	0.3	<3	71	99
BG5	0	0.5	12-Jan-93	10	<0.2	29	<2	<0.2	7	83	81
BG6	0	2.5	23-Jul-96	6	<0.06	83	<1	0.2	24	72	94
BG7	0	2.5	23-Jul-96	35	<0.06	32	<1	0.3	32	61	71
BG8	0	1.5	23-Jul-96	5	<0.06	56	<1	0.2	26	75	50
BG9	0	2.5	24-Jul-96	8	<0.06	28	<1	0.2	40	69	64
BG10	0	2.5	24-Jul-96	9	<0.06	36	<1	0.2	35	46	73
FE-13	0.5	1	24-Mar-94	26	<0.06	21	<2	0.3	14	87	56
FE-14	0.5	1	24-Mar-94	35.7	NA	46.4	<7.5	NA	<15	76.1	88.8
SS-AI-01	0.5	1	9-Oct-91	33.8	NA	NA	NA	NA	NA	NA	NA
SS-CI-01	0.5	1	9-Oct-91	90.6	NA	NA	NA	NA	NA	NA	NA
SS-CI-02	0.5	1	9-Oct-91	51.6	NA	NA	NA	NA	NA	NA	NA
			Background Site Range	<2 - 250	<0.06 - 0.7	21 - 83	<1 - 2	<0.2 - 1.4	<3 - 40	44 - 110	50 - 140
			Average	49.3	0.1	34.5	1.1	0.3	13.9	72.2	85.3
			Maximum	250	0.7	83.0	2	1.4	40	110	140
			Western United States Background[(1)]	<10 - 700	<0.01 - 4.6	<5 - 700	<0.1 - 4.3	<0.5 - 5	<0.25 - 10	7.0 - 500	10 - 2,100

NA = Not analyzed

(1) Source: Dragun and Chiasson, 1991, and Shacklette and Boerngen, 1984

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID / Sample Date	SS-7 11/20/98		SS-8 11/20/98		SS-9 11/20/98		SS-10 11/20/98	
Parameter	Units	Result	MDL	Result	MDL	Result	MDL	Result	MDL
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	651	0.500	907	0.500	1,240	1.00	1,050	1.00
Potassium	mg/kg	1,110	500	1,930	500	2,370	500	1,760	500
Arsenic	mg/kg	17.7	10.0	19.7	10.0	18.6	10.0	20.5	10.0
Barium	mg/kg	253	0.400	250	0.400	307	0.400	319	0.400
Beryllium	mg/kg	0.791	0.100	0.756	0.100	0.888	0.100	0.838	0.100
Cadmium	mg/kg	ND	1.00	ND	1.00	ND	1.00	ND	1.00
Chromium	mg/kg	39.7	1.00	38.6	1.00	49.2	1.00	38.3	1.00
Cobalt	mg/kg	13.1	0.700	14.9	0.700	17.4	0.700	16.2	0.700
Copper	mg/kg	37.7	1.00	49.1	1.00	57.7	1.00	42.9	1.00
Lead	mg/kg	8.84	7.50	31.8	7.50	23.6	7.50	34.0	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	30.8	3.00	41.0	3.00	53.4	3.00	36.0	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	96.7	1.00	70.2	1.00	74.7	1.00	83.9	1.00
Zinc	mg/kg	57.8	2.00	71.0	2.00	79.0	2.00	63.0	2.00
Nitrate as Nitrogen	mg/kg	1.53	1.00	ND	1.00	1.53	1.00	1.70	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	1.53	1.00	ND	1.00	1.53	1.00	1.70	1.00
Mercury	mg/kg	ND	0.050	0.12	0.050	0.096	0.050	0.11	0.050
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	11.3	0.500	241	2.50	283	2.50	174	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-11		SS-12		SS-13		SS-14	
	Sample Date	11/20/98		11/20/98		11/20/98		11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	834	0.500	1,070	1.00	558	0.500	1,180	1.00
Potassium	mg/kg	2,330	500	2,210	500	987	500	2,170	500
Arsenic	mg/kg	13.0	10.0	21.9	10.0	13.5	10.0	18.7	10.0
Barium	mg/kg	599	0.400	305	0.400	338	0.400	262	0.400
Beryllium	mg/kg	0.769	0.100	0.765	0.100	0.601	0.100	0.953	0.100
Cadmium	mg/kg	ND	1.00	ND	1.00	ND	1.00	ND	1.00
Chromium	mg/kg	41.3	1.00	39.5	1.00	31.1	1.00	50.1	1.00
Cobalt	mg/kg	13.8	0.700	21.6	0.700	13.7	0.700	16.3	0.700
Copper	mg/kg	46.8	1.00	57.6	1.00	44.9	1.00	53.7	1.00
Lead	mg/kg	10.8	7.50	17.7	7.50	ND	7.50	26.5	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	46.7	3.00	47.4	3.00	34.7	3.00	48.4	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	57.1	1.00	67.6	1.00	64.1	1.00	74.9	1.00
Zinc	mg/kg	67.4	2.00	83.4	2.00	65.5	2.00	71.4	2.00
Nitrate as Nitrogen	mg/kg	6.20	1.00	ND	1.00	ND	1.00	3.14	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	6.20	1.00	ND	1.00	ND	1.00	3.14	1.00
Mercury	mg/kg	ND	0.050	0.064	0.050	ND	0.050	0.075	0.050
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	394	5.00	21.0	0.500	56.1	0.500	223	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID / Sample Date	SS-15 11/20/98		SS-16 11/20/98		SS-17 11/20/98		SS-18 11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	840	0.500	820	0.500	513	0.500	832	0.500
Potassium	mg/kg	1,500	500	2,590	500	1,330	500	2,500	500
Arsenic	mg/kg	18.4	10.0	48.1	10.0	14.0	10.0	13.1	10.0
Barium	mg/kg	182	0.400	163	0.400	176	0.400	286	0.400
Beryllium	mg/kg	0.712	0.100	0.723	0.100	0.696	0.100	0.905	0.100
Cadmium	mg/kg	ND	1.00	1.67	1.00	ND	1.00	ND	1.00
Chromium	mg/kg	34.8	1.00	38.2	1.00	27.6	1.00	47.1	1.00
Cobalt	mg/kg	15.1	0.700	14.0	0.700	11.6	0.700	13.5	0.700
Copper	mg/kg	40.7	1.00	48.2	1.00	38.3	1.00	48.6	1.00
Lead	mg/kg	25.6	7.50	76.3	7.50	28.6	7.50	16.1	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	32.0	3.00	43.0	3.00	27.0	3.00	41.8	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	77.6	1.00	59.9	1.00	61.9	1.00	72.0	1.00
Zinc	mg/kg	64.0	2.00	83.9	2.00	56.7	2.00	63.3	2.00
Nitrate as Nitrogen	mg/kg	2.19	1.00	9.84	1.00	4.15	1.00	2.00	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	2.73	1.00	10.4	1.00	4.15	1.00	2.00	1.00
Mercury	mg/kg	0.093	0.050	1.9	0.043	0.11	0.042	0.092	0.050
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	94.5	0.500	375	2.50	13.2	0.500	108	1.00

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

-- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-20		SS-21		SS-30		SS-30*	
	Sample Date	11/20/98		11/20/98		11/20/98		12/01/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	-	-
Manganese	mg/kg	545	0.500	922	0.500	886	0.500	-	-
Potassium	mg/kg	2,240	500	2,150	500	1,660	500	-	-
Arsenic	mg/kg	13.7	10.0	16.5	10.0	16.8	10.0	-	-
Barium	mg/kg	331	0.400	212	0.400	258	0.400	-	-
Beryllium	mg/kg	0.805	0.100	0.793	0.100	0.699	0.100	-	-
Cadmium	mg/kg	ND	1.00	ND	1.00	ND	1.00	-	-
Chromium	mg/kg	41.2	1.00	39.5	1.00	31.5	1.00	-	-
Cobalt	mg/kg	12.3	0.700	15.2	0.700	15.1	0.700	-	-
Copper	mg/kg	47.1	1.00	45.4	1.00	39.3	1.00	-	-
Lead	mg/kg	21.4	7.50	20.0	7.50	34.4	7.50	-	-
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	-	-
Nickel	mg/kg	36.5	3.00	41.5	3.00	30.8	3.00	-	-
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	-	-
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	-	-
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	-	-
Vanadium	mg/kg	70.5	1.00	68.3	1.00	75.9	1.00	-	-
Zinc	mg/kg	65.9	2.00	70.4	2.00	59.6	2.00	-	-
Nitrate as Nitrogen	mg/kg	1.82	1.00	2.76	1.00	4.63	1.00	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	1.82	1.00	2.76	1.00	4.63	1.00	-	-
Mercury	mg/kg	0.11	0.043	0.11	0.050	0.121	0.0500	-	-
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	1.0
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Phosphate	mg/kg	296	2.50	311	2.50	4.39	0.500	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

\- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID Sample Date	SS-31 11/20/98		SS-32 11/20/98		SS-33 11/20/98		SS-33* 12/01/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	-	-
Manganese	mg/kg	791	0.500	712	0.500	805	0.500	-	-
Potassium	mg/kg	1,660	500	1,670	500	1,630	500	-	-
Arsenic	mg/kg	15.9	10.0	16.6	10.0	21.1	10.0	-	-
Barium	mg/kg	237	0.400	221	0.400	331	0.400	-	-
Beryllium	mg/kg	0.673	0.100	0.621	0.100	0.933	0.100	-	-
Cadmium	mg/kg	1.18	1.00	1.23	1.00	ND	1.00	-	-
Chromium	mg/kg	30.5	1.00	27.7	1.00	45.8	1.00	-	-
Cobalt	mg/kg	16.0	0.700	15.5	0.700	17.0	0.700	-	-
Copper	mg/kg	46.6	1.00	40.8	1.00	57.1	1.00	-	-
Lead	mg/kg	89.0	7.50	49.2	7.50	12.8	7.50	-	-
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	-	-
Nickel	mg/kg	32.3	3.00	28.1	3.00	45.2	3.00	-	-
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	-	-
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	-	-
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	-	-
Vanadium	mg/kg	66.3	1.00	69.1	1.00	91.1	1.00	-	-
Zinc	mg/kg	70.1	2.00	71.9	2.00	74.0	2.00	-	-
Nitrate as Nitrogen	mg/kg	1.70	1.00	5.34	1.00	1.44	1.00	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	1.70	1.00	5.34	1.00	1.44	1.00	-	-
Mercury	mg/kg	0.679	0.0500	0.570	0.0500	0.330	0.0500	-	-
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Phosphate	mg/kg	191	2.50	287	2.50	18.6	0.500	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-35		SS-36		SS-39		SS-40	
	Sample Date	11/20/98		11/20/98		11/20/98		11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	517	0.500	629	0.500	1,320	1.00	599	0.500
Potassium	mg/kg	1,130	500	1,740	500	2,700	500	1,910	500
Arsenic	mg/kg	16.6	10.0	18.1	10.0	20.0	10.0	19.7	10.0
Barium	mg/kg	152	0.400	176	0.400	183	0.400	223	0.400
Beryllium	mg/kg	0.676	0.100	0.759	0.100	0.778	0.100	0.599	0.100
Cadmium	mg/kg	ND	1.00	ND	1.00	ND	1.00	ND	1.00
Chromium	mg/kg	33.8	1.00	35.9	1.00	39.6	1.00	26.3	1.00
Cobalt	mg/kg	11.2	0.700	14.3	0.700	16.7	0.700	12.3	0.700
Copper	mg/kg	42.7	1.00	49.5	1.00	52.6	1.00	38.1	1.00
Lead	mg/kg	58.7	7.50	37.3	7.50	51.1	7.50	56.3	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	34.8	3.00	40.5	3.00	44.9	3.00	26.5	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	70.4	1.00	58.7	1.00	59.2	1.00	65.3	1.00
Zinc	mg/kg	58.3	2.00	76.8	2.00	85.4	2.00	71.5	2.00
Nitrate as Nitrogen	mg/kg	1.91	1.00	7.92	1.00	5.22	1.00	3.65	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	1.91	1.00	8.62	1.00	5.22	1.00	3.65	1.00
Mercury	mg/kg	0.0537	0.0500	0.102	0.0500	0.127	0.0500	0.216	0.0500
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	1.73	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	1.70	0.500	26.2	0.500	283	2.50	7.82	0.500

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-41		SS-42		SS-43		SS-44	
	Sample Date	11/20/98		11/20/98		11/20/98		11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	904	0.500	943	0.500	1,070	1.00	1,160	1.00
Potassium	mg/kg	1,440	500	1,190	500	1,830	500	1,400	500
Arsenic	mg/kg	11.4	10.0	17.5	10.0	18.3	10.0	13.2	10.0
Barium	mg/kg	307	0.400	372	0.400	245	0.400	183	0.400
Beryllium	mg/kg	0.510	0.100	0.669	0.100	0.766	0.100	0.549	0.100
Cadmium	mg/kg	ND	1.00	ND	1.00	1.21	1.00	1.07	1.00
Chromium	mg/kg	23.7	1.00	28.1	1.00	35.3	1.00	25.1	1.00
Cobalt	mg/kg	13.0	0.700	14.8	0.700	20.4	0.700	19.5	0.700
Copper	mg/kg	29.7	1.00	37.4	1.00	49.1	1.00	31.2	1.00
Lead	mg/kg	26.6	7.50	27.6	7.50	40.1	7.50	37.1	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	23.1	3.00	25.3	3.00	39.0	3.00	22.8	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	57.6	1.00	87.1	1.00	66.4	1.00	56.1	1.00
Zinc	mg/kg	49.5	2.00	63.6	2.00	68.2	2.00	52.9	2.00
Nitrate as Nitrogen	mg/kg	5.63	1.00	3.40	1.00	1.01	1.00	18.4	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	5.63	1.00	3.40	1.00	1.01	1.00	18.4	1.00
Mercury	mg/kg	0.0831	0.0500	0.0982	0.0500	0.238	0.0500	0.151	0.0500
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	15.7	0.500	ND	0.500	204	2.50	11.0	0.500

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Other Samples	Field Sample ID / Sample Date	FSS-1 12/02/98		FSS-2 12/02/98		FSS-4 12/02/98		FSS-5 12/02/98	
Parameter	Units	Result	MDL	Result	MDL	Result	MDL	Result	MDL
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	FSS-6		FSS-7		FSS-8		FSS-9	
	Sample Date	12/02/98		12/02/98		12/02/98		12/01/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	ND	1.0	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

\- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID Sample Date	FSS-12 12/02/98		FSS-13 12/02/98		FSS-14 12/02/98		FSS-15 12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID Sample Date	FSS-16 12/02/98		FSS-17 12/02/98		FSS-18 12/02/98		FSS-19 12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID / Sample Date	FSS-20 12/02/98		FSS-30 12/02/98	
Parameter	Units	Result	MDL	Result	MDL
Metals					
Antimony	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Potassium	mg/kg	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Barium	mg/kg	-	-	-	-
Beryllium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cobalt	mg/kg	-	-	-	-
Copper	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-
Molybdenum	mg/kg	-	-	-	-
Nickel	mg/kg	-	-	-	-
Selenium	mg/kg	-	-	-	-
Silver	mg/kg	-	-	-	-
Thallium	mg/kg	-	-	-	-
Vanadium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Explosive Compounds					
PETN	mg/kg	-	-	-	-
HMX	mg/kg	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-
Tetryl	mg/kg	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-
Phosphate	mg/kg	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	SS-1		SS-2		SS-3		SS-4	
	Sample Date	09/09/98		09/09/98		09/09/98		09/09/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	5.0	ND	5.0	ND	5.0	ND	5.0
Manganese	mg/kg	1,200	5.0	1,500	5.0	690	5.0	890	5.0
Potassium	mg/kg	1,500	10	1,400	10	1,500	10	1,300	10
Arsenic	mg/kg	ND	5.0	ND	5.0	ND	5.0	ND	5.0
Barium	mg/kg	220	0.5	250	0.5	180	0.5	160	0.5
Beryllium	mg/kg	0.89	0.5	1.0	0.5	0.84	0.5	0.85	0.5
Cadmium	mg/kg	ND	0.5	ND	0.5	ND	0.5	ND	0.5
Chromium	mg/kg	41	0.5	44	0.5	34	0.5	37	0.5
Cobalt	mg/kg	12	0.5	15	0.5	11	0.5	7.2	0.5
Copper	mg/kg	54	0.5	54	0.5	37	0.5	35	0.5
Lead	mg/kg	9.1	1.0	9.2	1.0	ND	1.0	ND	1.0
Molybdenum	mg/kg	ND	0.5	ND	0.5	ND	0.5	ND	0.5
Nickel	mg/kg	50	1.0	50	1.0	25	1.0	28	1.0
Selenium	mg/kg	ND	5.0	ND	5.0	ND	5.0	ND	5.0
Silver	mg/kg	ND	0.5	ND	0.5	ND	0.5	ND	0.5
Thallium	mg/kg	ND	5.0	ND	5.0	ND	5.0	ND	5.0
Vanadium	mg/kg	53	0.5	63	0.5	84	0.5	88	0.5
Zinc	mg/kg	79	1.0	65	1.0	62	1.0	60	1.0
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	0.044	0.010	0.041	0.010	0.030	0.010	0.039	0.010
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
Cyclonite (RDX)	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
1,3,5-Trinitrobenzene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
1,3-Dinitrobenzene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
Tetryl	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
Nitrobenzene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2,4,6-Trinitrotoluene (TNT)	mg/kg	72,400	3,000	12,200	300	4,990	300	49,000	3000
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2,4-Dinitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2,6-Dinitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
4-Nitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
3-Nitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2-Nitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table 1.5-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	SS-5		SS-6		SS-37		SS-38	
	Sample Date	09/09/98		09/09/98		11/20/98		11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	5.0	ND	5.0	ND	6.00	ND	6.00
Manganese	mg/kg	2100	5.0	1700	5.0	1,090	1.00	1,130	1.00
Potassium	mg/kg	1,800	10	2,400	10	1,780	500	2,110	500
Arsenic	mg/kg	ND	5.0	ND	5.0	13.6	10.00	15.7	10.00
Barium	mg/kg	300	0.5	180	0.5	219	0.400	227	0.400
Beryllium	mg/kg	1.3	0.5	0.90	0.5	0.786	0.100	0.898	0.100
Cadmium	mg/kg	ND	0.5	0.95	0.5	ND	1.00	ND	1.00
Chromium	mg/kg	71	0.5	47	0.5	36.9	1.00	44.1	1.00
Cobalt	mg/kg	27	0.5	15	0.5	15.2	0.700	16.2	0.700
Copper	mg/kg	71	0.5	61	0.5	48.6	1.00	55.3	1.00
Lead	mg/kg	ND	1.0	30	1.0	20.4	7.50	24.8	7.50
Molybdenum	mg/kg	ND	0.5	ND	0.5	ND	2.00	ND	2.00
Nickel	mg/kg	64	1.0	52	1.0	46.2	3.00	51.9	3.00
Selenium	mg/kg	ND	5.0	ND	5.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.5	ND	0.5	ND	0.700	ND	0.700
Thallium	mg/kg	ND	5.0	ND	5.0	ND	10.0	ND	10.0
Vanadium	mg/kg	90	0.5	66	0.5	59.2	1.00	68.2	1.00
Zinc	mg/kg	79	1.0	91	1.0	61.3	2.00	69.7	2.00
Nitrate as Nitrogen	mg/kg	-	-	-	-	1.98	1.00	2.66	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	1.98	2.00	2.66	2.00
Mercury	mg/kg	0.024	0.010	0.14	0.010	0.0615	0.0500	0.0630	0.0500
Explosive Compounds									
PETN	mg/kg	-	-	-	-	ND	0.30	ND	0.30
HMX	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	738	30	200	30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
Phosphate	mg/kg	-	-	-	-	181	2.50	258	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table 1.5-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	FSS-10*		FSS-10		FSS-31		FSS-33	
	Sample Date	12/01/98		12/02/98**/12/08/98		12/02/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	ND	250	-	-	-	-	-	-
HMX	mg/kg	ND	250	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	ND	250	3.1	1.0	-	-	ND	1.0
1,3,5-Trinitrobenzene	mg/kg	ND	250	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	ND	250	-	-	-	-	-	-
Tetryl	mg/kg	ND	250	-	-	-	-	-	-
Nitrobenzene	mg/kg	ND	250	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	5400	250	81.55**/2074.35	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	250		-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System. Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table 1.5-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	FSS-34		FSS-35		FSS-36		FSS-37	
	Sample Date	12/02/98		12/02/98		12/02/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	ND	1.0	ND	1.0	ND	1.0	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

\- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table 1.5-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	FSS-38		FSS-39		FSS-40*		FSS-40	
	Sample Date	12/02/98		12/02/98		12/01/98		12/03/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	ND	0.25	-	-
HMX	mg/kg	-	-	-	-	ND	0.25	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	ND	0.25	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	ND	0.25	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	ND	0.25	-	-
Tetryl	mg/kg	-	-	-	-	ND	0.25	-	-
Nitrobenzene	mg/kg	-	-	-	-	ND	0.25	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	0.25	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analyses of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table 1.5-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	FSS-41	
	Sample Date	12/03/1998**/12/08/98	
Parameter	**Units**	**Result**	**MDL**
Metals			
Antimony	mg/kg	-	-
Manganese	mg/kg	-	-
Potassium	mg/kg	-	-
Arsenic	mg/kg	-	-
Barium	mg/kg	-	-
Beryllium	mg/kg	-	-
Cadmium	mg/kg	-	-
Chromium	mg/kg	-	-
Cobalt	mg/kg	-	-
Copper	mg/kg	-	-
Lead	mg/kg	-	-
Molybdenum	mg/kg	-	-
Nickel	mg/kg	-	-
Selenium	mg/kg	-	-
Silver	mg/kg	-	-
Thallium	mg/kg	-	-
Vanadium	mg/kg	-	-
Zinc	mg/kg	-	-
Nitrate as Nitrogen	mg/kg	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-
Mercury	mg/kg	-	-
Explosive Compounds			
PETN	mg/kg	-	-
HMX	mg/kg	-	-
Cyclonite (RDX)	mg/kg	3.4	1.0
1,3,5-Trinitrobenzene	mg/kg	-	-
1,3-Dinitrobenzene	mg/kg	-	-
Tetryl	mg/kg	-	-
Nitrobenzene	mg/kg	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	79.566**/789.5	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-
2,4-Dinitrotoluene	mg/kg	-	-
2,6-Dinitrotoluene	mg/kg	-	-
4-Nitrotoluene	mg/kg	-	-
3-Nitrotoluene	mg/kg	-	-
2-Nitrotoluene	mg/kg	-	-
Phosphate	mg/kg	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table 1.5-4. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #1	Field Sample ID			TNT-1A-.5	TNT-1A-1	TNT-1A-1.5	TNT-1A-2	TNT-1B-.5	TNT-1B-1	TNT-1B-1.5	TNT-1B-2
	Sample Date			7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**	**MDL**								
ALUMINUM	SW6010B	mg/kg	2.91	-	21,000	-	15,000	22,000	21,000	-	17,000
ANTIMONY	SW6010B	mg/kg	0.502	-	ND	-	ND	ND	ND	-	ND
ARSENIC	SW6010B	mg/kg	0.559	-	17	-	13	15	14	-	12
BARIUM	SW6010B	mg/kg	0.590	-	330	-	170	220	220	-	200
BERYLLIUM	SW6010B	mg/kg	0.130	-	0.66	-	0.43	0.74	0.62	-	0.49
CADMIUM	SW6010B	mg/kg	0.057	-	0.4	-	0.2	0.12	0.24	-	0.24
CALCIUM	SW6010B	mg/kg	6.41	-	5,100	-	26,000	5,900	6,200	-	30,000
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	-	61	-	44	54	52	-	45
COBALT	SW6010B	mg/kg	0.112	-	21	-	13	20	21	-	22
COPPER	SW6010B	mg/kg	0.445	-	74	-	58	71	71	-	72
IRON	SW6010B	mg/kg	1.82	-	50,000	-	38,000	43,000	49,000	-	41,000
LEAD	SW6010B	mg/kg	0.437	-	20	-	9.5	12	11	-	10
MAGNESIUM	SW6010B	mg/kg	7.00	-	6,600	-	7,800	7,200	7,000	-	7,900
MANGANESE	SW6010B	mg/kg	0.184	-	1,200	-	700	1,200	1,700	-	1,800
MERCURY	SW7471A	mg/kg	0.0099	-	0.04	-	0.054	0.025	0.037	-	0.049
MOLYBDENUM	SW6010B	mg/kg	0.142	-	0.69	-	0.42	0.74	0.59	-	0.77
NICKEL	SW6010B	mg/kg	0.591	-	66	-	54	65	64	-	66
POTASSIUM	SW6010B	mg/kg	9.91	-	1,800	-	760	1,700	1,500	-	1,100
SELENIUM	SW6010B	mg/kg	0.464	-	0.9	-	0.69	0.98	0.75	-	ND
SILVER	SW6010B	mg/kg	0.099	-	ND	-	ND	0.12	ND	-	ND
SODIUM	SW6010B	mg/kg	23.96	-	79	-	54	86	62	-	49
THALLIUM	SW6010B	mg/kg	0.741	-	ND	-	ND	ND	ND	-	ND
VANADIUM	SW6010B	mg/kg	0.156	-	88	-	55	80	77	-	63
ZINC	SW6010B	mg/kg	0.622	-	94	-	80	88	92	-	95
ACENAPHTHENE	SW8310	mg/kg	0.01	-	ND	-	ND	ND	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	-	ND	-	ND	ND	ND	-	ND
ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	0.0074	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
CHRYSENE	SW8310	mg/kg	0.003	-	ND	-	ND	0.0074	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	-	ND	-	ND	ND	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	0.049	ND	-	ND
FLUORENE	SW8310	mg/kg	0.008	-	ND	-	ND	ND	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	0.008	-	ND	-	ND	0.013	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	0.005	-	ND	-	ND	0.061	ND	-	ND
PYRENE	SW8310	mg/kg	0.004	-	ND	-	ND	0.049	ND	-	ND

Table 1.5-4. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(2 of 4)

TNT Strip #1	Field Sample ID			TNT-1A-.5	TNT-1A-1	TNT-1A-1.5	TNT-1A-2	TNT-1B-.5	TNT-1B-1	TNT-1B-1.5	TNT-1B-2
	Sample Date			7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**	**MDL**								
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	-	87	-	79	74	110	-	68
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	-	ND	-	ND	ND	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	-	8,300	-	1,600	750	360	-	8.9
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	-	5	-	ND	ND	ND	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	ND	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	-	ND	-	ND	3.2	2.4	-	1.2
2-NITROTOLUENE	SW8330	mg/kg	0.028	-	ND	-	ND	ND	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	-	ND	-	ND	ND	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	-	ND	-	ND	ND	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	ND	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	-	ND	-	ND	ND	ND	-	ND
NITROBENZENE	SW8330	mg/kg	0.029	-	ND	-	ND	ND	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.070	ND	-	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	-	ND	-	ND	ND	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	ND	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	0.237	-	ND	-	ND	ND	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-4. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #1	Field Sample ID		TNT-1C-.5	TNT-1C-1	TNT-1C-1.5	TNT-1C-2	TNT-1C-3.5	TNT-1C-4
	Sample Date		7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth		0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	3.5 - 4.0	4.0 - 4.5
Parameter	**Method**	**Units**						
ALUMINUM	SW6010B	mg/kg	-	11,000	-	19,000	-	16,000
ANTIMONY	SW6010B	mg/kg	-	ND	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	-	7.9	-	14	-	14
BARIUM	SW6010B	mg/kg	-	130	-	220	-	190
BERYLLIUM	SW6010B	mg/kg	-	0.29	-	0.55	-	0.34
CADMIUM	SW6010B	mg/kg	-	ND	-	0.15	-	0.34
CALCIUM	SW6010B	mg/kg	-	3,100	-	5,900	-	16,000
CHROMIUM, TOTAL	SW6010B	mg/kg	-	31	-	59	-	48
COBALT	SW6010B	mg/kg	-	11	-	20	-	27
COPPER	SW6010B	mg/kg	-	36	-	68	-	73
IRON	SW6010B	mg/kg	-	25,000	-	45,000	-	45,000
LEAD	SW6010B	mg/kg	-	9.8	-	12	-	13
MAGNESIUM	SW6010B	mg/kg	-	3,600	-	7,100	-	8,000
MANGANESE	SW6010B	mg/kg	-	660	-	1,100	-	3,800
MERCURY	SW7471A	mg/kg	-	0.058	-	0.068	-	0.08
MOLYBDENUM	SW6010B	mg/kg	-	0.26	-	0.81	-	0.51
NICKEL	SW6010B	mg/kg	-	38	-	68	-	110
POTASSIUM	SW6010B	mg/kg	-	1,000	-	1,600	-	800
SELENIUM	SW6010B	mg/kg	-	0.74	-	ND	-	ND
SILVER	SW6010B	mg/kg	-	ND	-	ND	-	ND
SODIUM	SW6010B	mg/kg	-	ND	-	68	-	57
THALLIUM	SW6010B	mg/kg	-	ND	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	-	41	-	72	-	58
ZINC	SW6010B	mg/kg	-	49	-	87	-	94
ACENAPHTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	-	ND	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	-	0.01	-	0.015	-	ND
FLUORENE	SW8310	mg/kg	-	ND	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	-	ND	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	-	0.025	-	0.027	-	ND
PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND

Table 1.5-4. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #1	Field Sample ID		TNT-1C-.5	TNT-1C-1	TNT-1C-1.5	TNT-1C-2	TNT-1C-3.5	TNT-1C-4
	Sample Date		7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth		0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	3.5 - 4.0	4.0 - 4.5
Parameter	**Method**	**Units**						
1,3,5-TRINITROBENZENE	SW8330	mg/kg	-	42	-	150	-	32
1,3-DINITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	-	380,000	-	110,000	-	11
2,4-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	110	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	0.61
2-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	-	ND	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-5. Benicia Tourtelot Analytical Results for Soil

(Unvalidated Data)

(1 of 6)

TNT Strip #2	Field Sample ID			TNT-2A-.5	TNT-2A-1	TNT-2A-1.5	TNT-2A-2	TNT-2B-.5	TNT-2B-1	TNT-2B-1.5	TNT-2B-2
	Sample Date			7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**	**MDL**								
ALUMINUM	SW6010B	mg/kg	2.91	-	17,000	-	17,000	20,000	19,000	-	16,000
ANTIMONY	SW6010B	mg/kg	0.502	-	ND	-	ND	ND	ND	-	ND
ARSENIC	SW6010B	mg/kg	0.559	-	15	-	16	15	15	-	12
BARIUM	SW6010B	mg/kg	0.590	-	230	-	270	220	240	-	160
BERYLLIUM	SW6010B	mg/kg	0.130	-	0.49	-	0.49	0.75	0.62	-	0.35
CADMIUM	SW6010B	mg/kg	0.057	-	0.24	-	0.18	0.37	0.37	-	0.2
CALCIUM	SW6010B	mg/kg	6.41	-	4,500	-	5,100	5,000	5,500	-	19,000
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	-	53	-	53	54	55	-	48
COBALT	SW6010B	mg/kg	0.112	-	20	-	21	19	21	-	18
COPPER	SW6010B	mg/kg	0.445	-	61	-	65	66	68	-	60
IRON	SW6010B	mg/kg	1.82	-	48,000	-	46,000	44,000	46,000	-	39,000
LEAD	SW6010B	mg/kg	0.437	-	11	-	11	17	12	-	9.5
MAGNESIUM	SW6010B	mg/kg	7.00	-	5,700	-	8,400	5,900	6,200	-	7,500
MANGANESE	SW6010B	mg/kg	0.164	-	1,100	-	1,800	1,100	1,200	-	620
MERCURY	SW7471A	mg/kg	0.0099	-	0.037	-	0.037	0.05	0.025	-	0.071
MOLYBDENUM	SW6010B	mg/kg	0.142	-	0.66	-	0.55	0.75	0.5	-	0.35
NICKEL	SW6010B	mg/kg	0.591	-	60	-	65	62	64	-	55
POTASSIUM	SW6010B	mg/kg	9.91	-	1,600	-	1,200	1,600	1,400	-	1,100
SELENIUM	SW6010B	mg/kg	0.464	-	0.77	-	0.65	0.87	ND	-	ND
SILVER	SW6010B	mg/kg	0.099	-	ND	-	ND	ND	ND	-	ND
SODIUM	SW6010B	mg/kg	23.96	-	85	-	74	75	75	-	94
THALLIUM	SW6010B	mg/kg	0.741	-	ND	-	ND	ND	ND	-	ND
VANADIUM	SW6010B	mg/kg	0.156	-	76	-	75	81	81	-	60
ZINC	SW6010B	mg/kg	0.622	-	78	-	79	75	80	-	78
ACENAPHTHENE	SW8310	mg/kg	0.01	-	ND	-	ND	ND	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	-	ND	-	ND	ND	ND	-	ND
ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
CHRYSENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	-	ND	-	ND	ND	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
FLUORENE	SW8310	mg/kg	0.008	-	ND	-	ND	ND	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	0.008	-	ND	-	ND	ND	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	0.005	-	0.0061	-	0.011	ND	ND	-	ND
PYRENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	-	230	-	210	70	140	-	130

Table 1.5-5. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #2	Field Sample ID			TNT-2A-.5	TNT-2A-1	TNT-2A-1.5	TNT-2A-2	TNT-2B-.5	TNT-2B-1	TNT-2B-1.5	TNT-2B-2
	Sample Date			7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**	**MDL**								
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	-	ND	-	ND	ND	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	-	13,000	-	25,000	190	92,000	-	24
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	-	ND	-	20	ND	64	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	ND	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	-	ND	-	ND	1.4	ND	-	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	-	ND	-	ND	ND	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	-	ND	-	ND	ND	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	-	ND	-	ND	ND	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	ND	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	-	ND	-	ND	ND	ND	-	ND
NITROBENZENE	SW8330	mg/kg	0.029	-	ND	-	ND	ND	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.070	ND	-	ND	-	0.48	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	-	ND	-	ND	ND	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	ND	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	0.237	-	ND	-	ND	ND	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-5. Benicia Tourtelot Analytical Results for Soil
~~(Unvalidated Data)~~
(3 of 6)

TNT Strip #2	Field Sample ID		TNT-2B-3.5	TNT-2B-4	TNT-2C-.5	TNT-2C-1.0	TNT-2C-1.5	TNT-2C-2.0	TNT-2D-.5	TNT-2D-1
	Sample Date		7/19/99	7/19/99	7/20/99	7/20/99	7/20/99	7/20/99	7/19/99	7/19/99
	Depth		3.5 - 4.0	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5
Parameter	**Method**	**Units**								
ALUMINUM	SW6010B	mg/kg	-	16,000	-	20,000	-	22,000	-	17,000
ANTIMONY	SW6010B	mg/kg	-	ND	-	1.1	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	-	13	-	16	-	16	-	14
BARIUM	SW6010B	mg/kg	-	140	-	240	-	270	-	290
BERYLLIUM	SW6010B	mg/kg	-	0.34	-	0.61	-	0.62	-	0.72
CADMIUM	SW6010B	mg/kg	-	0.22	-	ND	-	ND	-	0.18
CALCIUM	SW6010B	mg/kg	-	17,000	-	6,000	-	9,800	-	5,400
CHROMIUM, TOTAL	SW6010B	mg/kg	-	53	-	51	-	55	-	52
COBALT	SW6010B	mg/kg	-	22	-	20	-	21	-	22
COPPER	SW6010B	mg/kg	-	69	-	66	-	67	-	64
IRON	SW6010B	mg/kg	-	45,000	-	43,000	-	45,000	-	44,000
LEAD	SW6010B	mg/kg	-	10	-	12	-	12	-	11
MAGNESIUM	SW6010B	mg/kg	-	8,900	-	7,200	-	7,700	-	5,600
MANGANESE	SW6010B	mg/kg	-	820	-	1,200	-	1,500	-	1,000
MERCURY	SW7471A	mg/kg	-	0.092	-	0.024	-	0.025	-	0.02
MOLYBDENUM	SW6010B	mg/kg	-	0.29	-	0.91	-	0.73	-	0.53
NICKEL	SW6010B	mg/kg	-	62	-	62	-	65	-	56
POTASSIUM	SW6010B	mg/kg	-	920	-	1,800	-	2,100	-	1,200
SELENIUM	SW6010B	mg/kg	-	0.62	-	1.2	-	1.4	-	0.86
SILVER	SW6010B	mg/kg	-	ND	-	ND	-	ND	-	ND
SODIUM	SW6010B	mg/kg	-	100	-	94	-	110	-	120
THALLIUM	SW6010B	mg/kg	-	ND	-	ND	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	-	58	-	76	-	78	-	79
ZINC	SW6010B	mg/kg	-	95	-	84	-	86	-	77
ACENAPHTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	-	ND	-	0.012	-	ND	-	ND
FLUORENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	-	ND	-	0.018	-	ND	-	ND
PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	-	71	-	180	-	210	-	4.1

Table 1.5-5. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #2	Field Sample ID		TNT-2B-3.5	TNT-2B-4	TNT-2C-.5	TNT-2C-1.0	TNT-2C-1.5	TNT-2C-2.0	TNT-2D-.5	TNT-2D-1
	Sample Date		7/19/99	7/19/99	7/20/99	7/20/99	7/20/99	7/20/99	7/19/99	7/19/99
	Depth		3.5 - 4.0	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5
Parameter	**Method**	**Units**								
1,3-DINITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	-	180	-	42	-	9,500	-	37
2,4-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	3.3	-	ND	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	0.4	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	1.3	-	ND	-	9.1
2-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	5.2
4-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.33	-	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg		ND	-	ND	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg		ND	-	ND	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-5. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)
(5 of 6)

TNT Strip #2	Field Sample ID		TNT-2D-1.5	TNT-2D-2	TNT-2E-1	TNT-2E-1.5	TNT-2E-2
	Sample Date		7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth		1.5 - 2.0	2.0 - 2.5	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	Method	Units					
ALUMINUM	SW6010B	mg/kg	-	19,000	19,000	-	19,000
ANTIMONY	SW6010B	mg/kg	-	ND	ND	-	ND
ARSENIC	SW6010B	mg/kg	-	13	14	-	14
BARIUM	SW6010B	mg/kg	-	290	250	-	240
BERYLLIUM	SW6010B	mg/kg	-	0.7	0.59	-	0.6
CADMIUM	SW6010B	mg/kg	-	0.35	0.35	-	0.24
CALCIUM	SW6010B	mg/kg	-	5,300	4,600	-	5,500
CHROMIUM, TOTAL	SW6010B	mg/kg	-	54	53	-	58
COBALT	SW6010B	mg/kg	-	21	21	-	22
COPPER	SW6010B	mg/kg	-	63	62	-	67
IRON	SW6010B	mg/kg	-	51,000	44,000	-	46,000
LEAD	SW6010B	mg/kg	-	12	18	-	12
MAGNESIUM	SW6010B	mg/kg	-	6,000	5,600	-	6,900
MANGANESE	SW6010B	mg/kg	-	1,100	1,500	-	1,400
MERCURY	SW7471A	mg/kg	-	0.035	0.071	-	0.024
MOLYBDENUM	SW6010B	mg/kg	-	0.49	0.47	-	0.4
NICKEL	SW6010B	mg/kg	-	57	62	-	67
POTASSIUM	SW6010B	mg/kg	-	1,300	1,300	-	1,200
SELENIUM	SW6010B	mg/kg	-	0.81	ND	-	1.1
SILVER	SW6010B	mg/kg	-	ND	ND	-	ND
SODIUM	SW6010B	mg/kg	-	120	59	-	48
THALLIUM	SW6010B	mg/kg	-	ND	ND	-	ND
VANADIUM	SW6010B	mg/kg	-	81	79	-	81
ZINC	SW6010B	mg/kg	-	78	78	-	84
ACENAPHTHENE	SW8310	mg/kg	-	ND	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	-	ND	ND	-	ND
ANTHRACENE	SW8310	mg/kg	-	ND	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	-	ND	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	-	ND	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	-	ND	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	-	ND	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	-	ND	ND	-	ND
CHRYSENE	SW8310	mg/kg	-	ND	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	-	ND	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	-	ND	ND	-	ND
FLUORENE	SW8310	mg/kg	-	ND	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	-	ND	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	-	ND	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	-	0.0082	0.0094	-	ND
PYRENE	SW8310	mg/kg	-	ND	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	-	6.8	0.41	-	1.3

Table 1.5-5. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #2	Field Sample ID		TNT-2D-1.5	TNT-2D-2	TNT-2E-1	TNT-2E-1.5	TNT-2E-2
	Sample Date		7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth		1.5 - 2.0	2.0 - 2.5	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**					
1,3-DINITROBENZENE	SW8330	mg/kg	-	ND	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	-	210	11	-	2.5
2,4-DINITROTOLUENE	SW8330	mg/kg	-	ND	ND	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	-	6	3.1	-	1.7
2-NITROTOLUENE	SW8330	mg/kg	-	ND	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	-	ND	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	-	3.7	8.7	-	3.1
4-NITROTOLUENE	SW8330	mg/kg	-	ND	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	ND	-	ND
NITROBENZENE	SW8330	mg/kg	-	ND	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.39	-	-	0.24	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	ND	-	-	ND	-
TETRYL	SW8330	mg/kg	-	ND	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-6. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)
(1 of 4)

TNT Strip #3	Field Sample ID			TNT-3A-.5	TNT-3A-1.0	TNT-3A-1.5	TNT-3A-2	TNT-3B-.5	TNT-3B-1	TNT-3B-1.5	TNT-3B-1DUP
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	1.0 - 1.5
Parameter	**Method**	**Units**	**MDL**								
ALUMINUM	SW6010B	mg/kg	2.91	-	19,000	-	20,000	-	21,000	-	20,000
ANTIMONY	SW6010B	mg/kg	0.502	-	ND	-	0.71	-	ND	-	0.68
ARSENIC	SW6010B	mg/kg	0.559	-	17	-	15	-	15	-	15
BARIUM	SW6010B	mg/kg	0.590	-	240	-	280	-	310	-	260
BERYLLIUM	SW6010B	mg/kg	0.130	-	0.36	-	0.49	-	0.49	-	0.5
CADMIUM	SW6010B	mg/kg	0.057	-	ND	-	ND	-	ND	-	ND
CALCIUM	SW6010B	mg/kg	6.41	-	3,600	-	4,300	-	4,300	-	4,100
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	-	44	-	45	-	47	-	45
COBALT	SW6010B	mg/kg	0.112	-	17	-	18	-	20	-	19
COPPER	SW6010B	mg/kg	0.445	-	51	-	55	-	55	-	54
IRON	SW6010B	mg/kg	1.82	-	39,000	-	42,000	-	39,000	-	44,000
LEAD	SW6010B	mg/kg	0.437	-	26	-	9.3	-	10	-	11
MAGNESIUM	SW6010B	mg/kg	7.00	-	6,100	-	6,400	-	7,100	-	6,800
MANGANESE	SW6010B	mg/kg	0.164	-	1,100	-	1,200	-	1,200	-	1,100
MERCURY	SW7471A	mg/kg	0.0099	-	0.06	-	0.037	-	0.02	-	0.075
MOLYBDENUM	SW6010B	mg/kg	0.142	-	1.2	-	1.2	-	0.79	-	0.85
NICKEL	SW6010B	mg/kg	0.591	-	47	-	55	-	55	-	53
POTASSIUM	SW6010B	mg/kg	9.91	-	3,200	-	2,600	-	2,800	-	2,800
SELENIUM	SW6010B	mg/kg	0.464	-	1.3	-	1.2	-	1.2	-	0.89
SILVER	SW6010B	mg/kg	0.099	-	ND	-	ND	-	ND	-	ND
SODIUM	SW6010B	mg/kg	23.96	-	78	-	110	-	140	-	130
THALLIUM	SW6010B	mg/kg	0.741	-	ND	-	ND	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	0.156	-	84	-	81	-	77	-	75
ZINC	SW6010B	mg/kg	0.622	-	79	-	75	-	74	-	75
ACENAPHTHENE	SW8310	mg/kg	0.01	-	ND	-	ND	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	-	ND	-	ND	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	-	ND	-	ND	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	-	ND	-	ND	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	-	ND	-	ND	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	0.003	-	ND	-	ND	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	-	ND	-	ND	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	-	ND	-	ND
FLUORENE	SW8310	mg/kg	0.008	-	ND	-	0.012	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	-	ND	-	ND	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	0.008	-	ND	-	ND	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	0.005	-	ND	-	ND	-	ND	-	ND
PYRENE	SW8310	mg/kg	0.004	-	ND	-	0.025	-	ND	-	ND

Table 1.5-6. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #3	Field Sample ID			TNT-3A-.5	TNT-3A-1.0	TNT-3A-1.5	TNT-3A-2	TNT-3B-.5	TNT-3B-1	TNT-3B-1.5	TNT-3B-1DUP
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	1.0 - 1.5
Parameter	**Method**	**Units**	**MDL**								
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	-	96	-	120	-	200	-	200
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	-	ND	-	ND	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	-	51,000	-	28,000	-	8.2	-	2.5
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	-	ND	-	12	-	1.1	-	1.4
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	-	ND	-	ND	-	ND	-	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	-	ND	-	ND	-	0.98	-	1.3
3-NITROTOLUENE	SW8330	mg/kg	0.043	-	ND	-	ND	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	-	ND	-	ND	-	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	-	ND	-	ND	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	0.029	-	ND	-	ND	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.070	ND	-	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	-	ND	-	ND	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	ND	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	0.237	-	ND	-	ND	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-6. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)
(3 of 4)

TNT Strip #3	Field Sample ID		TNT-3B-2	TNT-3B-3.5	TNT-3B-4	TNT-3C-.5	TNT-3C-1	TNT-3C-1.5	TNT-3C-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth		2.0 - 2.5	3.5 - 4.0	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**							
ALUMINUM	SW6010B	mg/kg	21,000	-	20,000	21,000	21,000	-	21,000
ANTIMONY	SW6010B	mg/kg	0.69	-	ND	ND	ND	-	ND
ARSENIC	SW6010B	mg/kg	14	-	14	16	15	-	15
BARIUM	SW6010B	mg/kg	330	-	300	270	300	-	370
BERYLLIUM	SW6010B	mg/kg	0.5	-	0.37	0.62	0.63	-	0.62
CADMIUM	SW6010B	mg/kg	ND	-	ND	0.074	ND	-	ND
CALCIUM	SW6010B	mg/kg	5,300	-	22,000	3,300	3,900	-	4,500
CHROMIUM, TOTAL	SW6010B	mg/kg	46	-	43	59	58	-	57
COBALT	SW6010B	mg/kg	21	-	17	21	23	-	22
COPPER	SW6010B	mg/kg	54	-	51	68	67	-	65
IRON	SW6010B	mg/kg	46,000	-	36,000	46,000	45,000	-	46,000
LEAD	SW6010B	mg/kg	11	-	9.9	16	11	-	11
MAGNESIUM	SW6010B	mg/kg	7,100	-	8,600	7,500	7,200	-	7,100
MANGANESE	SW6010B	mg/kg	1,900	-	1,100	1,500	1,400	-	1,500
MERCURY	SW7471A	mg/kg	0.014	-	0.099	0.012	0.019	-	0.02
MOLYBDENUM	SW6010B	mg/kg	0.85	-	0.86	0.49	0.83	-	0.63
NICKEL	SW6010B	mg/kg	63	-	52	67	65	-	66
POTASSIUM	SW6010B	mg/kg	2,800	-	3,000	1,700	2,000	-	2,000
SELENIUM	SW6010B	mg/kg	1.1	-	0.94	0.87	1.2	-	0.71
SILVER	SW6010B	mg/kg	ND	-	ND	ND	ND	-	ND
SODIUM	SW6010B	mg/kg	160	-	250	87	110	-	160
THALLIUM	SW6010B	mg/kg	ND	-	ND	ND	ND	-	ND
VANADIUM	SW6010B	mg/kg	78	-	60	87	88	-	87
ZINC	SW6010B	mg/kg	75	-	75	75	78	-	81
ACENAPHTHENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
ANTHRACENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
CHRYSENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
FLUORENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND
PYRENE	SW8310	mg/kg	ND	-	ND	ND	ND	-	ND

Table 1.5-6. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #3	Field Sample ID		TNT-3B-2	TNT-3B-3.5	TNT-3B-4	TNT-3C-.5	TNT-3C-1	TNT-3C-1.5	TNT-3C-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth		2.0 - 2.5	3.5 - 4.0	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**							
1,3,5-TRINITROBENZENE	SW8330	mg/kg	190	-	150	ND	180	-	210
1,3-DINITROBENZENE	SW8330	mg/kg	ND	-	ND	ND	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	83	-	10	16,000	31	-	15
2,4-DINITROTOLUENE	SW8330	mg/kg	0.25	-	ND	11	ND	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	ND	-	ND	ND	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.75	-	0.21	12	1.2	-	ND
2-NITROTOLUENE	SW8330	mg/kg	ND	-	ND	ND	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	ND	-	ND	ND	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	ND	-	ND	9.9	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	ND	-	ND	ND	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	ND	-	ND	ND	ND	-	ND
NITROBENZENE	SW8330	mg/kg	ND	-	ND	ND	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	-	0.24	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	ND	-	ND	ND	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	ND	-	ND	ND	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-7. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #4	Field Sample ID			TNT-4A-.5	TNT-4A-1	TNT-4A-2	TNT-4B-.5	TNT-4B-1	TNT-4B-1.5	TNT-4B-2	TNT-4B-3.5	TNT-4B-4
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	3.5 - 4.0	4.0 - 4.5
Parameter	**Method**	**Units**	**MDL**									
ALUMINUM	SW6010B	mg/kg	2.91	-	18,000	18,000	19,000	20,000	-	18,000	-	17,000
ANTIMONY	SW6010B	mg/kg	0.502	-	ND	ND	ND	ND	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	0.559	-	15	13	14	14	-	13	-	11
BARIUM	SW6010B	mg/kg	0.590	-	210	190	340	270	-	250	-	230
BERYLLIUM	SW6010B	mg/kg	0.130	-	0.47	0.48	0.82	0.62	-	0.63	-	0.49
CADMIUM	SW6010B	mg/kg	0.057	-	ND	ND	0.1	ND	-	ND	-	ND
CALCIUM	SW6010B	mg/kg	6.41	-	3,200	3,200	3,500	3,600	-	3,900	-	5,500
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	-	51	51	50	51	-	49	-	47
COBALT	SW6010B	mg/kg	0.112	-	25	17	22	21	-	20	-	18
COPPER	SW6010B	mg/kg	0.445	-	54	52	61	57	-	56	-	51
IRON	SW6010B	mg/kg	1.82	-	46,000	45,000	41,000	40,000	-	39,000	-	35,000
LEAD	SW6010B	mg/kg	0.437	-	10	8.7	12	11	-	11	-	11
MAGNESIUM	SW6010B	mg/kg	7.00	-	5,200	5,500	5,400	5,600	-	5,600	-	5,600
MANGANESE	SW6010B	mg/kg	0.164	-	1,300	830	1,500	1,500	-	1,200	-	1,100
MERCURY	SW7471A	mg/kg	0.0099	-	0.036	0.048	0.015	ND	-	ND	-	0.022
MOLYBDENUM	SW6010B	mg/kg	0.142	-	0.9	0.95	0.5	0.74	-	0.55	-	0.61
NICKEL	SW6010B	mg/kg	0.591	-	50	49	59	57	-	56	-	54
POTASSIUM	SW6010B	mg/kg	9.91	-	1,400	1,400	1,600	2,000	-	1,800	-	1,700
SELENIUM	SW6010B	mg/kg	0.464	-	1.7	0.93	0.75	1.2	-	1.1	-	1
SILVER	SW6010B	mg/kg	0.099	-	ND	ND	ND	ND	-	ND	-	ND
SODIUM	SW6010B	mg/kg	23.96	-	100	180	120	200	-	240	-	240
THALLIUM	SW6010B	mg/kg	0.741	-	ND	ND	ND	ND	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	0.156	-	97	87	81	79	-	78	-	88
ZINC	SW6010B	mg/kg	0.622	-	70	69	65	68	-	66	-	65
ACENAPHTHENE	SW8310	mg/kg	0.01	-	ND	ND	ND	ND	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	-	ND	ND	ND	ND	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	0.004	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	-	ND	ND	ND	ND	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	0.003	-	ND	ND	ND	ND	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	-	ND	ND	ND	ND	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	ND	ND	ND	-	ND	-	ND
FLUORENE	SW8310	mg/kg	0.008	-	ND	ND	ND	ND	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	-	ND	ND	ND	ND	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	0.008	-	ND	ND	ND	ND	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	0.005	-	ND	ND	0.01	ND	-	ND	-	ND
PYRENE	SW8310	mg/kg	0.004	-	ND	ND	ND	ND	-	ND	-	ND

Table 1.5-7. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(2 of 4)

TNT Strip #4	Field Sample ID			TNT-4A-.5	TNT-4A-1	TNT-4A-2	TNT-4B-.5	TNT-4B-1	TNT-4B-1.5	TNT-4B-2	TNT-4B-3.5	TNT-4B-4
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	3.5 - 4.0	4.0 - 4.5
Parameter	**Method**	**Units**	**MDL**									
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	-	5	0.6	200	190	-	160	-	20
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	-	ND	ND	ND	ND	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	-	150	18	52	14	-	660	-	240
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	-	ND	ND	2.4	1.9	-	1.3	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	-	ND	ND	ND	ND	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	-	6	5.3	ND	ND	-	1.1	-	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	-	ND	ND	ND	ND	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	-	ND	ND	ND	ND	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	-	5.4	5.3	ND	ND	-	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	-	ND	ND	ND	ND	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	-	ND	ND	ND	ND	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	0.029	-	ND	ND	ND	ND	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.070	ND	-	-	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	-	ND	ND	ND	ND	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	ND	-	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	0.237	-	ND	ND	ND	ND	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-7. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #4	Field Sample ID		TNT-4C-.5	TNT-4C-1	TNT-4C-1.5	TNT-4C-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99
	Depth		0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**				
ALUMINUM	SW6010B	mg/kg	-	18,000	-	19,000
ANTIMONY	SW6010B	mg/kg	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	-	14	-	13
BARIUM	SW6010B	mg/kg	-	250	-	130
BERYLLIUM	SW6010B	mg/kg	-	0.59	-	0.35
CADMIUM	SW6010B	mg/kg	-	ND	-	ND
CALCIUM	SW6010B	mg/kg	-	3,900	-	6,600
CHROMIUM, TOTAL	SW6010B	mg/kg	-	51	-	54
COBALT	SW6010B	mg/kg	-	21	-	27
COPPER	SW6010B	mg/kg	-	55	-	71
IRON	SW6010B	mg/kg	-	38,000	-	46,000
LEAD	SW6010B	mg/kg	-	15	-	11
MAGNESIUM	SW6010B	mg/kg	-	5,200	-	9,700
MANGANESE	SW6010B	mg/kg	-	1,400	-	660
MERCURY	SW7471A	mg/kg	-	0.047	-	0.047
MOLYBDENUM	SW6010B	mg/kg	-	0.76	-	0.39
NICKEL	SW6010B	mg/kg	-	58	-	75
POTASSIUM	SW6010B	mg/kg	-	1,700	-	1,300
SELENIUM	SW6010B	mg/kg	-	0.96	-	1.1
SILVER	SW6010B	mg/kg	-	ND	-	ND
SODIUM	SW6010B	mg/kg	-	93	-	110
THALLIUM	SW6010B	mg/kg	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	-	73	-	64
ZINC	SW6010B	mg/kg	-	67	-	100
ACENAPHTHENE	SW8310	mg/kg	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND
FLUORENE	SW8310	mg/kg	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	-	0.019	-	ND
PYRENE	SW8310	mg/kg	-	ND	-	ND

Table 1.5-7. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #4	Field Sample ID		TNT-4C-.5	TNT-4C-1	TNT-4C-1.5	TNT-4C-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99
	Depth		0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**				
1,3,5-TRINITROBENZENE	SW8330	mg/kg	-	68	-	89
1,3-DINITROBENZENE	SW8330	mg/kg	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	-	20,000	-	2
2,4-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
2-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	ND	-	ND	-
TETRYL	SW8330	mg/kg	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-8. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #5	Field Sample ID			TNT-5ASURFACE	TNT-5A-.5	TNT-5A-1	TNT-5A-1.5	TNT-5A-2	TNT-5B-.5	TNT-5B-1	TNT-5B-1.5	TNT-5B-2	TNT-5C-.5	TNT-5C-1
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5
Parameter	**Method**	**Units**	**MDL**											
ALUMINUM	SW6010B	mg/kg	2.91	16,000	-	17,000	-	17,000	17,000	16,000	-	19,000	-	18000
ANTIMONY	SW6010B	mg/kg	0.502	0.65	-	ND	-	1.1	ND	0.84	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	0.559	13	-	14	-	15	19	16	-	23	-	15
BARIUM	SW6010B	mg/kg	0.590	230	-	220	-	260	180	160	-	140	-	250
BERYLLIUM	SW6010B	mg/kg	0.130	0.51	-	0.48	-	0.61	0.36	0.35	-	0.35	-	0.49
CADMIUM	SW6010B	mg/kg	0.057	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
CALCIUM	SW6010B	mg/kg	6.41	2,600	-	2,600	-	3,400	3,300	3000	-	3,600	-	3600
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	50	-	50	-	53	43	41	-	47	-	47
COBALT	SW6010B	mg/kg	0.112	21	-	22	-	21	17	15	-	15	-	20
COPPER	SW6010B	mg/kg	0.445	58	-	58	-	58	50	44	-	61	-	53
IRON	SW6010B	mg/kg	1.62	39,000	-	41,000	-	45,000	47,000	46,000	-	41,000	-	43000
LEAD	SW6010B	mg/kg	0.437	11	-	14	-	10	7.3	6.4	-	8.2	-	9.5
MAGNESIUM	SW6010B	mg/kg	7.00	4,100	-	4,200	-	5,000	4,700	4,400	-	6,400	-	5300
MANGANESE	SW6010B	mg/kg	0.164	1,300	-	1,300	-	1,500	470	590	-	290	-	1400
MERCURY	SW7471A	mg/kg	0.0099	0.021	-	0.017	-	ND	0.036	0.035	-	0.047	-	0.014
MOLYBDENUM	SW6010B	mg/kg	0.142	0.9	-	0.65	-	0.61	1.2	1.2	-	0.84	-	0.86
NICKEL	SW6010B	mg/kg	0.591	51	-	54	-	58	38	35	-	50	-	50
POTASSIUM	SW6010B	mg/kg	9.91	2,100	-	2,000	-	2,100	1,100	1,400	-	1,200	-	2300
SELENIUM	SW6010B	mg/kg	0.464	0.94	-	0.83	-	0.7	1.1	1.1	-	0.76	-	0.74
SILVER	SW6010B	mg/kg	0.099	ND	-	ND	-	ND	ND	0.13	-	ND	-	ND
SODIUM	SW6010B	mg/kg	23.96	110	-	140	-	240	60	100	-	110	-	140
THALLIUM	SW6010B	mg/kg	0.741	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	0.156	80	-	80	-	81	100	97	-	98	-	85
ZINC	SW6010B	mg/kg	0.622	66	-	67	-	70	65	64	-	91	-	69
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.51	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.29	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	0.35	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	0.34	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.34	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-	-
1,2,3,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-	-
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.35	-	-	ND	-	-	-	-	-	-	-	-
2,3,4,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	0.35	-	-	ND	-	-	-	-	-	-	-	-
2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.30	-	-	ND	-	-	-	-	-	-	-	-
2,3,7,8-TETRACHLORODIBENZOFURAN	SW8290	pg/g	0.12	-	-	ND	-	-	-	-	-	-	-	-
HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.067	-	-	ND	-	-	-	-	-	-	-	-
HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	ND	-	-	-	-	-	-	-	-
HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.0	-	-	ND	-	-	-	-	-	-	-	-
HEXACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	ND	-	-	-	-	-	-	-	-
OCTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.99	-	-	ND	-	-	-	-	-	-	-	-

Table 1.5-8. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(2 of 4)

TNT Strip #5	Field Sample ID			TNT-5ASURFACE	TNT-5A-.5	TNT-5A-1	TNT-5A-1.5	TNT-5A-2	TNT-5B-.5	TNT-5B-1	TNT-5B-1.5	TNT-5B-2	TNT-5C-.5	TNT-5C-1
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5
Parameter	**Method**	**Units**	**MDL**											
OCTACHLORODIBENZOFURAN	SW8290	pg/g	0.5	-	-	ND	-	-	-	-	-	-	-	-
PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.49	-	-	ND	-	-	-	-	-	-	-	-
PENTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	4.3	-	-	-	-	-	-	-	-
TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.0	-	-	0.94	-	-	-	-	-	-	-	-
TETRACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	13	-	-	-	-	-	-	-	-
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
FLUORENE	SW8310	mg/kg	0.008	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	0.005	0.0072	-	ND	-	ND	ND	ND	-	ND	-	ND
PYRENE	SW8310	mg/kg	0.004	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	31	-	35	-	160	13	14	-	7.5	-	200
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	1,500	-	10,000	-	12	4,200	21,000	-	7,800	-	3.1
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	0.93	-	2.5	-	0.55	8.9	15	-	5.4	-	2.5
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	-	1.1	-	ND	3.8	3.9	-	0.82	-	0.62
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.070	-	0.35	-	0.3	-	ND	-	ND	-	0.6	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	-	ND	-	ND	ND	ND	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	-	ND	-	ND	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	0.237	ND	-	ND	-	ND	ND	ND	-	ND	-	ND

Notes

Sample results reported on a dry weight basis

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

pg/g = picogram per gram

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech
This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-8. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(3 of 4)

TNT Strip #5	Field Sample ID		TNT-5C-1.5	TNT-5C-2	TNT-5D-.5	TNT-5D-1	TNT-5D-1.5	TNT-5D-2	TNT-5E-.5	TNT-5E-1	TNT-5E-1.5	TNT-5E-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth		1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**										
ALUMINUM	SW6010B	mg/kg	-	20000	-	20000	-	22000	-	19000	-	16000
ANTIMONY	SW6010B	mg/kg	-	ND	-	0.82	-	ND	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	-	12	-	15	-	14	-	12	-	14
BARIUM	SW6010B	mg/kg	-	250	-	240	-	260	-	190	-	220
BERYLLIUM	SW6010B	mg/kg	-	0.5	-	0.59	-	0.59	-	0.55	-	1
CADMIUM	SW6010B	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
CALCIUM	SW6010B	mg/kg	-	4000	-	3000	-	3200	-	2600	-	2800
CHROMIUM, TOTAL	SW6010B	mg/kg	-	48	-	59	-	58	-	50	-	54
COBALT	SW6010B	mg/kg	-	20	-	24	-	25	-	20	-	22
COPPER	SW6010B	mg/kg	-	55	-	62	-	60	-	55	-	56
IRON	SW6010B	mg/kg	-	41000	-	45000	-	45000	-	38000	-	40000
LEAD	SW6010B	mg/kg	-	9.7	-	12	-	12	-	11	-	13
MAGNESIUM	SW6010B	mg/kg	-	5600	-	4900	-	5000	-	4200	-	4400
MANGANESE	SW6010B	mg/kg	-	1400	-	1500	-	1800	-	1200	-	1500
MERCURY	SW7471A	mg/kg	-	ND	-	0.018	-	0.015	-	0.033	-	0.023
MOLYBDENUM	SW6010B	mg/kg	-	0.94	-	0.99	-	0.88	-	0.77	-	1.1
NICKEL	SW6010B	mg/kg	-	52	-	64	-	67	-	45	-	61
POTASSIUM	SW6010B	mg/kg	-	2500	-	2400	-	2500	-	1900	-	2200
SELENIUM	SW6010B	mg/kg	-	0.99	-	1.2	-	0.94	-	0.64	-	1.3
SILVER	SW6010B	mg/kg	-	ND	-	ND	-	ND	-	ND	-	0.54
SODIUM	SW6010B	mg/kg	-	190	-	240	-	350	-	150	-	230
THALLIUM	SW6010B	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	-	84	-	93	-	89	-	79	-	82
ZINC	SW6010B	mg/kg	-	68	-	72	-	73	-	60	-	67
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
2,3,4,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
2,3,7,8-TETRACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
HEXACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
OCTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-

Table 1.5-8. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #5	Field Sample ID		TNT-5C-1.5	TNT-5C-2	TNT-5D-.5	TNT-5D-1	TNT-5D-1.5	TNT-5D-2	TNT-5E-.5	TNT-5E-1	TNT-5E-1.5	TNT-5E-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth		1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**										
OCTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
PENTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
TETRACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-
ACENAPHTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
FLUORENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	-	190	-	ND	-	0.59	-	ND	-	ND
1,3-DINITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	-	460	-	1.7	-	750	-	1.6	-	0.69
2,4-DINITROTOLUENE	SW8330	mg/kg	-	1.7	-	ND	-	ND	-	ND	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	2.7	-	5.4	-	2.1	-	0.46
2-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	2.6	-	3.6	-	2.6	-	0.57
4-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.6	-	ND	-	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

pg/g = picogram per gram

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech
This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-9. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Former Howitzer Test Facility	Field Sample ID Sample Date		SS-19 11/20/98
Parameter	**Units**	**Result**	**MDL**
Metals			
Antimony	mg/kg	ND	6.00
Manganese	mg/kg	917	0.500
Potassium	mg/kg	2,040	500
Arsenic	mg/kg	17.0	10.0
Barium	mg/kg	238	0.400
Beryllium	mg/kg	0.804	0.100
Cadmium	mg/kg	ND	1.00
Chromium	mg/kg	43.1	1.00
Cobalt	mg/kg	16.4	0.700
Copper	mg/kg	48.5	1.00
Lead	mg/kg	16.0	7.50
Molybdenum	mg/kg	ND	2.00
Nickel	mg/kg	48.0	3.00
Selenium	mg/kg	ND	10.0
Silver	mg/kg	ND	0.700
Thallium	mg/kg	ND	10.0
Vanadium	mg/kg	71.6	1.00
Zinc	mg/kg	75.3	2.00
Nitrate as Nitrogen	mg/kg	1.24	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	1.24	1.00
Mercury	mg/kg	ND	0.040
Explosive Compounds			
PETN	mg/kg	ND	0.30
HMX	mg/kg	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30
Tetryl	mg/kg	ND	0.30
Nitrobenzene	mg/kg	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30
Phosphate	mg/kg	10.5	0.500

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-10. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Former Howitzer Test Facility	Field Sample ID			SP3-1B	SP3-2-B	SP3-3A	SP3-3-A	SP3-4-A
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Parameter	Method	Units	MDL					
ALUMINUM	SW6010B	mg/kg	2.91	19,000	18,000	17,000	17,000	13,000
ANTIMONY	SW6010B	mg/kg	0.502	ND	ND	1.1	0.78	ND
ARSENIC	SW6010B	mg/kg	0.559	13	17	13	13	14
BARIUM	SW6010B	mg/kg	0.590	240	200	200	210	190
BERYLLIUM	SW6010B	mg/kg	0.130	0.44	0.34	0.34	0.33	ND
CADMIUM	SW6010B	mg/kg	0.057	ND	ND	ND	ND	ND
CALCIUM	SW6010B	mg/kg	6.41	9,300	8,500	8,200	7,100	6,300
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	43	45	43	41	41
COBALT	SW6010B	mg/kg	0.112	20	19	18	19	17
COPPER	SW6010B	mg/kg	0.445	63	59	61	61	48
IRON	SW6010B	mg/kg	1.82	42,000	47,000	38,000	39,000	36,000
LEAD	SW6010B	mg/kg	0.437	41	12	89	70	120
MAGNESIUM	SW6010B	mg/kg	7.00	8,000	6,700	7,400	7,700	6,000
MANGANESE	SW6010B	mg/kg	0.164	1,100	900	800	1,100	980
MERCURY	SW7471A	mg/kg	0.0099	0.088	0.068	0.1	0.13	0.1
MOLYBDENUM	SW6010B	mg/kg	0.142	0.44	0.71	0.52	0.44	0.44
NICKEL	SW6010B	mg/kg	0.591	56	47	50	58	53
POTASSIUM	SW6010B	mg/kg	9.91	1,500	1,100	1,800	1,600	1,200
SELENIUM	SW6010B	mg/kg	0.464	0.66	1.4	1.2	1	0.89
SILVER	SW6010B	mg/kg	0.099	ND	ND	ND	ND	ND
SODIUM	SW6010B	mg/kg	23.96	110	210	160	110	100
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	67	87	66	66	70
ZINC	SW6010B	mg/kg	0.622	93	84	82	89	70
ACENAPHTHENE	SW8270	mg/kg	0.0395	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8270	mg/kg	0.0395	ND	ND	ND	ND	ND
ANTHRACENE	SW8270	mg/kg	0.0277	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8270	mg/kg	0.0203	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8270	mg/kg	0.0229	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8270	mg/kg	0.0281	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8270	mg/kg	0.0269	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8270	mg/kg	0.0254	ND	ND	ND	ND	ND
CHRYSENE	SW8270	mg/kg	0.0225	0.077	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8270	mg/kg	0.0297	ND	ND	ND	ND	ND
FLUORANTHENE	SW8270	mg/kg	0.0229	ND	ND	ND	ND	ND
FLUORENE	SW8270	mg/kg	0.0463	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8270	mg/kg	0.0296	ND	ND	ND	ND	ND
NAPHTHALENE	SW8270	mg/kg	0.0480	ND	ND	ND	ND	ND
PHENANTHRENE	SW8270	mg/kg	0.0302	ND	ND	ND	ND	ND
PYRENE	SW8270	mg/kg	0.0197	0.033	ND	ND	ND	ND

Table 1.5-10. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

(2 of 2)

Former Howitzer Test Facility	Field Sample ID			SP3-1B	SP3-2-B	SP3-3A	SP3-3-A	SP3-4-A
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Parameter	**Method**	**Units**	**MDL**					
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech.
This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-11. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Former Ammunition Renovation Area/Primer Destruction Site	Field Sample ID Sample Date	FSS-32 12/02/98	
Parameter	**Units**	**Result**	**MDL**
Metals			
Antimony	mg/kg	-	-
Manganese	mg/kg	-	-
Potassium	mg/kg	-	-
Arsenic	mg/kg	-	-
Barium	mg/kg	-	-
Beryllium	mg/kg	-	-
Cadmium	mg/kg	-	-
Chromium	mg/kg	-	-
Cobalt	mg/kg	-	-
Copper	mg/kg	-	-
Lead	mg/kg	-	-
Molybdenum	mg/kg	-	-
Nickel	mg/kg	-	-
Selenium	mg/kg	-	-
Silver	mg/kg	-	-
Thallium	mg/kg	-	-
Vanadium	mg/kg	-	-
Zinc	mg/kg	-	-
Nitrate as Nitrogen	mg/kg	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-
Mercury	mg/kg	-	-
Explosive Compounds			
PETN	mg/kg	-	-
HMX	mg/kg	-	-
Cyclonite (RDX)	mg/kg	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-
1,3-Dinitrobenzene	mg/kg	-	-
Tetryl	mg/kg	-	-
Nitrobenzene	mg/kg	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-
2,4-Dinitrotoluene	mg/kg	-	-
2,6-Dinitrotoluene	mg/kg	-	-
4-Nitrotoluene	mg/kg	-	-
3-Nitrotoluene	mg/kg	-	-
2-Nitrotoluene	mg/kg	-	-
Phosphate	mg/kg	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-12. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

(1 of 2)

Former Ammunition Renovation Area/Primer Destruction Site	Field Sample ID			SP1A1	SP1B1	SP2A1	SP2B1	SP3-1B	SP3-2-B
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/21/99	7/21/99
	Depth			0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Parameter	**Method**	**Units**	**MDL**						
ALUMINUM	SW6010B	mg/kg	2.91	19,000	19,000	18,000	16,000	19,000	18,000
ANTIMONY	SW6010B	mg/kg	0.502	0.75	ND	0.57	ND	ND	ND
ARSENIC	SW6010B	mg/kg	0.559	16	14	13	13	13	17
BARIUM	SW6010B	mg/kg	0.590	210	180	230	220	240	200
BERYLLIUM	SW6010B	mg/kg	0.130	0.33	0.33	0.45	0.33	0.44	0.34
CADMIUM	SW6010B	mg/kg	0.057	ND	ND	ND	ND	ND	ND
CALCIUM	SW6010B	mg/kg	6.41	6,800	5,000	11,000	10,000	9,300	8,500
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	47	46	41	45	43	45
COBALT	SW6010B	mg/kg	0.112	19	18	19	20	20	19
COPPER	SW6010B	mg/kg	0.445	58	52	56	57	63	59
IRON	SW6010B	mg/kg	1.82	44,000	42,000	39,000	38,000	42,000	47,000
LEAD	SW6010B	mg/kg	0.437	17	19	13	82	41	12
MAGNESIUM	SW6010B	mg/kg	7.00	7,200	6,000	7,300	6,900	8,000	6,700
MANGANESE	SW6010B	mg/kg	0.164	1,100	820	950	990	1,100	900
MERCURY	SW7471A	mg/kg	0.0099	0.055	0.045	0.067	0.067	0.088	0.068
MOLYBDENUM	SW6010B	mg/kg	0.142	0.65	0.6	0.5	0.69	0.44	0.71
NICKEL	SW6010B	mg/kg	0.591	50	46	50	49	56	47
POTASSIUM	SW6010B	mg/kg	9.91	1,600	1,600	1,800	1,400	1,500	1,100
SELENIUM	SW6010B	mg/kg	0.464	0.74	ND	0.73	ND	0.66	1.4
SILVER	SW6010B	mg/kg	0.099	ND	ND	0.11	0.12	ND	ND
SODIUM	SW6010B	mg/kg	23.96	180	140	160	140	110	210
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	81	84	65	64	67	87
ZINC	SW6010B	mg/kg	0.622	85	75	80	99	93	84
ACENAPHTHENE	SW8270	mg/kg	0.0395	-	ND	-	ND	ND	ND
ACENAPHTHYLENE	SW8270	mg/kg	0.0395	-	ND	-	ND	ND	ND
ANTHRACENE	SW8270	mg/kg	0.0277	-	ND	-	ND	ND	ND
BENZO(a)ANTHRACENE	SW8270	mg/kg	0.0203	-	ND	-	0.11	ND	ND
BENZO(a)PYRENE	SW8270	mg/kg	0.0229	-	ND	-	0.11	ND	ND
BENZO(b)FLUORANTHENE	SW8270	mg/kg	0.0281	-	ND	-	0.11	ND	ND
BENZO(g,h,i)PERYLENE	SW8270	mg/kg	0.0269	-	ND	-	0.044	ND	ND
BENZO(k)FLUORANTHENE	SW8270	mg/kg	0.0254	-	ND	-	0.11	ND	ND
CHRYSENE	SW8270	mg/kg	0.0225	-	ND	-	0.11	0.077	ND
DIBENZ(a,h)ANTHRACENE	SW8270	mg/kg	0.0297	-	ND	-	ND	ND	ND
FLUORANTHENE	SW8270	mg/kg	0.0229	-	ND	-	0.11	ND	ND
FLUORENE	SW8270	mg/kg	0.0463	-	ND	-	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8270	mg/kg	0.0296	-	ND	-	0.067	ND	ND
NAPHTHALENE	SW8270	mg/kg	0.0480	-	ND	-	ND	ND	ND
PHENANTHRENE	SW8270	mg/kg	0.0302	-	ND	-	ND	ND	ND
PYRENE	SW8270	mg/kg	0.0197	-	ND	-	0.11	0.033	ND

Table 1.5-12. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(2 of 2)

Former Ammunition Renovation Area/Primer Destruction Site	Field Sample ID			SP1A1	SP1B1	SP2A1	SP2B1	SP3-1B	SP3-2-B
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/21/99	7/21/99
	Depth			0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Parameter	**Method**	**Units**	**MDL**						
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	0.0078	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	0.67	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-13. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Flare Site	Field Sample ID	SS-22		SS-22*		SS-22***	
	Sample Date	11/20/98		11/20/98		12/01/98	
Parameter	Units	Result	MDL	Result	MDL	Result	MDL
Metals							
Antimony	mg/kg	1,470	600	666	48	-	-
Manganese	mg/kg	395	50.0	236	12.0	-	-
Potassium	mg/kg	ND	50,000	-	-	-	-
Arsenic	mg/kg	ND	1,000	9.9**	1.0**	-	-
Barium	mg/kg	74,100	40.0	76,600	160.0	-	-
Beryllium	mg/kg	ND	10.0	ND	4.0	-	-
Cadmium	mg/kg	ND	100	ND	4	-	-
Chromium	mg/kg	185	100	87.5	8	-	-
Cobalt	mg/kg	80.2	70.0	-	-	-	-
Copper	mg/kg	24,200	100	21,200	20	-	-
Lead	mg/kg	46,600	750	42,200/32,000**	40/5,000**	-	-
Molybdenum	mg/kg	ND	200	-	-	-	-
Nickel	mg/kg	ND	300	50.3	32	-	-
Selenium	mg/kg	ND	1,000	ND**	2.5**	-	-
Silver	mg/kg	ND	70.0	ND	8.0	-	-
Thallium	mg/kg	ND	1,000	ND**	2.5**	-	-
Vanadium	mg/kg	ND	100	-	-	-	-
Zinc	mg/kg	4,560	200	3,870	16	-	-
Nitrate as Nitrogen	mg/kg	3.21	1.0	ND	0.25	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	4.56	1.0	1.3	0.25	-	-
Mercury	mg/kg	0.092	0.050	ND**	0.10**	-	-
Explosive Compounds							
PETN	mg/kg	ND	0.30	ND	0.50	-	-
HMX	mg/kg	ND	0.30	ND	0.25	-	-
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.25	-	-
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.25	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.25	-	-
Tetryl	mg/kg	ND	0.30	ND	0.25	-	-
Nitrobenzene	mg/kg	ND	0.30	ND	0.25	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.25	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.25	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.25	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.25	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.25	-	-
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.25	-	-
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.25	-	-
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.25	-	-
Phosphate	mg/kg	17.1	0.500	18.1	10.0	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Sample SS-22.

** Samples analyzed using EPA Method 7000 series.

***Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-13. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(2 of 2)

Flare Site	Field Sample ID / Sample Date		FSS-21 12/02/98		FSS-29 12/02/98	
Parameter		Units	Result	MDL	Result	MDL
Metals						
Antimony		mg/kg	-	-	-	-
Manganese		mg/kg	-	-	-	-
Potassium		mg/kg	-	-	-	-
Arsenic		mg/kg	-	-	-	-
Barium		mg/kg	-	-	-	-
Beryllium		mg/kg	-	-	-	-
Cadmium		mg/kg	-	-	-	-
Chromium		mg/kg	-	-	-	-
Cobalt		mg/kg	-	-	-	-
Copper		mg/kg	-	-	-	-
Lead		mg/kg	-	-	-	-
Molybdenum		mg/kg	-	-	-	-
Nickel		mg/kg	-	-	-	-
Selenium		mg/kg	-	-	-	-
Silver		mg/kg	-	-	-	-
Thallium		mg/kg	-	-	-	-
Vanadium		mg/kg	-	-	-	-
Zinc		mg/kg	-	-	-	-
Nitrate as Nitrogen		mg/kg	-	-	-	-
Nitrate/Nitrite as Nitrogen		mg/kg	-	-	-	-
Mercury		mg/kg	-	-	-	-
Explosive Compounds						
PETN		mg/kg	-	-	-	-
HMX		mg/kg	-	-	-	-
Cyclonite (RDX)		mg/kg	-	-	2.6	1.0
1,3,5-Trinitrobenzene		mg/kg	-	-	-	-
1,3-Dinitrobenzene		mg/kg	-	-	-	-
Tetryl		mg/kg	-	-	-	-
Nitrobenzene		mg/kg	-	-	-	-
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene		mg/kg	-	-	-	-
2-Amino-4,6-Dinitrotoluene		mg/kg	-	-	-	-
2,4-Dinitrotoluene		mg/kg	-	-	-	-
2,6-Dinitrotoluene		mg/kg	-	-	-	-
4-Nitrotoluene		mg/kg	-	-	-	-
3-Nitrotoluene		mg/kg	-	-	-	-
2-Nitrotoluene		mg/kg	-	-	-	-
Phosphate		mg/kg	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Sample SS-22.

** Samples analyzed using EPA Method 7000 series.

***Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-14. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

(1 of 2)

Flare Site	Field Sample ID			FA1-.5	FA1-1	FA1-2	FA2-1	FA2-2	FA3-.5
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	1.0 - 1.5	2.0 - 2.5	0.5 - 1.0
Parameter	**Method**	**Units**	**MDL**						
ALUMINUM	SW6010B	mg/kg	2.91	23,000	18,000	17,000	17,000	18,000	31,000
ANTIMONY	SW6010B	mg/kg	0.502	ND	ND	ND	2.3	2.2	150
ARSENIC	SW6010B	mg/kg	0.559	16	14	16	15	13	18
BARIUM	SW6010B	mg/kg	0.590	190	190	190	290	220	3,400
BERYLLIUM	SW6010B	mg/kg	0.130	0.45	0.44	0.46	0.47	0.44	0.22
CADMIUM	SW6010B	mg/kg	0.057	0.091	ND	ND	0.12	ND	1.6
CALCIUM	SW6010B	mg/kg	6.41	4,700	4,900	4,300	4,000	4,100	3,800
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	54	45	48	45	51	110
COBALT	SW6010B	mg/kg	0.112	20	20	21	20	18	20
COPPER	SW6010B	mg/kg	0.445	69	67	77	100	100	8100
IRON	SW6010B	mg/kg	1.82	47,000	43,000	48,000	48,000	43,000	66,000
LEAD	SW6010B	mg/kg	0.437	11	29	21	110	110	7600
MAGNESIUM	SW6010B	mg/kg	7.00	7,500	7,100	7,300	7,400	8,300	11,000
MANGANESE	SW6010B	mg/kg	0.164	820	900	460	830	610	1100
MERCURY	SW7471A	mg/kg	0.0099	0.26	0.22	0.41	0.59	0.26	0.25
MOLYBDENUM	SW6010B	mg/kg	0.142	0.68	0.66	0.58	0.7	0.56	4.5
NICKEL	SW6010B	mg/kg	0.591	53	52	56	52	57	98
POTASSIUM	SW6010B	mg/kg	9.91	1,400	1,400	1,500	1,500	1,200	2,100
SELENIUM	SW6010B	mg/kg	0.464	1.1	1.1	1.2	1	1.1	1.1
SILVER	SW6010B	mg/kg	0.099	ND	ND	ND	ND	0.11	0.89
SODIUM	SW6010B	mg/kg	23.96	100	110	100	93	110	220
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	79	75	74	83	71	66
ZINC	SW6010B	mg/kg	0.622	91	100	100	270	240	2,000
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.25	-	-	-	-	-	34
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	-	-	-	36
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	-	-	-	3.4
1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.51	-	-	-	-	-	2.7
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.29	-	-	-	-	-	37
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	0.35	-	-	-	-	-	6.3
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	-	-	-	13
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	0.34	-	-	-	-	-	9.1
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.34	-	-	-	-	-	0
1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.25	-	-	-	-	-	4.2
1,2,3,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	-	-	-	13
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.35	-	-	-	-	-	20
2,3,4,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	0.35	-	-	-	-	-	26
2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.30	-	-	-	-	-	1.5
2,3,7,8-TETRACHLORODIBENZOFURAN	SW8290	pg/g	0.12	-	-	-	-	-	19
HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.067	-	-	-	-	-	76
HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	57
HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	110
HEXACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	140
OCTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.99	-	-	-	-	-	69

Table 1.5-14. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(2 of 2)

Flare Site	Field Sample ID			FA1-.5	FA1-1	FA1-2	FA2-1	FA2-2	FA3-.5
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	1.0 - 1.5	2.0 - 2.5	0.5 - 1.0
Parameter	**Method**	**Units**	**MDL**						
OCTACHLORODIBENZOFURAN	SW8290	pg/g	0.5	-	-	-	-	-	9.9
PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.49	-	-	-	-	-	83
PENTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	310
TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	60
TETRACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	490
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0 237	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

pg/g = picogram per gram

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech.
This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-15. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

(1 of 2)

Demolition Site #1	Field Sample ID	SS-24		FSS-24	
	Sample Date	11/20/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**
Metals					
Antimony	mg/kg	ND	6.00	-	-
Manganese	mg/kg	759	0.500	-	-
Potassium	mg/kg	1,770	500	-	-
Arsenic	mg/kg	14.7	10.0	-	-
Barium	mg/kg	173	0.400	-	-
Beryllium	mg/kg	0.778	0.100	-	-
Cadmium	mg/kg	ND	1.00	-	-
Chromium	mg/kg	46.4	1.00	-	-
Cobalt	mg/kg	14.6	0.700	-	-
Copper	mg/kg	48.9	1.00	-	-
Lead	mg/kg	12.7	7.50	-	-
Molybdenum	mg/kg	ND	2.00	-	-
Nickel	mg/kg	48.6	3.00	-	-
Selenium	mg/kg	ND	10.0	-	-
Silver	mg/kg	ND	0.700	-	-
Thallium	mg/kg	ND	10.0	-	-
Vanadium	mg/kg	63.0	1.00	-	-
Zinc	mg/kg	97.9	2.00	-	-
Nitrate as Nitrogen	mg/kg	9.16	1.00	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	9.16	1.00	-	-
Mercury	mg/kg	0.12	0.500	-	-
Explosive Compounds					
PETN	mg/kg	ND	0.30	-	-
HMX	mg/kg	ND	0.30	-	-
Cyclonite (RDX)	mg/kg	ND	0.30	-	-
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.30	-	-
Tetryl	mg/kg	ND	0.30	-	-
Nitrobenzene	mg/kg	ND	0.30	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.30	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.30	-	-
4-Nitrotoluene	mg/kg	ND	0.30	-	-
3-Nitrotoluene	mg/kg	ND	0.30	-	-
2-Nitrotoluene	mg/kg	ND	0.30	-	-
Phosphate	mg/kg	360	5.00	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, *Rapid Field Screen* for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-15. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

(2 of 2)

Demolition Site #1	Field Sample ID / Sample Date		FSS-25 12/02/98		FSS-26 12/02/98		FSS-27 12/02/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals								
Antimony		mg/kg	-	-	-	-	-	-
Manganese		mg/kg	-	-	-	-	-	-
Potassium		mg/kg	-	-	-	-	-	-
Arsenic		mg/kg	-	-	-	-	-	-
Barium		mg/kg	-	-	-	-	-	-
Beryllium		mg/kg	-	-	-	-	-	-
Cadmium		mg/kg	-	-	-	-	-	-
Chromium		mg/kg	-	-	-	-	-	-
Cobalt		mg/kg	-	-	-	-	-	-
Copper		mg/kg	-	-	-	-	-	-
Lead		mg/kg	-	-	-	-	-	-
Molybdenum		mg/kg	-	-	-	-	-	-
Nickel		mg/kg	-	-	-	-	-	-
Selenium		mg/kg	-	-	-	-	-	-
Silver		mg/kg	-	-	-	-	-	-
Thallium		mg/kg	-	-	-	-	-	-
Vanadium		mg/kg	-	-	-	-	-	-
Zinc		mg/kg	-	-	-	-	-	-
Nitrate as Nitrogen		mg/kg	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen		mg/kg	-	-	-	-	-	-
Mercury		mg/kg	-	-	-	-	-	-
Explosive Compounds								
PETN		mg/kg	-	-	-	-	-	-
HMX		mg/kg	-	-	-	-	-	-
Cyclonite (RDX)		mg/kg	-	-	1.4	1.0	-	-
1,3,5-Trinitrobenzene		mg/kg	-	-	-	-	-	-
1,3-Dinitrobenzene		mg/kg	-	-	-	-	-	-
Tetryl		mg/kg	-	-	-	-	-	-
Nitrobenzene		mg/kg	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene		mg/kg	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene		mg/kg	-	-	-	-	-	-
2,4-Dinitrotoluene		mg/kg	-	-	-	-	-	-
2,6-Dinitrotoluene		mg/kg	-	-	-	-	-	-
4-Nitrotoluene		mg/kg	-	-	-	-	-	-
3-Nitrotoluene		mg/kg	-	-	-	-	-	-
2-Nitrotoluene		mg/kg	-	-	-	-	-	-
Phosphate		mg/kg	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-16. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(1 of 2)

Demolition Site #1	Field Sample ID			DA1-1-1	DA1-1-2	DA1-1-4	DA1-2-.5	DA1-2-1	DA1-2-2	DA1-2-3.5
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	3.5 - 4.0
Parameter	**Method**	**Units**	**MDL**							
ALUMINUM	SW6010B	mg/kg	2.91	20,000	20,000	20,000	21,000	19,000	17,000	20,000
ANTIMONY	SW6010B	mg/kg	0.502	1.2	1.3	ND	ND	ND	2	0.66
ARSENIC	SW6010B	mg/kg	0.559	16	17	16	16	16	17	16
BARIUM	SW6010B	mg/kg	0.590	280	310	320	180	170	200	220
BERYLLIUM	SW6010B	mg/kg	0.130	0.46	0.47	0.49	0.34	0.33	0.34	0.46
CADMIUM	SW6010B	mg/kg	0.057	0.35	0.35	ND	0.22	0.21	0.45	ND
CALCIUM	SW6010B	mg/kg	6.41	4,500	4,300	4,300	3,700	3,800	3,800	4,100
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	51	50	52	55	51	51	52
COBALT	SW6010B	mg/kg	0.112	17	22	21	17	19	20	19
COPPER	SW6010B	mg/kg	0.445	99	85	69	59	59	88	75
IRON	SW6010B	mg/kg	1.82	48,000	43,000	47,000	46,000	42,000	46,000	45,000
LEAD	SW6010B	mg/kg	0.437	37	36	11	16	14	48	20
MAGNESIUM	SW6010B	mg/kg	7.00	7,500	7,000	7,900	7,900	8,000	7,200	7,400
MANGANESE	SW6010B	mg/kg	0.164	660	1,300	1,000	860	870	850	850
MERCURY	SW7471A	mg/kg	0.0099	0.12	0.081	0.049	0.067	0.078	0.18	0.046
MOLYBDENUM	SW6010B	mg/kg	0.142	0.86	0.62	0.64	0.67	0.85	0.96	0.84
NICKEL	SW6010B	mg/kg	0.591	52	57	58	54	56	55	58
POTASSIUM	SW6010B	mg/kg	9.91	2,400	2,800	1,700	1,600	1,700	1,900	2,300
SELENIUM	SW6010B	mg/kg	0.464	1.5	1.6	2	1	1.7	1.5	1.5
SILVER	SW6010B	mg/kg	0.099	ND	ND	ND	ND	0.13	0.21	ND
SODIUM	SW6010B	mg/kg	23.96	200	170	210	110	180	200	230
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	79	78	79	77	71	74	77
ZINC	SW6010B	mg/kg	0.622	120	130	91	86	90	110	92
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND

Table 1.5-16. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Demolition Site #1	Field Sample ID			DA1-1-1	DA1-1-2	DA1-1-4	DA1-2 -.5	DA1-2-1	DA1-2-2	DA1-2-3.5
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	3.5 - 4.0
Parameter	**Method**	**Units**	**MDL**							
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-17. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Demolition Site #2	Field Sample ID Sample Date	SS-23 11/20/98		FSS-22 12/02/98		FSS-23 12/02/98		FSS-28 12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	-	-	-	-	-	-
Manganese	mg/kg	928	0.500	-	-	-	-	-	-
Potassium	mg/kg	2,260	500	-	-	-	-	-	-
Arsenic	mg/kg	16.8	10.0	-	-	-	-	-	-
Barium	mg/kg	206	0.400	-	-	-	-	-	-
Beryllium	mg/kg	0.821	0.100	-	-	-	-	-	-
Cadmium	mg/kg	ND	1.00	-	-	-	-	-	-
Chromium	mg/kg	50.4	1.00	-	-	-	-	-	-
Cobalt	mg/kg	20.6	0.700	-	-	-	-	-	-
Copper	mg/kg	55.1	1.00	-	-	-	-	-	-
Lead	mg/kg	25.8	7.50	-	-	-	-	-	-
Molybdenum	mg/kg	ND	2.00	-	-	-	-	-	-
Nickel	mg/kg	52.4	3.00	-	-	-	-	-	-
Selenium	mg/kg	ND	10.0	-	-	-	-	-	-
Silver	mg/kg	ND	0.700	-	-	-	-	-	-
Thallium	mg/kg	ND	10.0	-	-	-	-	-	-
Vanadium	mg/kg	71.1	1.00	-	-	-	-	-	-
Zinc	mg/kg	86.3	2.00	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	11.6	1.00	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	11.6	1.00	-	-	-	-	-	-
Mercury	mg/kg	0.21	0.050	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	ND	0.30	-	-	-	-	-	-
HMX	mg/kg	ND	0.30	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	ND	0.30	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.30	-	-	-	-	-	-
Tetryl	mg/kg	ND	0.30	-	-	-	-	-	-
Nitrobenzene	mg/kg	ND	0.30	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
Phosphate	mg/kg	307	2.50	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System. Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-18. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

(1 of 2)

Demolition Site #2	Field Sample ID			DA2-1-1	DA2-1-2	DA2-1-3.75	DA2-2-1	DA2-2-2	DA2-2-4
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	3.75 - 4.25	1.0 - 1.5	2.0 - 2.5	4.0 - 4.5
Parameter	**Method**	**Units**	**MDL**						
ALUMINUM	SW6010B	mg/kg	2.91	20,500	20,000	21,000	23,000	22,000	15,000
ANTIMONY	SW6010B	mg/kg	0.502	1.25	1	ND	ND	ND	0.78
ARSENIC	SW6010B	mg/kg	0.559	17	16	15	15.5	17	13
BARIUM	SW6010B	mg/kg	0.590	235	230	200	225	190	170
BERYLLIUM	SW6010B	mg/kg	0.130	0.53	0.48	0.49	0.525	0.46	0.35
CADMIUM	SW6010B	mg/kg	0.057	0.235	ND	ND	ND	ND	ND
CALCIUM	SW6010B	mg/kg	6.41	4,200	3,900	4,100	4,350	4,400	21,000
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	53	48	49	58	52	41
COBALT	SW6010B	mg/kg	0.112	23	20	20	19.5	18	16
COPPER	SW6010B	mg/kg	0.445	65.5	62	60	64	64	51
IRON	SW6010B	mg/kg	1.82	43,500	43,000	48,000	47,500	44,000	36,000
LEAD	SW6010B	mg/kg	0.437	23	11	11	14.5	31	14
MAGNESIUM	SW6010B	mg/kg	7.00	7,400	7,400	7,400	7,450	6,800	8,400
MANGANESE	SW6010B	mg/kg	0.164	1,250	1,100	1,000	855	830	840
MERCURY	SW7471A	mg/kg	0.0099	0.0845	0.036	0.037	0.064	0.1	0.069
MOLYBDENUM	SW6010B	mg/kg	0.142	0.74	0.8	0.62	0.81	0.68	0.58
NICKEL	SW6010B	mg/kg	0.591	62	54	52	57	54	49
POTASSIUM	SW6010B	mg/kg	9.91	2,500	2,900	1,900	2,000	2,400	1,500
SELENIUM	SW6010B	mg/kg	0.464	1.55	1.3	0.99	1.2	2.3	0.74
SILVER	SW6010B	mg/kg	0.099	ND	ND	ND	ND	ND	ND
SODIUM	SW6010B	mg/kg	23.96	175	170	120	230	230	230
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	77	78	79	86.5	81	60
ZINC	SW6010B	mg/kg	0.622	91	84	80	103.5	91	71
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND

Table 1.5-18. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(2 of 2)

Demolition Site #2	Field Sample ID			DA2-1-1	DA2-1-2	DA2-1-3.75	DA2-2-1	DA2-2-2	DA2-2-4
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	3.75 - 4.25	1.0 - 1.5	2.0 - 2.5	4.0 - 4.5
Parameter	**Method**	**Units**	**MDL**						
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-19. Benicia Tourtelot Analytical Results of Soil (Unvalidated Data)
(1 of 4)

Demolition Site #3	Field Sample ID / Sample Date		SS-25 11/20/98		SS-25* 11/20/98		SS-26 11/20/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals								
Antimony		mg/kg	ND	6.00	-	-	ND	6.00
Manganese		mg/kg	589	0.500	-	-	735	0.500
Potassium		mg/kg	1,040	500	-	-	1,250	500
Arsenic		mg/kg	13.4	10.0	-	-	19.1	10.0
Barium		mg/kg	158	0.400	-	-	183	0.400
Beryllium		mg/kg	0.547	0.100	-	-	0.637	0.100
Cadmium		mg/kg	ND	1.00	-	-	ND	1.00
Chromium		mg/kg	26.4	1.00	-	-	38.1	1.00
Cobalt		mg/kg	13.7	0.700	-	-	13.8	0.700
Copper		mg/kg	44.8	1.00	-	-	49.9	1.00
Lead		mg/kg	24.9	7.50	-	-	12.9	7.50
Molybdenum		mg/kg	ND	2.00	-	-	ND	2.00
Nickel		mg/kg	24.6	3.00	-	-	34.0	3.00
Selenium		mg/kg	ND	10.0	-	-	ND	10.0
Silver		mg/kg	ND	0.700	-	-	ND	0.700
Thallium		mg/kg	ND	10.0	-	-	ND	10.0
Vanadium		mg/kg	67.6	1.00	-	-	76.2	1.00
Zinc		mg/kg	90.0	2.00	-	-	72.7	2.00
Nitrate as Nitrogen		mg/kg	3.00	1.00	-	-	ND	1.00
Nitrate/Nitrite as Nitrogen		mg/kg	3.75	1.00	-	-	ND	1.00
Mercury		mg/kg	0.90	0.050	-	-	0.39	0.043
Explosive Compounds								
PETN		mg/kg	ND	0.30	-	-	ND	0.30
HMX		mg/kg	ND	0.30	ND	0.25	ND	0.30
Cyclonite (RDX)		mg/kg	ND	0.30	ND	0.25	ND	0.30
1,3,5-Trinitrobenzene		mg/kg	ND	0.30	ND	0.25	ND	0.30
1,3-Dinitrobenzene		mg/kg	ND	0.30	ND	0.25	ND	0.30
Tetryl		mg/kg	ND	0.30	ND	0.25	ND	0.30
Nitrobenzene		mg/kg	ND	0.30	ND	0.25	ND	0.30
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	0.30	ND	0.25	ND	0.30
4-Amino-2,6-Dinitrotoluene		mg/kg	ND	0.30	ND	0.25	ND	0.30
2-Amino-4,6-Dinitrotoluene		mg/kg	ND	0.30	ND	0.25	ND	0.30
2,4-Dinitrotoluene		mg/kg	ND	0.30	ND	0.25	ND	0.30
2,6-Dinitrotoluene		mg/kg	ND	0.30	ND	0.25	ND	0.30
4-Nitrotoluene		mg/kg	ND	0.30	ND	0.25	ND	0.30
3-Nitrotoluene		mg/kg	ND	0.30	ND	0.25	ND	0.30
2-Nitrotoluene		mg/kg	ND	0.30	ND	0.25	ND	0.30
Phosphate		mg/kg	255	5.00	-	-	214	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analyses of Samples SS-25 and SS-26.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-19. Benicia Tourtelot Analytical Results of Soil (Unvalidated Data)

Demolition Site #3	Field Sample ID		SS-26**		SS-27		SS-27**		SS-28	
	Sample Date		12/01/98		11/20/98		12/01/98		11/20/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals										
Antimony		mg/kg	-	-	ND	6.00	-	-	ND	6.00
Manganese		mg/kg	-	-	614	0.500	-	-	448	0.500
Potassium		mg/kg	-	-	1,420	500	-	-	881	500
Arsenic		mg/kg	-	-	16.3	10.0	-	-	16.7	10.0
Barium		mg/kg	-	-	197	0.400	-	-	182	0.400
Beryllium		mg/kg	-	-	0.650	0.100	-	-	0.599	0.100
Cadmium		mg/kg	-	-	ND	1.00	-	-	ND	1.00
Chromium		mg/kg	-	-	28.4	1.00	-	-	27.8	1.00
Cobalt		mg/kg	-	-	23.1	0.700	-	-	13.5	0.700
Copper		mg/kg	-	-	59.1	1.00	-	-	44.6	1.00
Lead		mg/kg	-	-	27.4	7.50	-	-	12.7	7.50
Molybdenum		mg/kg	-	-	ND	2.00	-	-	ND	2.00
Nickel		mg/kg	-	-	31.8	3.00	-	-	27.0	3.00
Selenium		mg/kg	-	-	ND	10.0	-	-	ND	10.0
Silver		mg/kg	-	-	ND	0.700	-	-	ND	0.700
Thallium		mg/kg	-	-	ND	10.0	-	-	ND	10.0
Vanadium		mg/kg	-	-	78.6	1.00	-	-	77.2	1.00
Zinc		mg/kg	-	-	74.8	2.00	-	-	64.5	2.00
Nitrate as Nitrogen		mg/kg	-	-	4.13	1.00	-	-	ND	1.00
Nitrate/Nitrite as Nitrogen		mg/kg	-	-	4.13	1.00	-	-	ND	1.00
Mercury		mg/kg	-	-	0.861	0.200	-	-	0.455	0.050
Explosive Compounds										
PETN		mg/kg	-	-	ND	0.30	-	-	ND	0.30
HMX		mg/kg	-	-	ND	0.30	-	-	ND	0.30
Cyclonite (RDX)		mg/kg	-	-	ND	0.30	-	-	ND	0.30
1,3,5-Trinitrobenzene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
1,3-Dinitrobenzene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
Tetryl		mg/kg	-	-	ND	0.30	-	-	ND	0.30
Nitrobenzene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	1.0	ND	0.30	ND	1.0	ND	0.30
4-Amino-2,6-Dinitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2-Amino-4,6-Dinitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2,4-Dinitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2,6-Dinitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
4-Nitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
3-Nitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2-Nitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
Phosphate		mg/kg	-	-	44.1	0.500	-	-	149	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Samples SS-25 and SS-28.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-19. Benicia Tourtelot Analytical Results of Soil (Unvalidated Data)

Demolition Site #3	Field Sample ID Sample Date	SS-28* 11/20/98		SS-28** 12/01/98		SS-29 11/20/99		SS-29** 12/01/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	ND	6.00	-	-
Manganese	mg/kg	-	-	-	-	662	0.500	-	-
Potassium	mg/kg	-	-	-	-	1,560	500	-	-
Arsenic	mg/kg	-	-	-	-	17.2	10.0	-	-
Barium	mg/kg	-	-	-	-	190	0.400	-	-
Beryllium	mg/kg	-	-	-	-	0.650	0.100	-	-
Cadmium	mg/kg	-	-	-	-	ND	1.00	-	-
Chromium	mg/kg	-	-	-	-	32.1	1.00	-	-
Cobalt	mg/kg	-	-	-	-	14.7	0.700	-	-
Copper	mg/kg	-	-	-	-	53.3	1.00	-	-
Lead	mg/kg	-	-	-	-	28.6	7.50	-	-
Molybdenum	mg/kg	-	-	-	-	ND	2.00	-	-
Nickel	mg/kg	-	-	-	-	30.5	3.00	-	-
Selenium	mg/kg	-	-	-	-	ND	10.0	-	-
Silver	mg/kg	-	-	-	-	ND	0.700	-	-
Thallium	mg/kg	-	-	-	-	ND	10.0	-	-
Vanadium	mg/kg	-	-	-	-	73.1	1.00	-	-
Zinc	mg/kg	-	-	-	-	80.1	2.00	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	4.50	1.00	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	4.50	1.00	-	-
Mercury	mg/kg	-	-	-	-	2.17	0.200	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	ND	0.30	-	-
HMX	mg/kg	ND	0.25	-	-	ND	0.30	-	-
Cyclonite (RDX)	mg/kg	ND	0.25	-	-	ND	0.30	-	-
1,3,5-Trinitrobenzene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
Tetryl	mg/kg	ND	0.25	-	-	ND	0.30	-	-
Nitrobenzene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.25	ND	1.0	ND	0.30	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
4-Nitrotoluene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
3-Nitrotoluene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
2-Nitrotoluene	mg/kg	ND	0.25	-	-	ND	0.30	-	-
Phosphate	mg/kg	-	-	-	-	233	2.50	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Samples SS-25 and SS-28.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System. Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-19. Benicia Tourtelot Analytical Results of Soil (Unvalidated Data)

Demolition Site #3	Field Sample ID		FSS-3		FSS-11	
	Sample Date		12/02/98		12/02/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**
Metals						
Antimony		mg/kg	-	-	-	-
Manganese		mg/kg	-	-	-	-
Potassium		mg/kg	-	-	-	-
Arsenic		mg/kg	-	-	-	-
Barium		mg/kg	-	-	-	-
Beryllium		mg/kg	-	-	-	-
Cadmium		mg/kg	-	-	-	-
Chromium		mg/kg	-	-	-	-
Cobalt		mg/kg	-	-	-	-
Copper		mg/kg	-	-	-	-
Lead		mg/kg	-	-	-	-
Molybdenum		mg/kg	-	-	-	-
Nickel		mg/kg	-	-	-	-
Selenium		mg/kg	-	-	-	-
Silver		mg/kg	-	-	-	-
Thallium		mg/kg	-	-	-	-
Vanadium		mg/kg	-	-	-	-
Zinc		mg/kg	-	-	-	-
Nitrate as Nitrogen		mg/kg	-	-	-	-
Nitrate/Nitrite as Nitrogen		mg/kg	-	-	-	-
Mercury		mg/kg	-	-	-	-
Explosive Compounds						
PETN		mg/kg	-	-	-	-
HMX		mg/kg	-	-	-	-
Cyclonite (RDX)		mg/kg	-	-	-	-
1,3,5-Trinitrobenzene		mg/kg	-	-	-	-
1,3-Dinitrobenzene		mg/kg	-	-	-	-
Tetryl		mg/kg	-	-	-	-
Nitrobenzene		mg/kg	-	-	-	-
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene		mg/kg	-	-	-	-
2-Amino-4,6-Dinitrotoluene		mg/kg	-	-	-	-
2,4-Dinitrotoluene		mg/kg	-	-	-	-
2,6-Dinitrotoluene		mg/kg	-	-	-	-
4-Nitrotoluene		mg/kg	-	-	-	-
3-Nitrotoluene		mg/kg	-	-	-	-
2-Nitrotoluene		mg/kg	-	-	-	-
Phosphate		mg/kg	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Samples SS-25 and SS-28.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table 1.5-20. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

(1 of 2)

Demolition Site #3	Field Sample ID			DA3-1-1	DA3-1-2	DA3-1-4	DA3-2-.5	DA3-2-1	DA3-2-2	DA3-2-4
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	4.0 - 4.5
Parameter	**Method**	**Units**	**MDL**							
ALUMINUM	SW6010B	mg/kg	2.91	13,000	13,000	16,000	14,000	15,000	15,000	18,000
ANTIMONY	SW6010B	mg/kg	0.502	ND	ND	ND	ND	ND	ND	ND
ARSENIC	SW6010B	mg/kg	0.559	13	14	11	15	14	14	14
BARIUM	SW6010B	mg/kg	0.590	180	180	130	250	240	230	250
BERYLLIUM	SW6010B	mg/kg	0.130	0.17	0.16	ND	0.33	0.33	0.22	ND
CADMIUM	SW6010B	mg/kg	0.057	ND	0.12	ND	ND	ND	ND	ND
CALCIUM	SW6010B	mg/kg	6.41	2,400	2,900	2,400	2,600	2,700	3,000	3,100
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	31	34	29	41	41	40	40
COBALT	SW6010B	mg/kg	0.112	18	18	24	18	17	17	15
COPPER	SW6010B	mg/kg	0.445	42	64	37	41	39	50	30
IRON	SW6010B	mg/kg	1.82	40,000	42,000	43,000	45,000	41,000	42,000	48,000
LEAD	SW6010B	mg/kg	0.437	6.7	16	3.2	7.5	7.5	17	4.7
MAGNESIUM	SW6010B	mg/kg	7.00	3,600	4,100	5,700	3,400	3,500	4,400	6,100
MANGANESE	SW6010B	mg/kg	0.164	660	680	190	1,100	1,100	920	350
MERCURY	SW7471A	mg/kg	0.0099	1.8	2.1	0.02	0.044	0.076	0.65	0.046
MOLYBDENUM	SW6010B	mg/kg	0.142	0.37	0.7	0.32	0.44	0.44	0.43	0.34
NICKEL	SW6010B	mg/kg	0.591	23	28	22	33	33	35	31
POTASSIUM	SW6010B	mg/kg	9.91	1,300	1,300	450	1,500	1,400	1,300	800
SELENIUM	SW6010B	mg/kg	0.464	1.3	1.2	0.95	1.1	1.1	1.1	1.1
SILVER	SW6010B	mg/kg	0.099	ND	0.18	ND	ND	ND	ND	ND
SODIUM	SW6010B	mg/kg	23.96	83	71	140	55	44	86	110
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	92	89	91	97	97	92	110
ZINC	SW6010B	mg/kg	0.622	55	74	66	55	58	75	66
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND

Table 1.5-20. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(2 of 2)

Demolition Site #3	**Field Sample ID**			DA3-1-1	DA3-1-2	DA3-1-4	DA3-2-.5	DA3-2-1	DA3-2-2	DA3-2-4
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	4.0 - 4.5
Parameter	**Method**	**Units**	**MDL**							
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.5-21. Benicia Tourtelot Analytical Results for Water (Unvalidated Data)

Wetlands (Water Samples)	Field Sample ID / Sample Date		WS-1 12/04/98	WS-1 12/10/98	WS-2 12/04/98	WS-2 12/10/98
Parameter	Units	MDL				
Metals						
Antimony	mg/L	60.0	ND	ND	ND	ND
Manganese	mg/L	5.00	377	25.9	22.6	ND
Potassium	mg/L	5000	ND	ND	ND	ND
Arsenic	mg/L	100	ND	ND	ND	ND
Barium	mg/L	4.00	82.3	56.1	12.3	9.24
Beryllium	mg/L	1.00	ND	ND	ND	ND
Cadmium	mg/L	10.0	ND	ND	ND	ND
Chromium	mg/L	10.0	ND	ND	ND	ND
Cobalt	mg/L	7.00	ND	ND	ND	ND
Copper	mg/L	10.0	17.8	ND	11.8	ND
Lead	mg/L	75.0	ND	ND	ND	ND
Molybdenum	mg/L	20.0	ND	ND	ND	ND
Nickel	mg/L	30.0	ND	ND	ND	ND
Selenium	mg/L	100	ND	ND	ND	ND
Silver	mg/L	7.00	ND	ND	ND	ND
Thallium	mg/L	100	ND	ND	ND	ND
Vanadium	mg/L	10.0	11.1	ND	ND	ND
Zinc	mg/L	20.0	33.6	28.9	61.5	26.0
Nitrate as Nitrogen	mg/L	100	ND	-	338	-
Nitrate/Nitrite as Nitrogen	mg/L	100	ND	-	338	-
Mercury	mg/L	0.20	ND	ND	ND	ND
Explosive Compounds						
PETN	mg/L	1.50	ND	-	ND	-
HMX	mg/L	1.50	ND	-	ND	-
Cyclonite (RDX)	mg/L	1.50	ND	-	ND	-
1,3,5-Trinitrobenzene	mg/L	1.50	ND	-	ND	-
1,3-Dinitrobenzene	mg/L	1.50	ND	-	ND	-
Tetryl	mg/L	1.50	ND	-	ND	-
Nitrobenzene	mg/L	1.50	ND	-	ND	-
2,4,6-Trinitrotoluene (TNT)	mg/L	1.50	ND	-	ND	-
4-Amino-2,6-Dinitrotoluene	mg/L	1.50	ND	-	ND	-
2-Amino-4,6-Dinitrotoluene	mg/L	1.50	ND	-	ND	-
2,4-Dinitrotoluene	mg/L	1.50	ND	-	ND	-
2,6-Dinitrotoluene	mg/L	1.50	ND	-	ND	-
4-Nitrotoluene	mg/L	1.50	ND	-	ND	-
3-Nitrotoluene	mg/L	1.50	ND	-	ND	-
2-Nitrotoluene	mg/L	1.50	ND	-	ND	-
Phosphate	mg/L	50.0	85.3	-	95.4	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/L = micrograms per liter

ND = not detected above the method reporting limit

MDL = Method Detection Limit

Metals were analyzed for using EPA Method 6000/7000 Series.

Nitrate/Nitrite were analyzed for using EPA Method 353.2.

Total Phosphate was analyzed for using EPA Method 365.2.

Explosive compounds were analyzed for using EPA Method 8330.

Source: SECOR International, Inc.

Table 1.5-22. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Wetlands (Sediment Sample)	Field Sample ID			WET-1B
	Sample Date			7/21/99
	Depth			0 - 0.5
Parameter	**Method**	**Units**	**MDL**	
ALUMINUM	SW6010B	mg/kg	2.91	18,000
ANTIMONY	SW6010B	mg/kg	0.502	ND
ARSENIC	SW6010B	mg/kg	0.559	15
BARIUM	SW6010B	mg/kg	0.590	250
BERYLLIUM	SW6010B	mg/kg	0.130	0.35
CADMIUM	SW6010B	mg/kg	0.057	0.35
CALCIUM	SW6010B	mg/kg	6.41	4,700
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	45
COBALT	SW6010B	mg/kg	0.112	18
COPPER	SW6010B	mg/kg	0.445	120
IRON	SW6010B	mg/kg	1.82	44,000
LEAD	SW6010B	mg/kg	0.437	35
MAGNESIUM	SW6010B	mg/kg	7.00	6,200
MANGANESE	SW6010B	mg/kg	0.164	810
MERCURY	SW7471A	mg/kg	0.0099	1.3
MOLYBDENUM	SW6010B	mg/kg	0.142	0.69
NICKEL	SW6010B	mg/kg	0.591	45
POTASSIUM	SW6010B	mg/kg	9.91	2,100
SELENIUM	SW6010B	mg/kg	0.464	1
SILVER	SW6010B	mg/kg	0.099	ND
SODIUM	SW6010B	mg/kg	23.96	120
THALLIUM	SW6010B	mg/kg	0.741	ND
VANADIUM	SW6010B	mg/kg	0.156	85
ZINC	SW6010B	mg/kg	0.622	160
ACENAPHTHENE	SW8310	mg/kg	0.01	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND
CHRYSENE	SW8310	mg/kg	0.003	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND
FLUORENE	SW8310	mg/kg	0.008	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND
PYRENE	SW8310	mg/kg	0.004	ND

Table 1.5-22. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)
(2 of 2)

Wetlands	Field Sample ID			WET-1B
(Sediment Sample)	Sample Date			7/21/99
	Depth			0 - 0.5
Parameter	**Method**	**Units**	**MDL**	
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.070	ND
TETRYL	SW8330	mg/kg	0.129	ND

Notes:

Sample results reported on a dry weight basis

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table 1.7-1. Applicable or Relevant and Appropriate Requirements (ARARs), Tourtelot Cleanup Project, Benicia, California

Requirement	Citation	Description	Type	Applicable or Relevant and Appropriate	Comments
California Designated Level Methodology for Waste Characterization and Cleanup Level Determination	Staff Report, California regional Water Quality Control Board	Proposes a methodology for determining cleanup levels in soil based upon impact on groundwater.	Chemical-specific	TBC	Can be used in determining cleanup levels in soil that are protective of groundwater quality.
Water Quality Objectives	Water Quality Control Plan, San Francisco Bay Basin	The Porter-Cologne Water Quality Act established authority of state and regional Water Quality Control Boards to regulate discharges into water of the state. The Basin Plan establishes limits and procedures to protect water quality. The objective of the plan is to protect the quality of surface and groundwater in the San Francisco Bay Area.	Chemical-specific	Applicable	Discharge standards for National Pollutant Discharge Elimination System (NPDES) permits and Waste Discharge Requirements (WDRs) may be applicable if discharge to surface water is proposed.
California Environmental Health Standards for the Management of Hazardous Waste[a]	Title 22, Sections 66261 and 66268.1, and 66261.23	Criteria for identifying RCRA hazardous wastes and hazardous wastes that are restricted from the landfill. Under this rule, UXO is considered a hazardous waste.	Chemical-specific	Applicable	Waste munitions, munition fragments, and soil contaminated with explosives could be considered hazardous if they contain a listed waste or exhibit hazardous waste characteristics (e.g., reactivity). If found to be hazardous, they could be restricted from landfill disposal.
California Endangered Species Act (CESA)	CESA Code 2080.2081	Protects endangered species from being exported or imported. Establishes authority permitting processes and mitigation requirements to protect endangered species.	Location-specific	Relevant and Appropriate	Disturbance to riparian, wetland habitats, or vegetation will require mitigation such as contouring the ground surface to pre-project elevation and replanting of native vegetation in appropriate ratios.

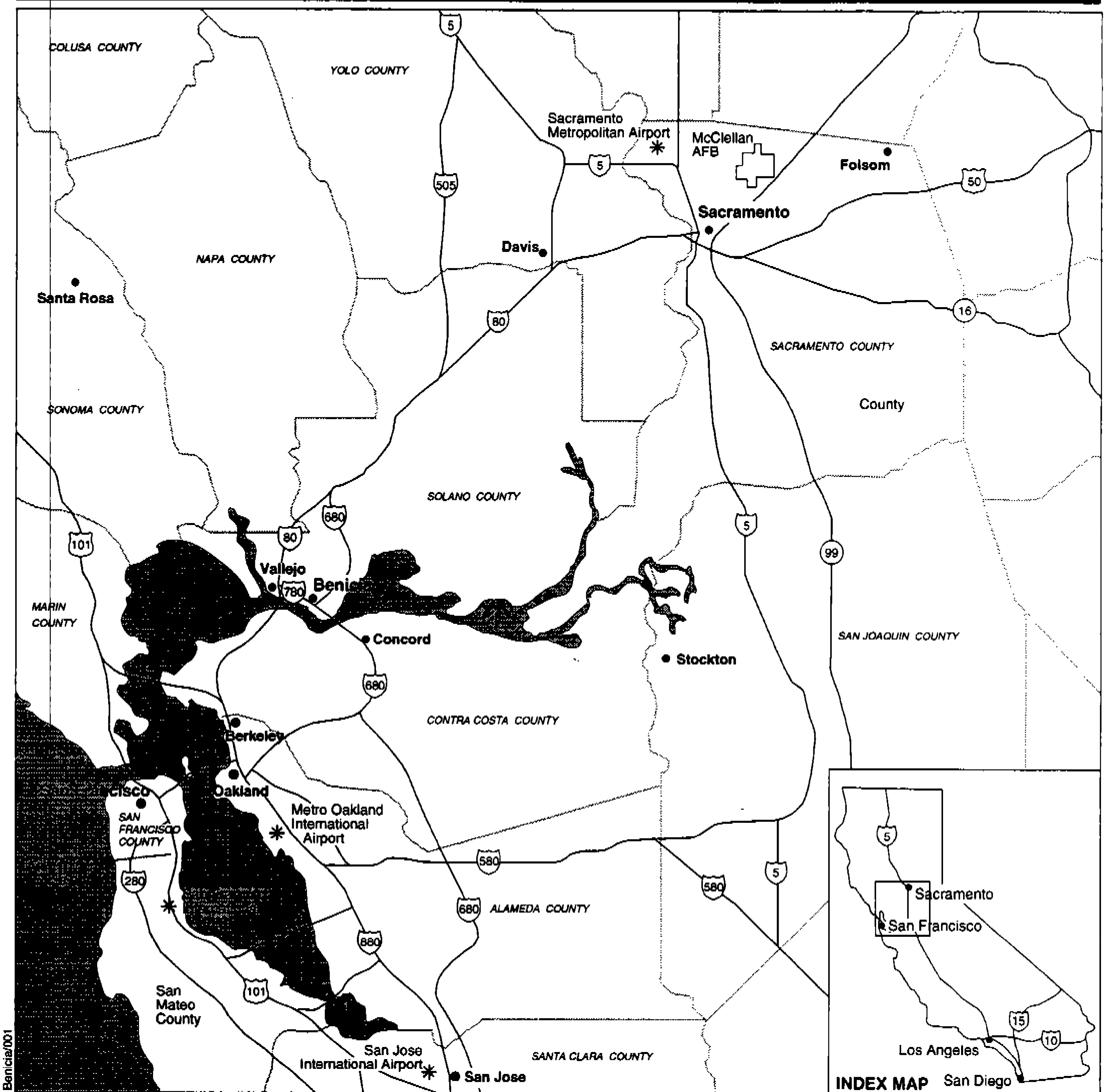
Table 1.7-1. Applicable or Relevant and Appropriate Requirements (ARARs), Tourtelot Cleanup Project, Benicia, California

Requirement	Citation	Description	Type	Applicable or Relevant and Appropriate	Comments
California Clean Air Act (CCAA)[b]	AB 2595	Establishes primary and secondary air quality standards necessary to protect human health, welfare, plant and animal life, buildings, materials, and visibility.	Location-specific	Relevant and Appropriate	Provisions of this Act should be followed.
Bay Area Air Quality Management District (BAAQMD) Air Quality Rules and Regulations	BAAQMD 5-401.14	Establishes the permitting requirements for the disposal of explosives through open burning.	Action-specific	Relevant and Appropriate	A variance permit is required as of January 1, 1997, to conduct combustion-related disposal within BAAQMD districts that produces PM pollution that is visible for more than 3 minutes.
California Health and Safety Code (HSC)	HSC, Division 20 Chapter 6.5, 6.8	Establishes regulations and incentives to ensure generators of hazardous wastes to employ safe handling practices, treatment, recycling, and destruction of hazardous waste prior to disposal. Also establishes a program for response authority for release, spills, disposal sites, and compensation for medical expenses resulting from injuries caused by exposure to releases of hazardous substances.	Action-specific	Applicable	Under Title 22, Section 66261.23, UXO is considered a hazardous waste. Provisions of this Act should be followed.

Table 1.7-1. Applicable or Relevant and Appropriate Requirements (ARARs), Tourtelot Cleanup Project, Benicia, California

Requirement	Citation	Description	Type	Applicable or Relevant and Appropriate	Comments
OE Waste Identification	Draft Department of the Army Memorandum	Adopts criterion of 10% explosive content as a measure of contaminated soil for secondary explosives.	Action-specific	TBC	Provisions of this Act should be followed.

Notes: (a) Title 22 is more stringent than the federal RCRA.
(b) CCAA is more stringent than the federal Clean Air Act.
AB = Assembly Bill
OE = ordnance and explosives
RCRA = Resource Conservation and Recovery Act
TBC = to be considered
UXO = unexploded ordnance



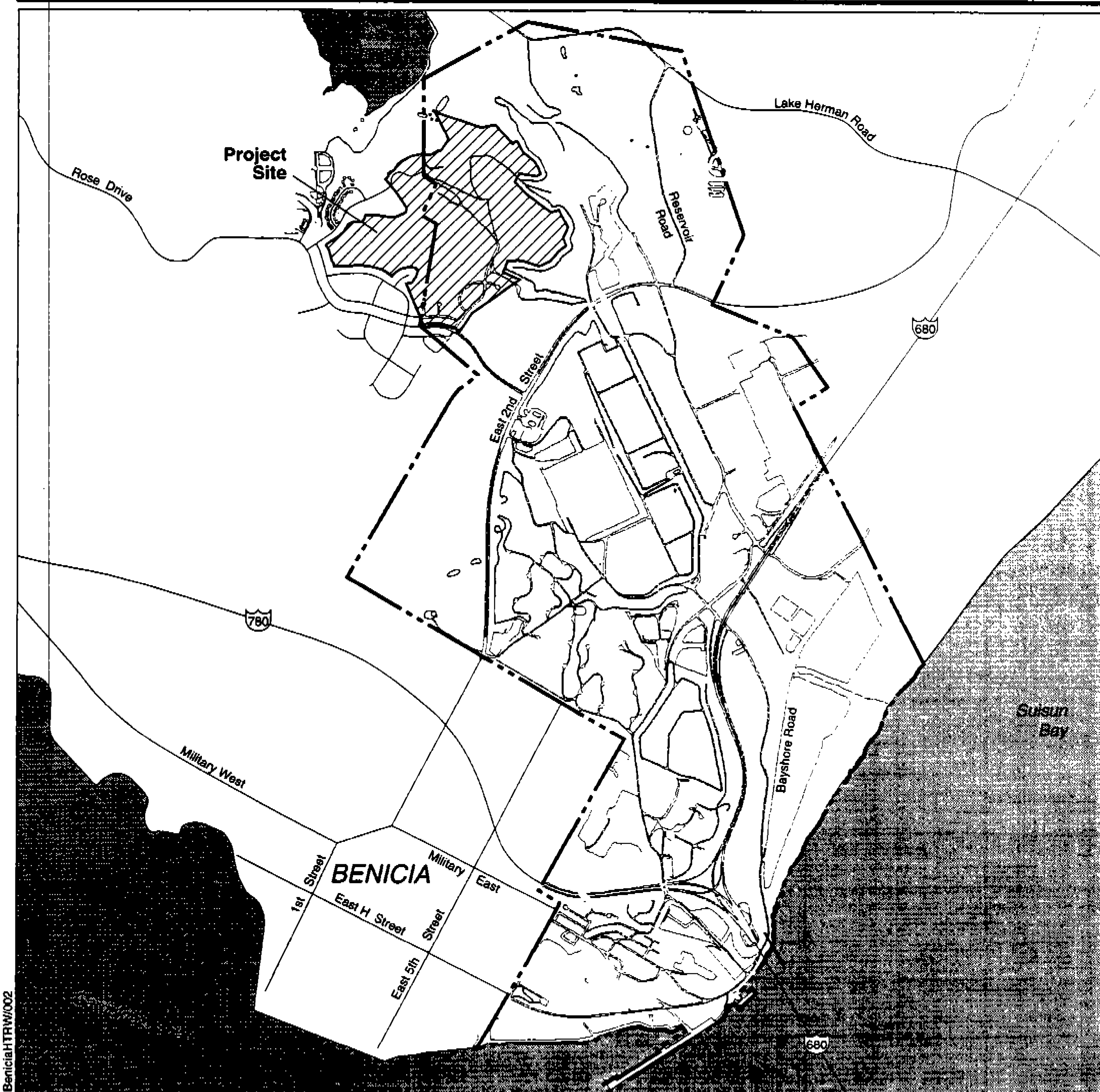
EXPLANATION

- Airports
- California State Highway
- U.S. Highway
- Interstate Highway
- County Boundary

0 3.5 7 14 Miles

Regional Map

Figure 1.1-1



EXPLANATION

680 Interstate Highway

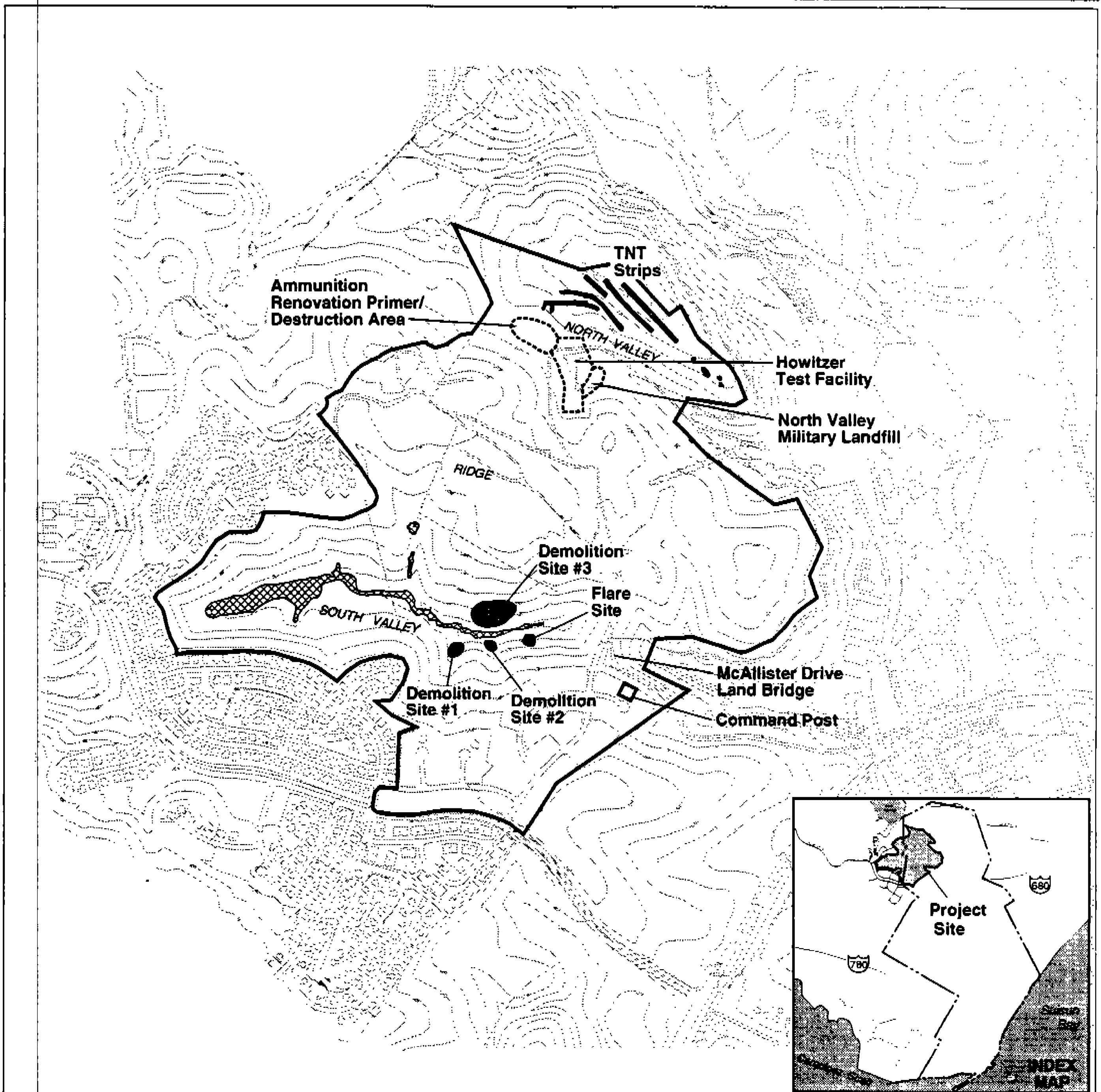
— • • — Former Benicia Arsenal Boundary (estimated)

Project Site

0 .125 .25 .5 Mile

Project Site Location Map

Figure 1.1-2



EXPLANATION

Project Site Boundary

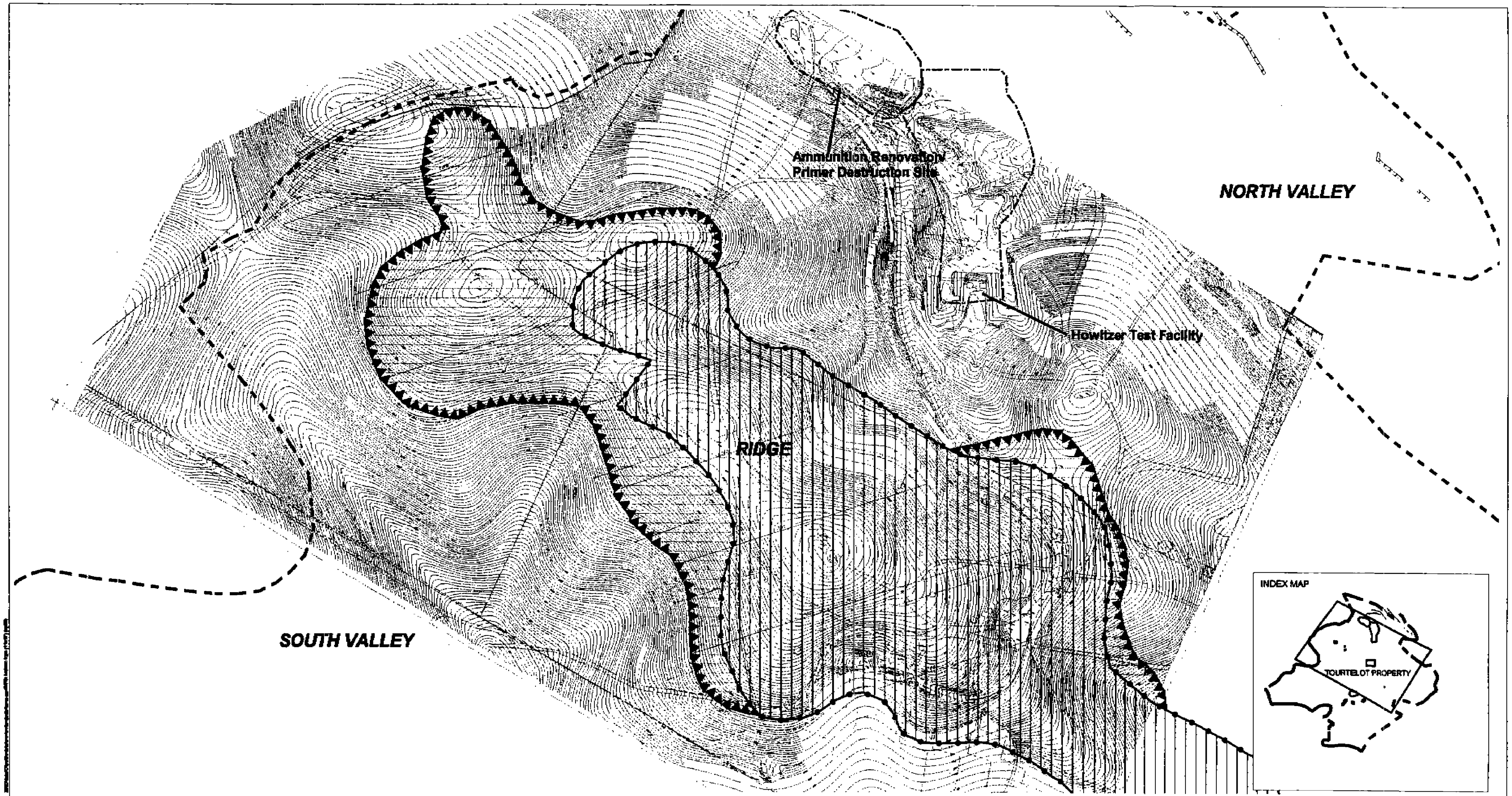
South Valley Wetlands

0 250 500 1000 Feet

Note: Contour interval equals 25 feet.

Project Site Map

Figure 1.1-3



EXPLANATION

- Areas of Concern
- TNT Strips
- Topography
- Tourtelot Property Boundary
- Area disturbed by grading activities between May 1990 and September 1990
- Area disturbed by grading activities between September 1990 and February 1991

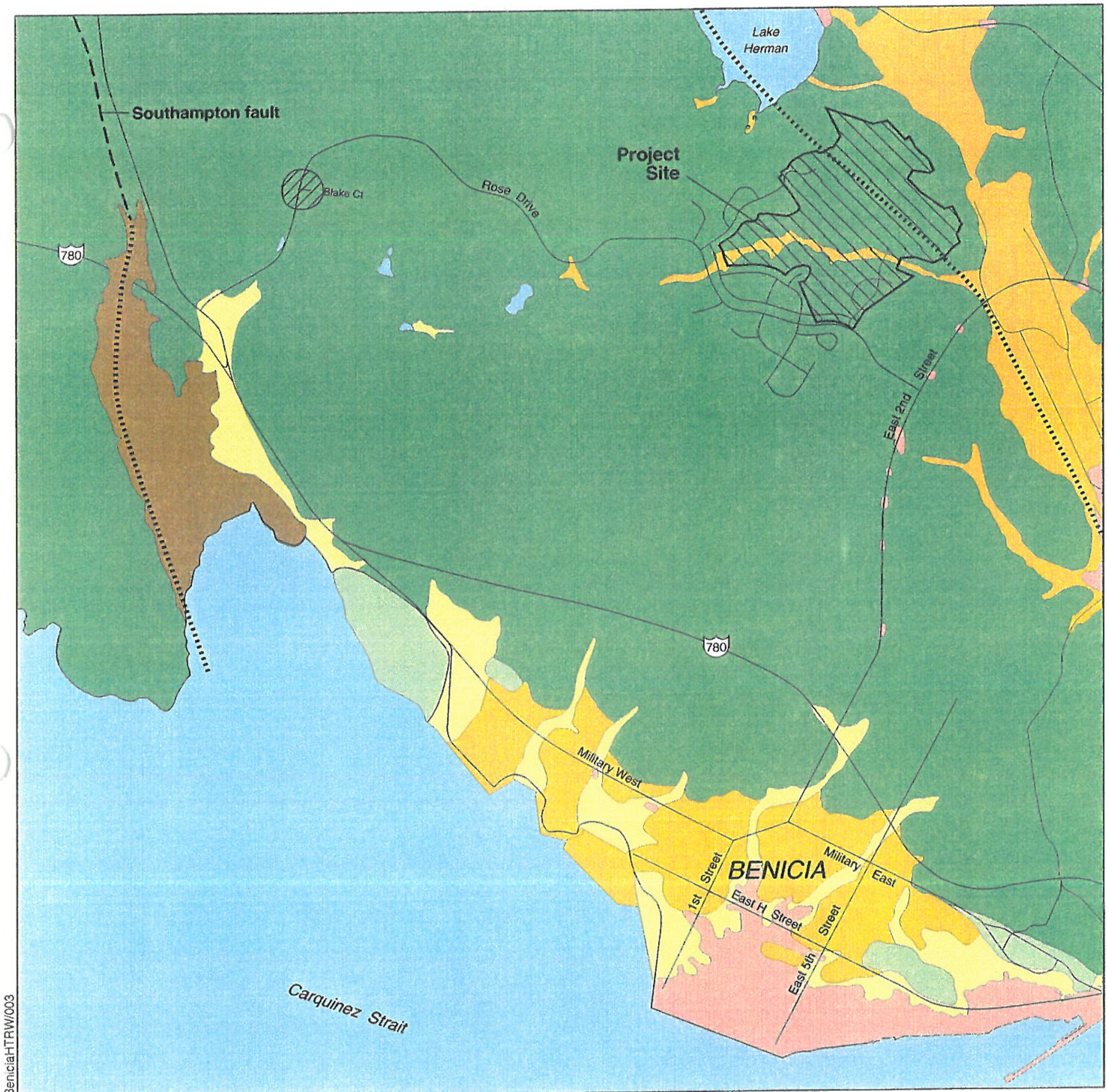
N

100 0 100 200 Feet

Scale: 1" = 200'

Area Disturbed by Grading Activities
Tourtelot Cleanup Project

Figure 1.2-1



EXPLANATION

Fault (approximate)

Fault (concealed)

680 Interstate Highway

Sample collection area to determine local metals background range (Solano County Landfill Site)

Project site

Open Water

Undivided sandstone and shale

Alluvial fan and fluvial deposits (Holocene)

Alluvial fan and fluvial deposits (Pleistocene)

Artificial fill

Bay mud

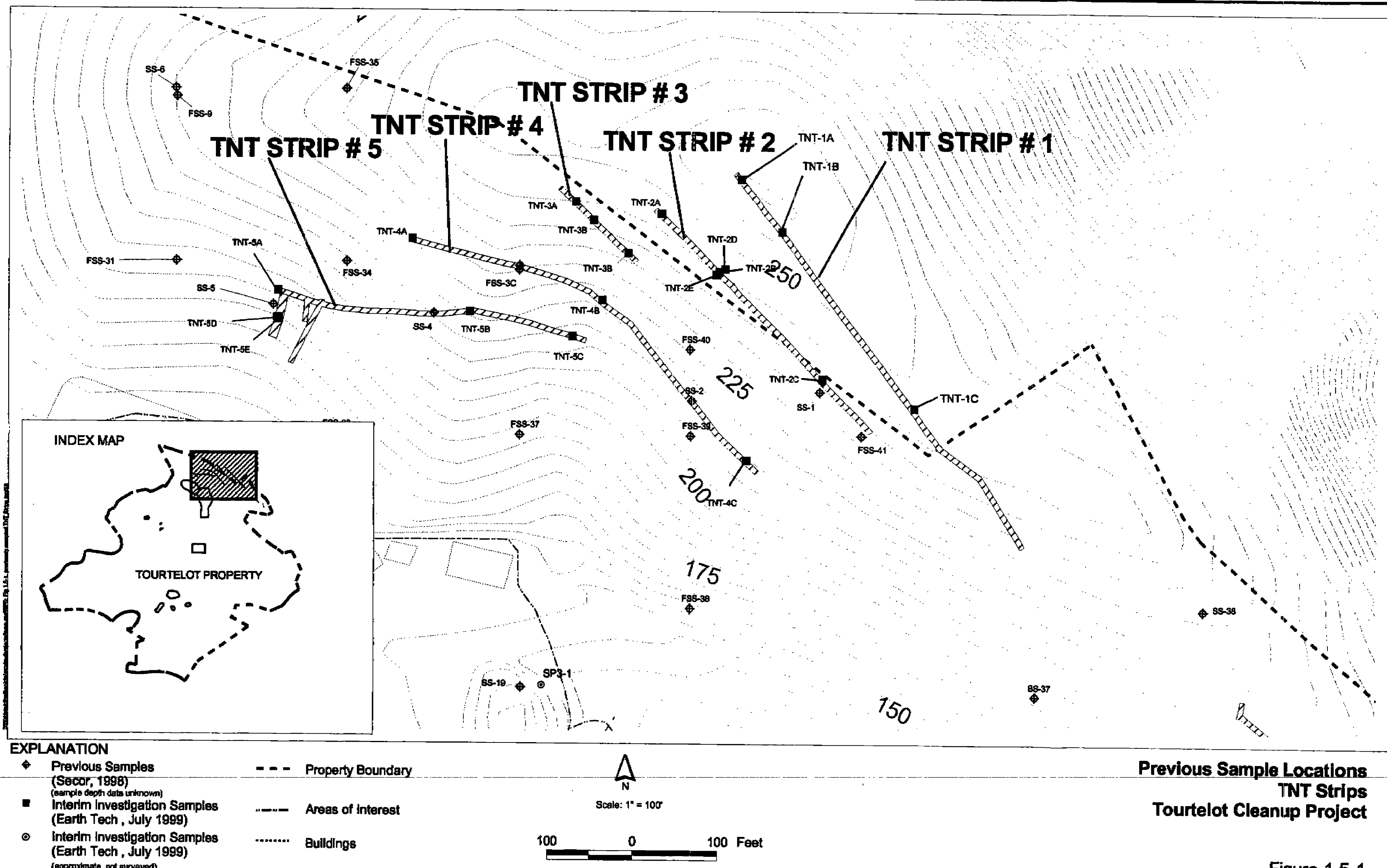
Vine Hill Sandstone of Weaver

0 .125 .25 .5 Mile

Source: U.S.G.S Open File Report 99-162

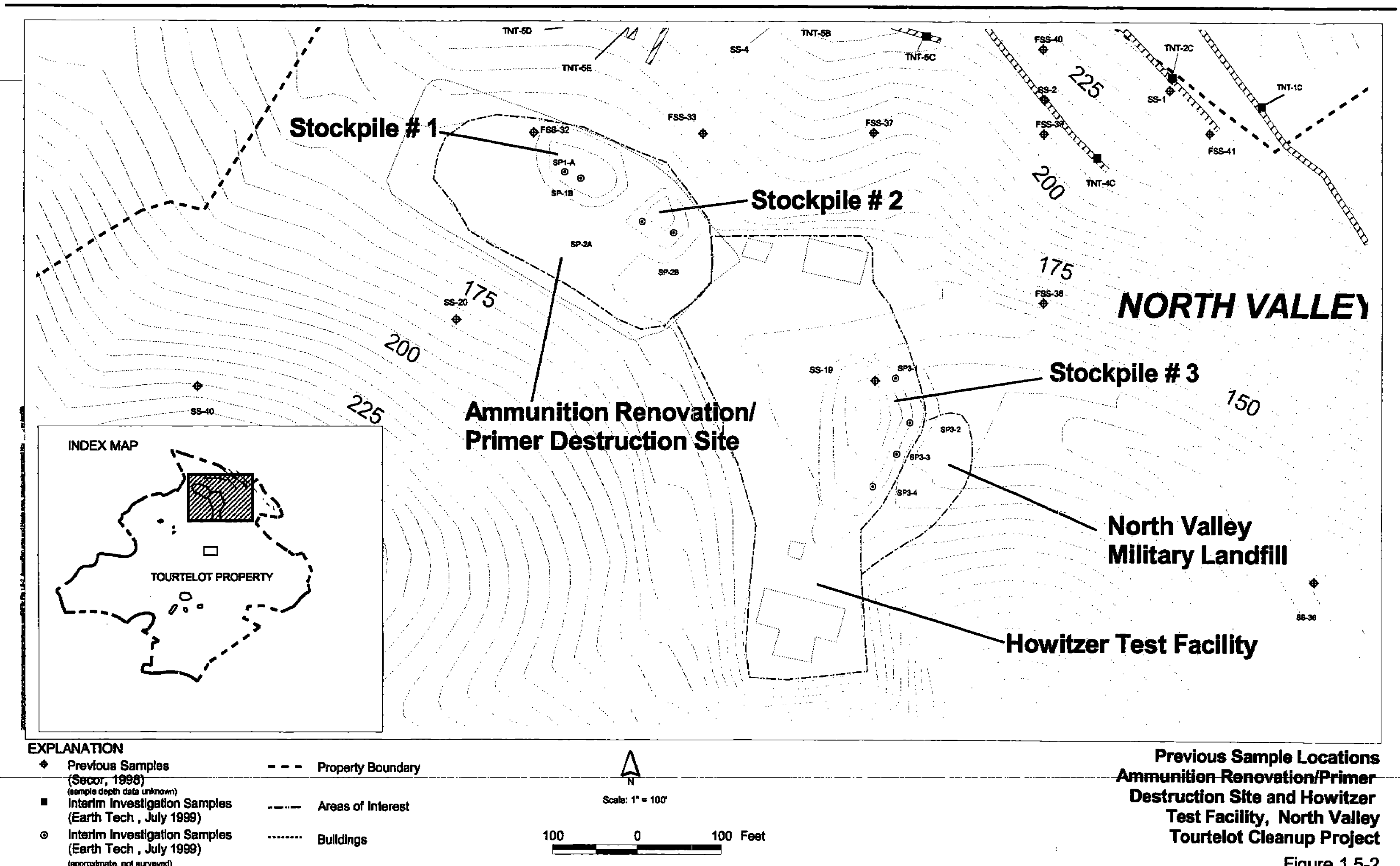
Regional Geology

Figure 1.3-1



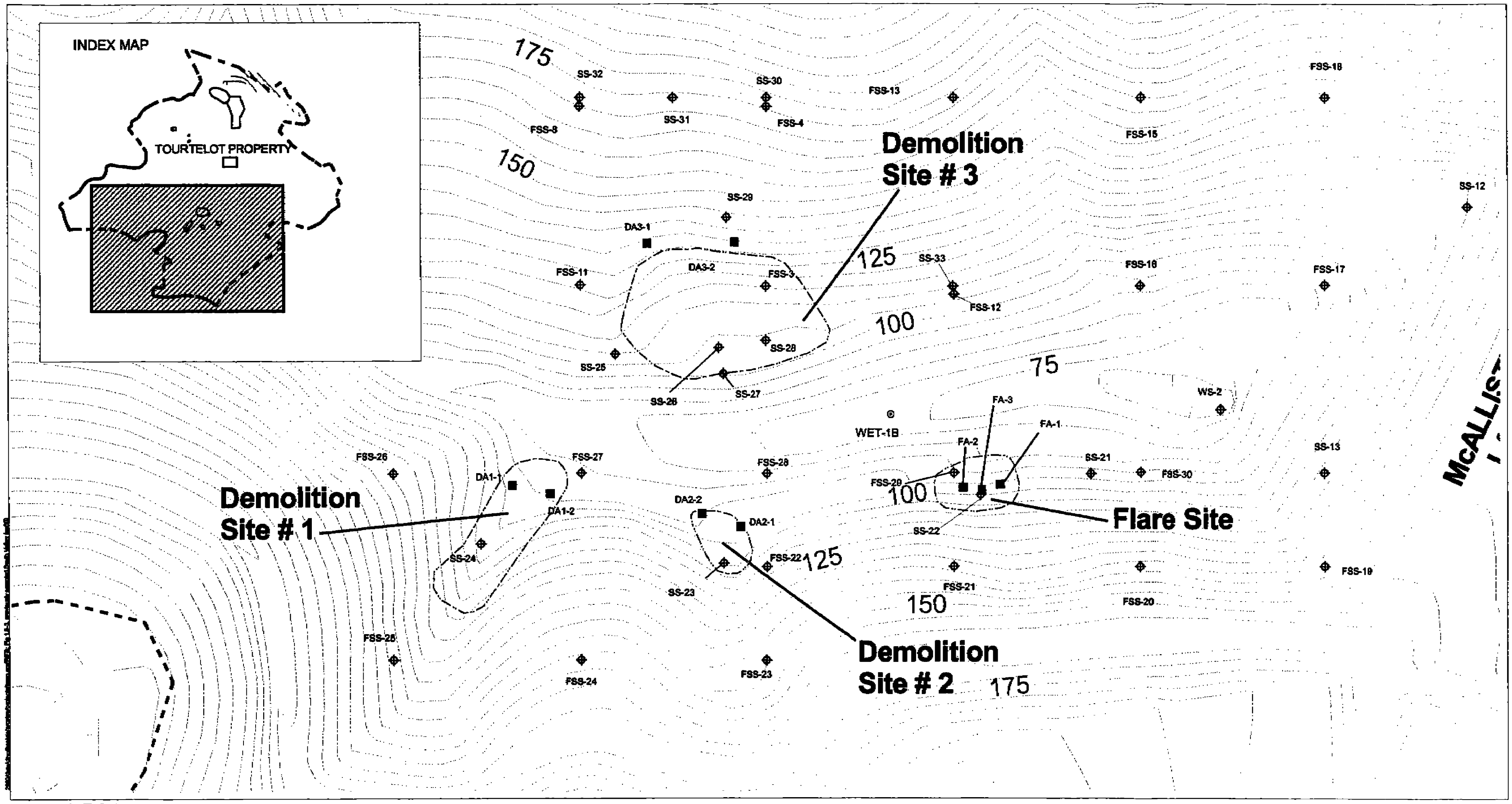
Previous Sample Locations
TNT Strips
Tourtelot Cleanup Project

Figure 1.5-1



Previous Sample Locations
Ammunition Renovation/Primer
Destruction Site and Howitzer
Test Facility, North Valley
Tourtelot Cleanup Project

Figure 1.5-2



EXPLANATION

- Previous Samples (Secor, 1998) (sample depth data unknown)
- Interim Investigation Samples (Earth Tech, July 1999)
- Interim Investigation Samples (Earth Tech, July 1999) (approximate, not surveyed)
- Property Boundary
- Areas of Interest
- Buildings

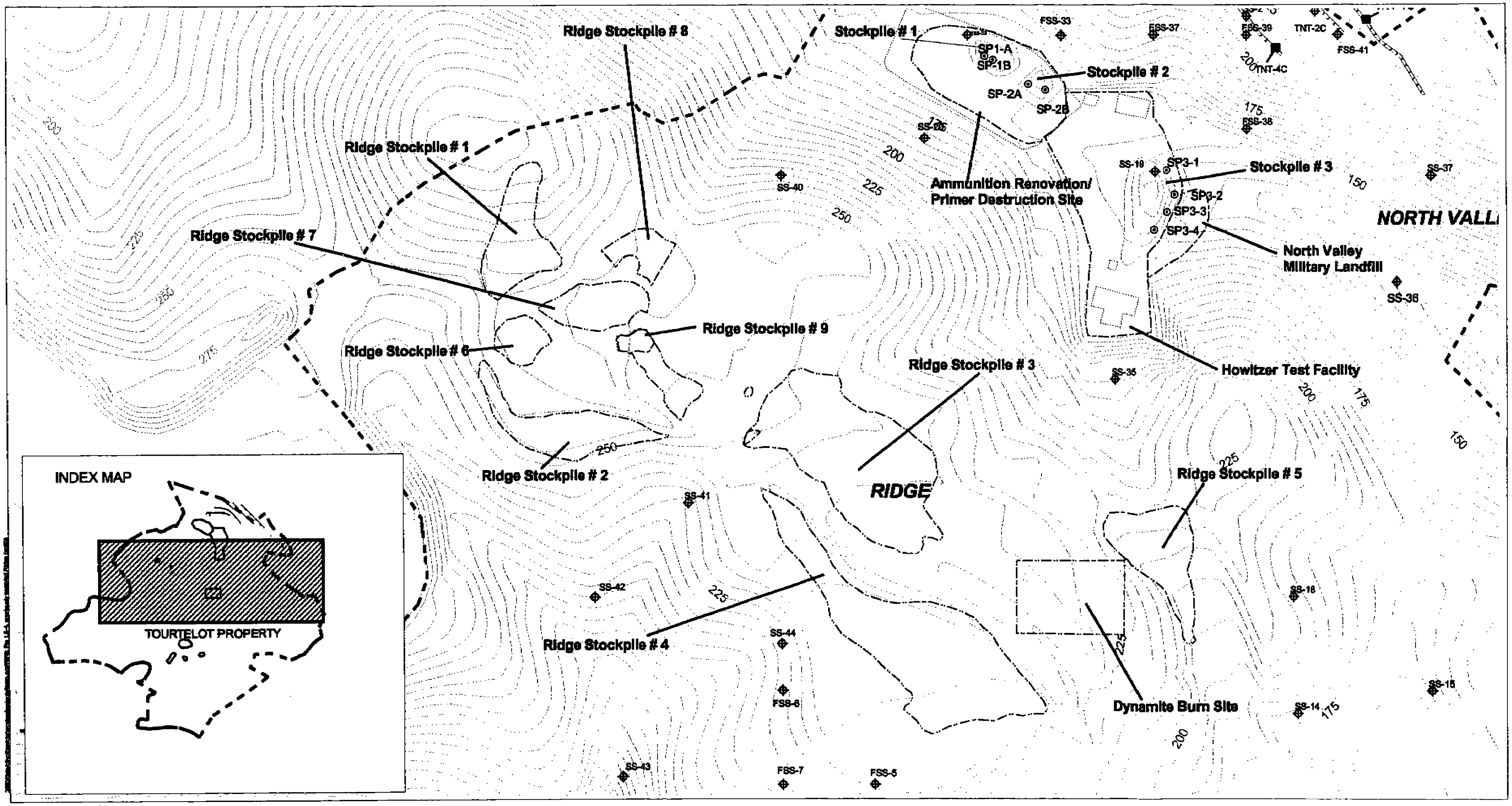
N

Scale: 1" = 100'

100 0 100 Feet

Previous Sample Locations
Demolition and Flare Sites, South Valley
Tourtelot Cleanup Project

Figure 1.5-3

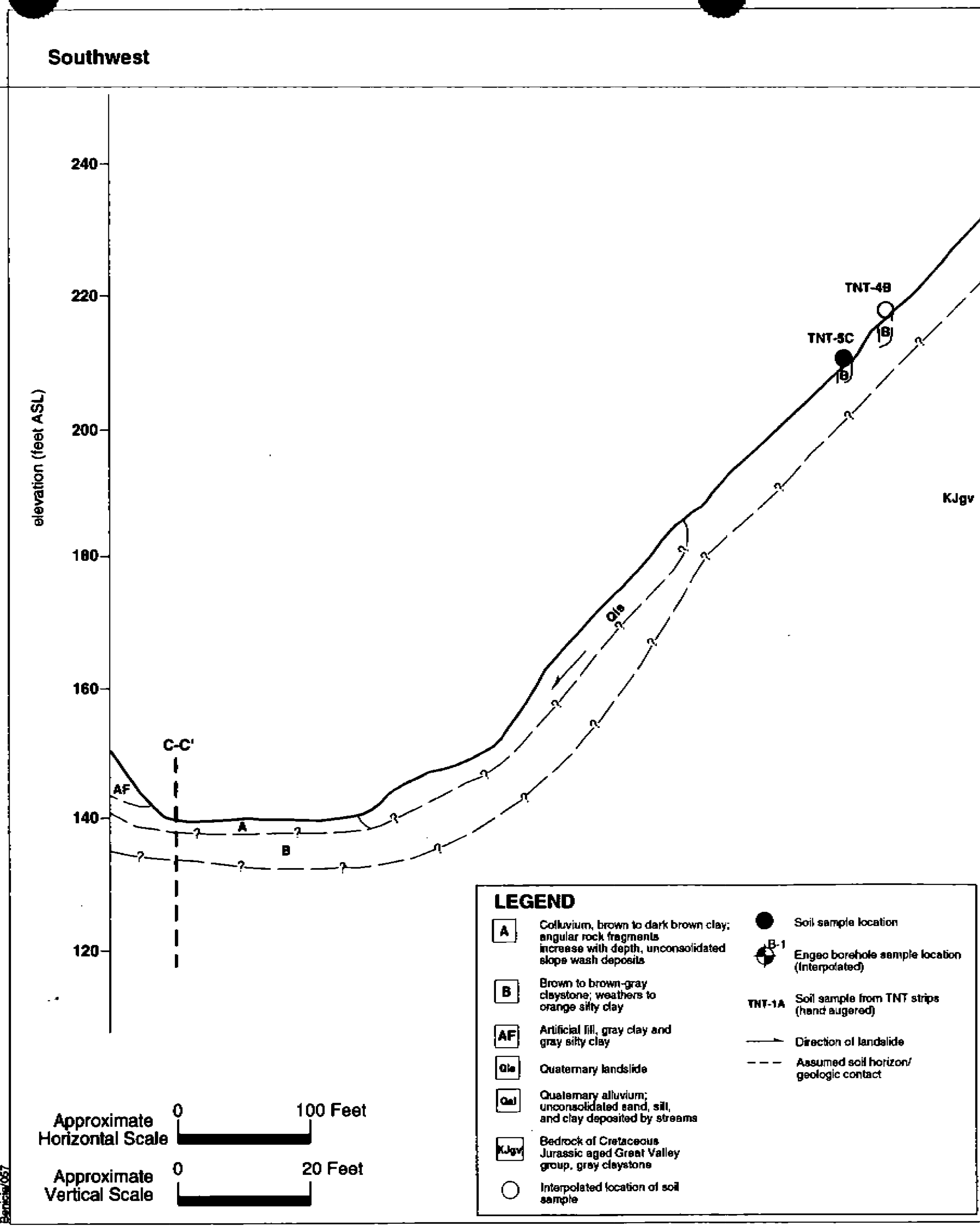


EXPLANATION

- Previous Samples (Secor, 1998) (sample depth data unknown)
- Interim Investigation Samples (Earth Tech , July 1999)
- Interim Investigation Samples (Earth Tech , July 1999) (approximate, not surveyed)
- Property Boundary
- Areas of Interest
- Buildings

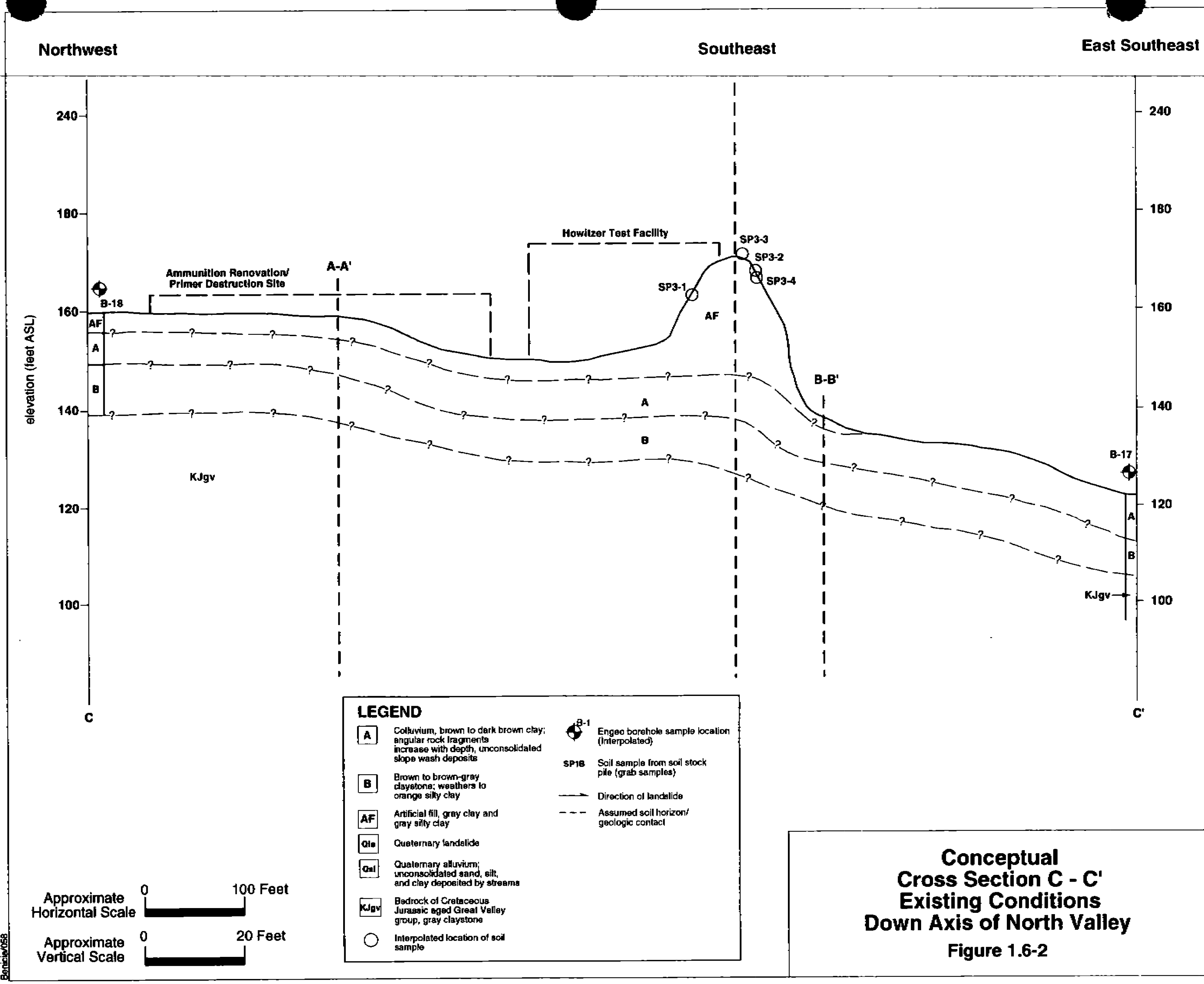
Previous Sample Locations
Ridge Area
Tourtelot Cleanup Project

Figure 1.5-4



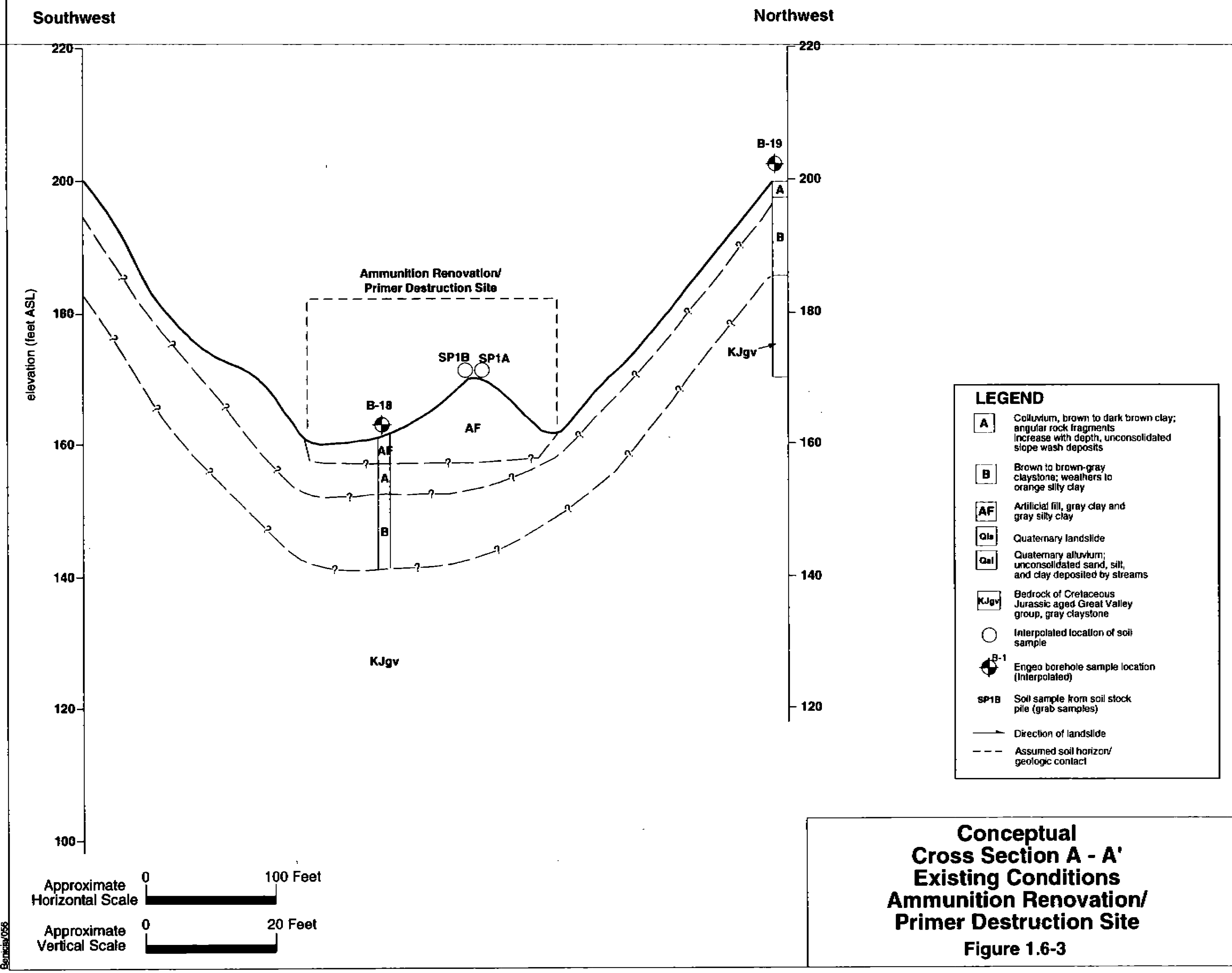
Conceptual Cross Section B - B' Existing Conditions TNT Strips

Figure 1.6-1



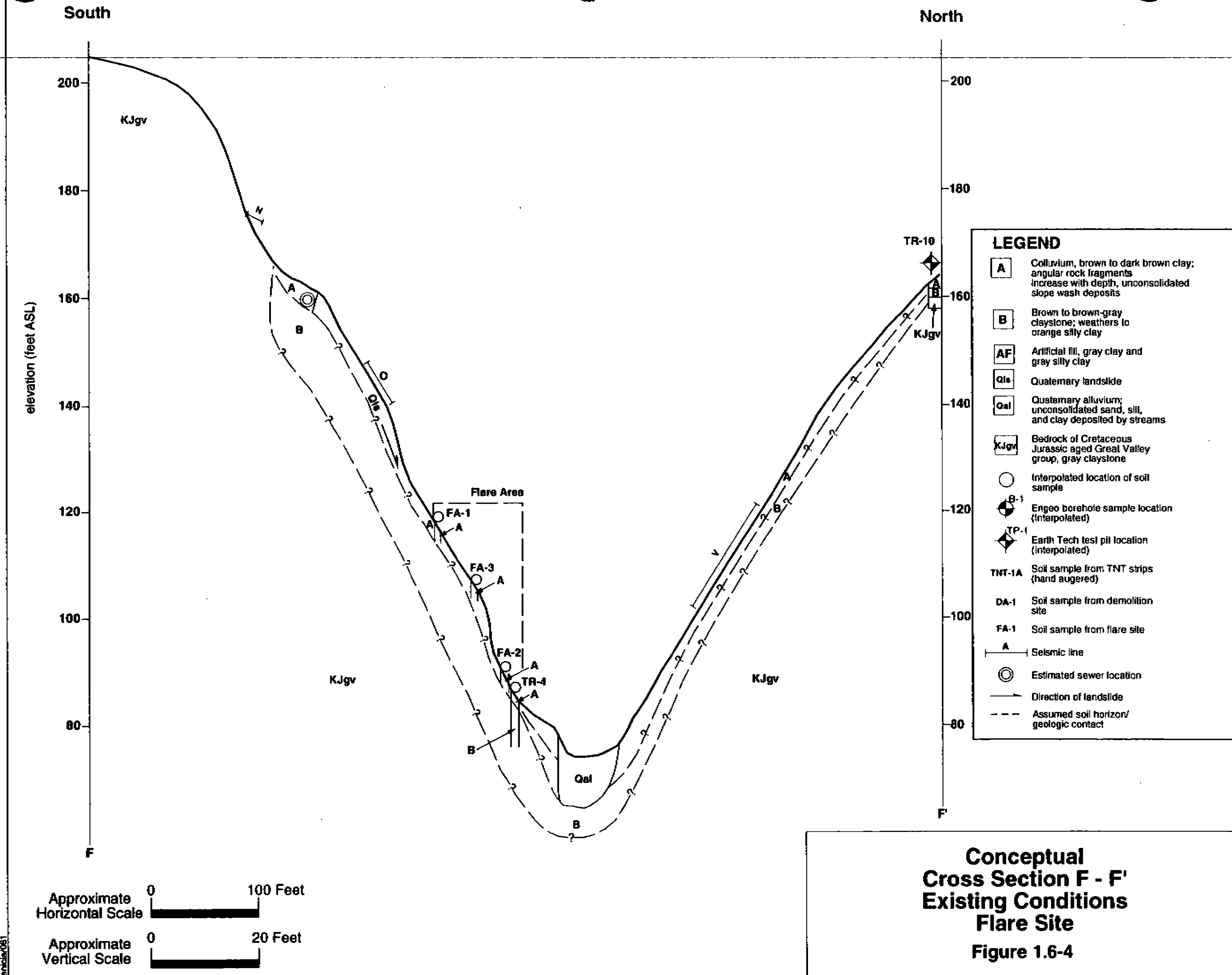
Conceptual Cross Section C - C' Existing Conditions Down Axis of North Valley

Figure 1.6-2



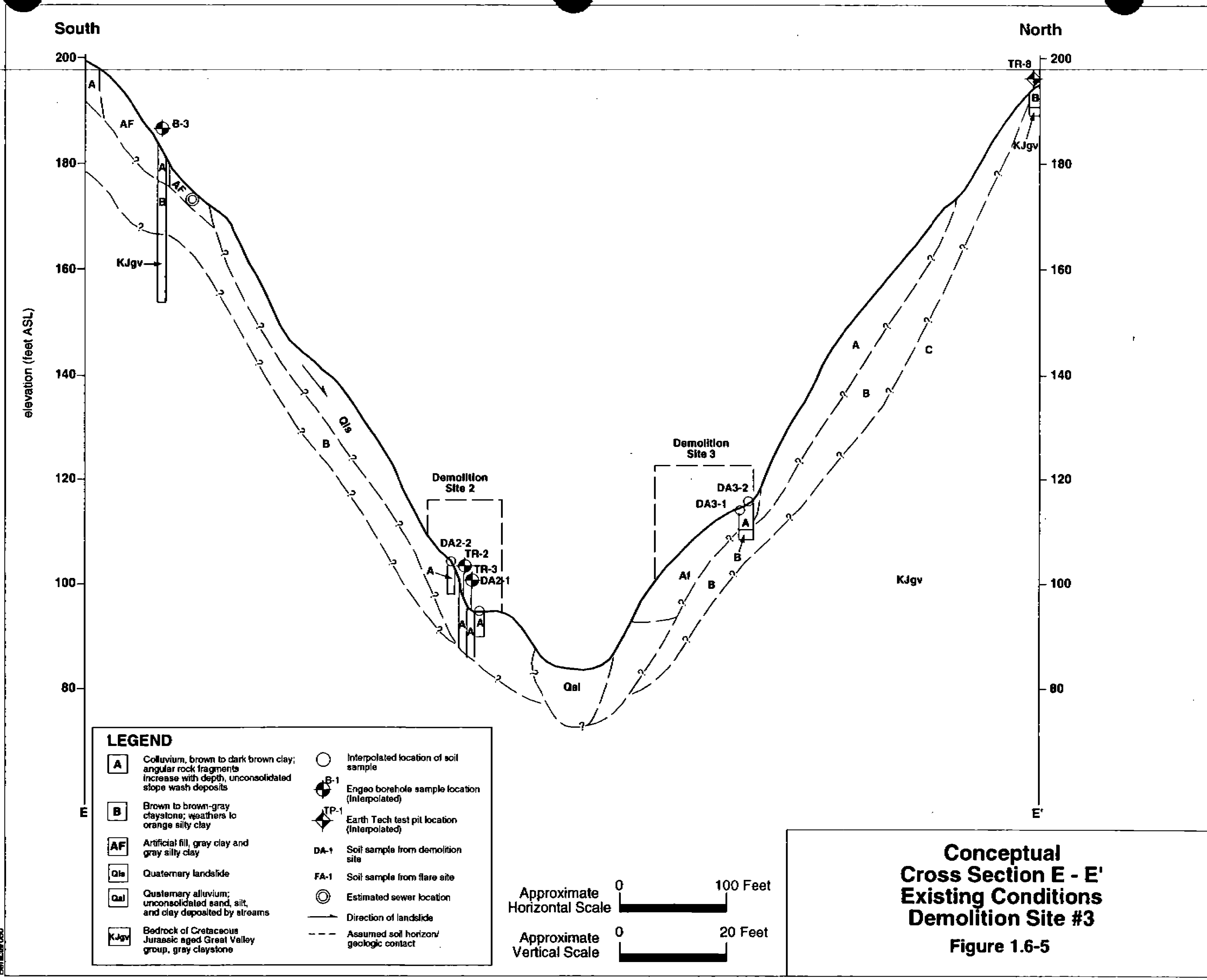
Conceptual Cross Section A - A' Existing Conditions Ammunition Renovation/ Primer Destruction Site

Figure 1.6-3



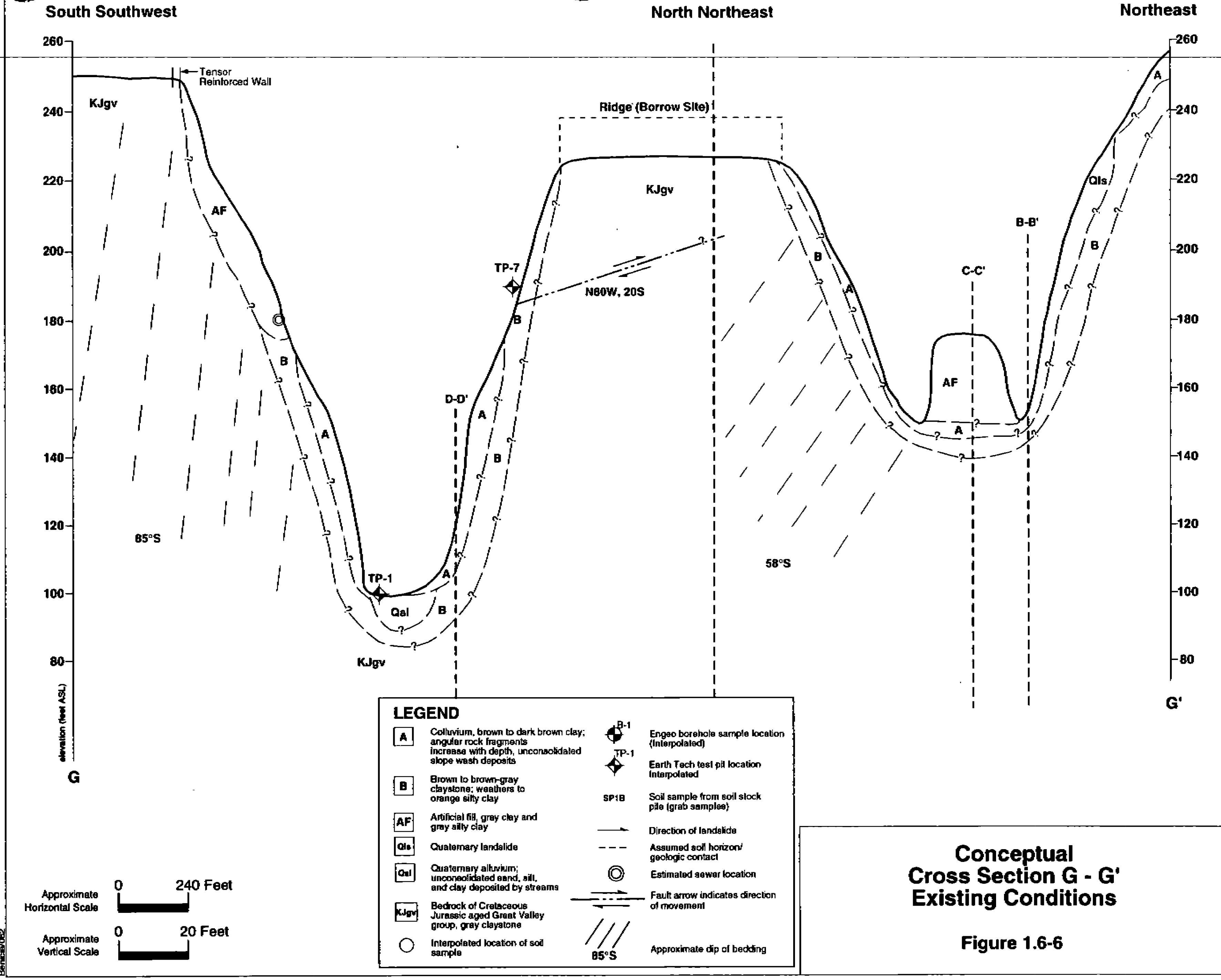
Conceptual Cross Section F - F' Existing Conditions Flare Site

Figure 1.6-4



Conceptual Cross Section E - E' Existing Conditions Demolition Site #3

Figure 1.6-5



Conceptual Cross Section G - G' Existing Conditions

Figure 1.6-6

See City Attorney's Office for Full Size
707-746-4216

N

200 0 200 400 Feet

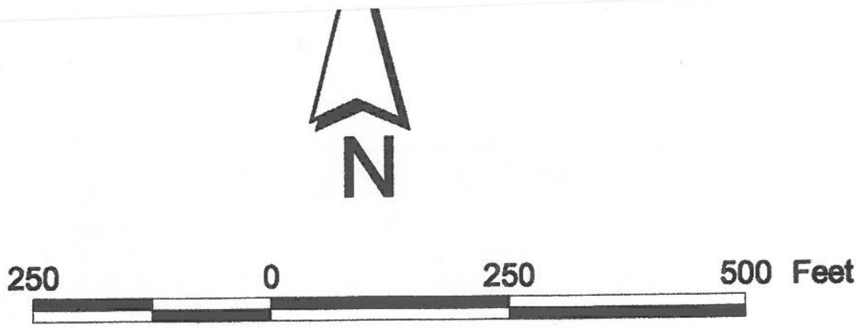
Scale: 1" = 200'

Plate 1.2-1

ıgnetometer Survey Data
-Ordnance and Explosives
I Investigation/Feasibility Study
ɔurtelot Cleanup Project

15 February 2000

See City Attorney's Office for Full Size
707-746-4216



Scale: 1" = 200'

Plate 1.2-2

evious Sample Locations
-Ordnance and Explosives
al Investigation/Feasibility Study
ourtelot Cleanup Project

15 February 2000

See City Attorney's Office for Full Size
707-746-4216

Scale: 1" = 250'

Plate 1.2-3

Geologic Map

Non-Ordnance and Explosives
Remedial Investigation/Feasibility Study
Tourtelot Cleanup Project

15 February 2000

2.0 FIELD SAMPLING PLAN

This chapter presents the Field Sampling Plan (FSP) for the proposed field investigation activities at the Project Site. This FSP, in conjunction with the Quality Assurance Project Plan (QAPP) presented in Chapter 3.0, will be used to ensure that (1) all sample and field measurements are consistent with the project data quality objectives (DQOs); (2) samples are collected, identified, handled, preserved, packaged, and shipped in such a manner as to maintain their integrity and validity; and (3) field data are collected in such a manner as to ensure accuracy, precision, completeness, representativeness, and comparability, and provide an adequate database for achieving the DQOs.

2.1 DATA QUALITY OBJECTIVES

The primary function of field sampling and measurement is to generate data of quantity and quality sufficient to support project decision making. To achieve this goal, DQOs have been developed for this project to determine the type, quantity, and quality of project data that need to be collected. The DQO development process is described in the EPA guidance documents entitled *Guidance for the Data Quality Objectives Process* (EPA QA/G-4 Final, September 1994) and *Data Quality Objectives Process for Superfund: Interim Final Guidance* (EPA/540/G-93/071, September 1993). DQOs are qualitative and quantitative statements developed by data users to specify the quality and quantity of data from field and laboratory data generation activities required to support project decision making or regulatory actions, while minimizing data collection expenditures by defining data requirements and acceptable levels of decision errors during the planning stage of projects. The DQO process provides a systematic procedure for defining the criteria that a data collection design should satisfy, including when and where to collect samples, the tolerable level of decision errors for the study, and how many samples to collect. The final product of the DQO process is a data collection design that meets the quantitative and qualitative needs of the study.

To evaluate the data using the DQO process, it is necessary to have first established decision quality criteria using the DQO process or its equivalent. DQOs for environmental assessment are included in the following section. DQOs for field record and analytical data quality assurance (QA)/quality control (QC) are included in the QAPP (see Section 3.1.4).

2.1.1 The Seven-Step DQO Process

The DQO process involves the following seven steps:

1. Problem Statement Summarize the problem that requires environmental data acquisition and identify the resources available to resolve the problem.

2. Decision Identification Identify the decision that requires acquisition of environmental data to address the problem. Identify the intended uses of the data projected to be acquired.

3. Identification of Decision Input Identify the information needed to support the decision and specify the inputs requiring environmental measurements.

4. Definition of Study Boundaries Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision.

5. Decision Rule Develop a logical statement that defines the conditions that would cause the decision-maker to choose among alternative actions.

6. Limits of Decision Error Specify the decision-maker's acceptable limits on decision errors, which are used to establish appropriate performance goals for limiting uncertainty in environmental data.

7. Optimization of the Data Collection Design Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy project DQOs.

Problem Statement. As discussed in Chapter 1.0, a wide variety of activities that may have affected soils and ground water has occurred within the Project Site. Several of the sites have previously been investigated. The following list identifies the potential and known contaminants for each area of interest:

1. TNT Strips: TNT and trace levels of PAHs, as well as dioxins/furans, arsenic, iron, and manganese, at levels above the residential PRGs. Dioxin/furans have also been identified at very low levels at this site. No other potential contaminants have identified.

2. Howitzer Test Facility: Trace levels of PAHs, as well as arsenic and iron at levels above the residential PRGs. Additional potential contaminants include explosives, pesticides, perchlorates, dioxin/furans, VOCs, and heavy fuels.

3. Ammunition Renovation/Primer Destruction Site: TNT and PAHs, as well as arsenic and iron at levels above the residential PRGs. Additional potential contaminants include other explosives, dioxin/furans, VOCs, and heavy fuels.

4. Flare Site: Explosives, as well as dioxins/furans, antimony, arsenic, barium, copper, iron and lead, at levels above the

residential PRGs. PAHs are also considered potential contaminants of concern.

5. Demolition Sites: No explosives; arsenic and iron at levels above the residential PRGs. Although not detected, explosives remain a concern, in addition to dioxin/furans and PAHs.

6. Wetlands: Sediment: Arsenic and iron at levels above the residential PRGs.

   Water: Barium, copper, manganese, vanadium, and zinc.

7. Ridge: This site has not previously been sampled. The soils stockpiles are believed to have been imported for the adjacent development. Potential contaminants of concern include heavy fuels, and to a lesser degree, explosives and PAHs.

8. Dynamite Burn Site: This site has not been previously sampled. Nitroglycerin is a potential contaminant of concern for this site. Because of the previous grading activities that occurred in this area, soils that may have been affected could have been moved during grading to the McAllister Drive Land Bridge. Therefore, there are two potential areas that may have been affected by the Dynamite Burn Site: soils along the ridge, and soils within the land bridge.

The contaminants associated with each site's past use have been identified as described. The previous investigations do not provide sufficient data to fully define the lateral and vertical extent of the contaminants at each site, nor do they provide sufficient data to determine if the contaminants have affected nearby groundwater and sediments.

Decision Identification. The goal is to determine the vertical and lateral extent of contamination in soil at each of the sites at a confidence level of 95 percent. To achieve this goal, the acquisition of additional soil data is necessary at each of the sites.

As noted in Section 1.3.4, groundwater is not present at shallow depths beneath most of the sites; therefore, in order to determine if shallow groundwater has been affected by past uses of the Project Site, groundwater in the North and South Valleys will be collected and analyzed. Surface water and seeps in the South Valley will be collected and analyzed.

Arsenic and iron occur throughout the Project Site at levels above the residential soil PRGs. There is insufficient existing data to determine whether these levels are due to activities associated with past uses of the Project Site or whether they are background levels; therefore, additional sampling and evaluation will be proposed to determine background levels of arsenic and iron. Manganese (TNT Strips), antimony, barium, copper, and lead (Flare Site) are not included in the determination of background levels as these metals are associated with the past uses of the sites and will be subject to future remediation.

Although not known to be associated with past Project Site uses, dioxins/furans have been detected at the Project Site. Additional sampling and evaluation will be proposed to determine levels of dioxins/furans.

Identification of Decision Input. Decision-making inputs will include historical and chemical data collected at each site and comparison to background concentrations to determine the potential contaminants of interest (COI). PRGs will be used only as a guidance tool.

Chemical data will include the results from the previous investigations and new data collections proposed in this Work Plan. The scope of the planned data acquisition is presented in Table 2.1-1, which provides the rationale for the proposed sampling and laboratory method of measurement for each matrix at each site.

The action levels are based on residential land use regulatory thresholds or background concentrations to be determined. The background metals and dioxins/furans concentrations will be established using previous environmental investigation results from on-site and off-site locations (within the City of Benicia and within Solano County), and data collections proposed in this Work Plan.

The ultimate goal is to achieve clean closure based on nondetect results of non-naturally occurring compounds. PRGs and background concentrations will be addressed as guidance tools.

Definition of Study Boundaries. This RI/FS Work Plan addresses only the chemical contamination issues at the Project Site. Information regarding OE at the site is included in the *Engineering Evaluation/Cost Analysis, Former Benicia Arsenal, Benicia, California* (Earth Tech, 1999), and will be addressed in the Removal Action Work Plan, to be submitted at a later date. Additional information regarding OE will also be presented in the Remedial Action Plan and OE Remedial Design Document. Study boundaries have been defined by the Tourtelot Property boundary and review of available records (including historical aerial photographs) to include potentially affected portions of adjoining properties. The sites have been defined as follows:

- The lateral extent of the TNT Strips was established by review of historical aerial photographs, field reconnaissance surveys, field screening data, and soil sampling data

- The lateral extent of the Ammunition Renovation/Primer Destruction Site, the Howitzer Test Facility, and soil stockpiles in the North Valley is based on review of historical records, photographs, geography of the valley, topography, and soil sampling data

- The lateral extent of the Flare Site was established by field reconnaissance surveys, field screening data, soil sampling data, and review of historical aerial photographs

- The lateral extent of the Demolition Sites was established by field reconnaissance surveys, field screening data, soil sampling data, and review of historical aerial photographs

- The lateral extent of the Ridge Stockpiles and adjacent Dynamite Burn Site are based on topography, field reconnaissance survey, and soil sampling data

- The lateral extent of the wetlands is based on field reconnaissance survey, topography and photographs.

During previous investigations, soil samples were collected to a maximum depth of approximately 4.5 feet bgs. Soil contamination has been identified at shallow soil depths, generally at surface to approximately 2 feet bgs. Additional soil data will be collected to determine the lateral and vertical extent of contaminant of concern detections above the action levels at each site. At Demolition Site #1 and the Flare Site, sample collection is restricted to a maximum depth of 3.5 feet bgs due to OE clearance.

The sampling results are assumed to be representative of future conditions at the site based on its use as a residential development. The sampling results will not vary with weather conditions because they will be reported on a dry weight basis.

Decision Rules. The sampling data (validated to a confidence level of 95 percent) will be considered definitive for contaminant extent determinations for each site. The decision rule for each site is, "If the contaminant concentrations are greater than background concentrations, or greater than non-detect, then the site soil/ groundwater/surface water will be remediated; if not, then the soil/groundwater/ surface water will be left in situ."

Some analytical detection limits are recognized to be above the established decision thresholds. In these cases, if other data (e.g., previous detection, historical usage, known degradation byproducts of confirmed releases) suggest the presence of those analytes, the analyses will be performed using the best available technology. If the practical quantitation limit (PQL) for such an analyte exceeds the established decision threshold, the method detection limit (MDL) will be used (see Section 3.2.4.2 for definitions). If the MDL exceeds the established decision threshold, the default decision threshold will be the laboratory-reported MDL below which the analyte is assumed not to be present. If multiple laboratories are used, MDLs for each laboratory will be evaluated with regard to decision thresholds. Table 2.1-2 compares the PQLs (and MDLs where the PQLs exceed the action levels) and action levels for each contaminant of concern.

The traditional approach for establishing background concentrations is to compare analytical results for samples collected from background locations outside of the study areas. It is assumed at this time that background concentrations will be established for all COIs.

A statistical approach for estimating the background concentrations is proposed based primarily on EPA-suggested methods as described in *Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites* (U.S. Environmental Protection Agency, 1995, R.P. Breckenridge and A.B. Crocket). In this approach, the inorganic data collected at the Project Site, and surrounding sites where data meet the DQOs of this Work Plan, are pooled, and potentially contaminated data points are removed using historical use data; samples that tested positive for organic compounds are censored. The data is also statistically analyzed to exclude potentially contaminated data points, or outliers, and to establish upper tolerance levels to compare to data collected from the sites. The use of a pooled data set has two advantages:

- A far greater data set can be used for calculation of background concentrations
- Background samples are collected from the same geologic regimes as environmental samples.

The upper tolerance limits established will be used as a preliminary screening tool for the analysis of metals and dioxins/furans results at the Project Site. Statistical procedures modified from those outlined by EPA (1995) will be applied to the pooled sample results in order to establish background concentrations for metals and dioxins/furans as follows:

- Calculate proportion of nondetects
- Analyze data distribution
- Identify potentially contaminated sites
- Establish the 95th quantile on nonnormal distributed data and analytes with a large proportion of nondetects.

The soil sampling program at the TNT Strips includes a series of step-out borings. The decision criterion for advancing the borings vertically and laterally is a TNT/TNB/DNT detection. The borings will be advanced and soil samples tested until TNT/TNB/DNT is nondetect. Details of the step-out boring program and the field testing criteria are included in Section 2.2.1.1.

Limits of Decision Error. The tolerance for decision errors would be least when the chemical data erroneously indicate that the site contaminants do not exceed the action levels, resulting in a potential hazard to public health. This type of false positive error ("Type I") should be less than 5 percent and should approach 0 percent for each analyte.

The tolerance for decision errors would be somewhat higher when the chemical data erroneously indicate the site contaminants do exceed the action levels, resulting in unnecessary remediation expenditure. This type of false negative error ("Type II") should be less than 10 percent for each analyte.

Optimization of the Design. A judgment-based sampling program has been developed for each site based on existing data collection results and the conceptual site models. In general, the selected additional data points target expected maximum concentration locations where no data exists, and additional upgradient, downgradient, and crossgradient locations for the determination of lateral and vertical extent. For stockpiles, samples will be collected where no data exists, and additional samples will be collected to verify previous results. Additional sediment and surface water samples will be collected from the wetlands area. Soil boring locations in the South Valley and North Valley areas have been targeted to obtain hydrogeologic and water chemistry data via the installation of temporary monitoring wells. In addition, water samples will be collected from any seeps and springs that produce sufficient water to be sampled.

Table 2.1-1 summarizes the proposed quantities of samples, the sample matrices, the contaminants of concern and measurement methods, and the rationale for the sampling program at each site. Samples will be submitted for analyses to an off-site laboratory only if the total explosive concentration is <10 percent.

The protocols and procedures described in the following sections have been developed to provide representative soil, groundwater, and surface water sample collection and analysis consistent with the qualitative and quantitative needs of this study.

2.2 PROPOSED SCOPE OF WORK

The proposed scope of work for the field investigation activities at the Project Site will be conducted in accordance with the protocols and procedures presented in this FSP. The field sampling program is being conducted to better define the nature and extent of potential contamination in the following areas: five TNT Strips in the North Valley; the Ammunition Renovation/Primer Destruction Site in the North Valley; the Howitzer Test Facility in the North Valley; Demolition Site #3 and #1 in the South Valley; and one Flare Site, also in the South Valley. Surface water and groundwater at the Project Site will also be investigated through the collection of surface water samples and surface seep/spring samples from the South Valley, and groundwater samples through the installation of temporary groundwater monitoring wells in the North and South Valleys. Additional sampling of soil Stockpile areas within the Ammunition Renovation/Primer Destruction Site in the North Valley, nine Ridge Stockpile areas and the Dynamite Burn Site on the ridge between the North and South Valleys, and sediment in the Wetlands in the South Valley have also been included in the field sampling program.

Tables 2.2-1 through 2.2-12 summarize the field sampling program, including sample matrix, number of samples to be collected, depth of sample collection, and analyses to be performed. All proposed field sampling locations are shown on Figures 2.2-1 through 2.2-4.

In addition to the proposed field sampling program, existing site geology data will be supplemented through field geologic mapping within the Project Site.

2.2.1 Field Sampling Program

2.2.1.1 TNT Strips.

Three of the TNT strips (TNT Strips #1, #4 and #5) have been chosen for additional investigation to further define the vertical and lateral extent of the contamination by advancing a series of step-out borings at a distance of 5 feet, 10 feet, and 20 feet from the center axis of the TNT strips (see Figure 2.2-1). The TNT-1C series step-out borings will be advanced at the previous sampling location identified as TNT-1C and across the strip in an upslope and downslope direction, intersecting previous boring location TNT-1C. The TNT-1F series step-out borings will be oriented along a firebreak, which is observed to cross TNT Strip #1 on historical aerial photographs. The TNT-4C series step-out borings will be advanced beyond the end of TNT Strip #4 and across the strip in an upslope and downslope direction, intersecting previous boring location TNT-4C. The TNT-5A series step-out borings will be advanced across TNT Strip #5 in an upslope and downslope direction, offset from previous boring location TNT-5A approximately 10 feet to the east. Additional borings at TNT Strip #5 will be advanced down slope from surface expressions of slope wash eminating from the strip.

5-feet, 10-feet, and 20-feet step-out borings will be advanced to a maximum depth of competent bedrock or to rig refusal, whichever is encountered first. Soil samples will be collected at the surface, and generally every two feet to total depth of boring. Surface samples will be collected only from the 20-foot step-out borings. One additional boring will be advanced during the TNT-1F series borings, on the center axis of the strip, since this location was not previously sampled. This boring will be advanced to competent bedrock or rig refusal, whichever is encountered first. Soil samples will be collected at the surface, and generally every two feet to total depth of boring. Analyses of soil samples will start at the top and continue downward until the results of two consecutive intervals are non-detect.

The soil samples will be tested in the field for TNT using an on-site mobile laboratory utilizing EPA Method SW8330 (see Section 2.8.2). The soil samples will be tested in sequence in order to determine the extent of the step-out program (i.e., shallowest to deepest soil samples, starting with those borings nearest to the TNT strip center axis). Soil samples will be tested until TNT is nondetect. If the TNT nondetect field testing criterion is met, any remaining deeper samples from a particular boring will not be analyzed. If a surface sample meets the TNT nondetect field testing criterion, samples from further step-out borings will not be analyzed. Although not anticipated, if the surface sample from the 20-foot step-out boring exceeds the TNT nondetect field testing criterion, additional samples will be collected generally every two feet to total depth of boring for analysis using an on-site mobile laboratory. Additional step-out borings (i.e., 40 feet) will also be advanced until the TNT nondetect line has been determined.

The highest concentration of TNT detected to date at the TNT Strips is at the southeastern end of TNT Strip #1, where 380,000 mg/kg of TNT was detected at 1 foot bgs at boring location TNT-1C (see Figure 1.5-1). Given the high concentration of TNT detected, the potential for lateral and vertical migration of TNT was considered to be greatest at this location.

One boring (TNT-1C2) will be advanced adjacent to previous boring location TNT-1C at the southeastern end of TNT Strip #1 to confirm the elevated TNT levels detected at this location and to evaluate the maximum depth of contamination associated with the elevated contamination levels. This boring will be advanced to a maximum depth of competent bedrock or rig refusal, whichever is encountered first. Soil samples will be collected at the surface, and generally every two feet to total depth of boring. The soil samples will be tested in the field for TNT using an on-site mobile laboratory. Samples will be analyzed sequentially for the following compounds:

- PAHs by EPA Method SW8310
- CAM 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc) plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium by EPA Methods SW6010B, SW7470A, and SW7471A
- Explosives by EPA Method SW8330.

In addition, the sample collected at 1 foot bgs at boring TNT-1C2 will be analyzed for dioxins/furans by EPA Method SW8290.

The TNT-1C series step-out borings will be advanced at 5 feet, 10 feet, and 20 feet from the center axis of TNT Strip #1, as previously described. Soil samples from the step-out borings will be collected at the surface, and generally every two feet to total depth of boring. Samples will be analyzed sequentially. If TNT is detected, the sample will be submitted to the analytical laboratory for analysis of PAHs, CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, sodium, and explosives, by the test methods previously listed. Additional step-out borings (i.e., 40 feet) will also be advanced until the samples no longer exceed the TNT nondetect field testing criterion. Any sample exceeding the TNT nondetect field testing criterion will be submitted to the analytical laboratory for analysis of PAHs, CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, sodium, and explosives by the test methods previously listed.

In addition, seven borings (TNT-1D, TNT-1E, TND-1G, TNT-1H, TNT-1J, TNT-1K, and TNT-1L) will be advanced along the suspected extension of TNT Strip #1 toward the southeast, and three borings (TNT-5I, TNT-5M, and TNT-5N) will be advanced northeast along the suspected down topographic gradient direction of TNT Strip #5. The borings will be advanced to a maximum depth of competent bedrock or rig refusal, whichever is encountered first. Soil samples will be collected at the surface, generally every two feet to total depth of boring, and will be tested in the field for TNT using an on-site mobile laboratory. Samples will be analyzed sequentially using the field testing criterion previously described.

The field sampling program for the TNT strips is summarized in Tables 2.2-1 through 2.2-3. All samples will be submitted to an analytical laboratory for analysis by EPA Method SW8330.

Additional samples may be collected during the TNT Strips sampling program at greater step-out distances and depths than indicated in this Work Plan, should the analytical results obtained from the on-site mobile laboratory indicate that additional samples need to be collected to further define the vertical and lateral extent of contamination in a particular area of investigation.

2.2.1.2 Howitzer Test Facility.

Seven borings will be advanced within and adjacent to the Howitzer Test Facility. Three borings (HF-1 through HF-3) will be advanced toward the northern end of the Howitzer Test Facility approximately below the historical fire butts, while HF-4 will be advanced at the south end approximately below the historic location for the Test Tunnels(see Figure 2.2-2). Borings will be advanced to competent bedrock or to rig refusal, whichever is encountered first. Soil samples will be collected at 0.5 foot, 4 feet, 10 feet, 15 feet, 20 feet bgs, and at every 5 feet thereafter, to total depth of hole, and analyzed for the following:

- PAHs by EPA Method SW8310
- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A

- Explosives, including nitroglycerin and PETN, by EPA Method SW8330

- Nitrate/nitrite as nitrogen by EPA Method 300.0

- TEPHs as diesel and motor oil by California LUFT Modified EPA Method SW8015

- TEPHs as kerosene by California LUFT Modified EPA Method SW8015.

- VOCs by EPA Method SW8260B

The remaining three borings (TW-4, TW-5, and TW-6) will be advanced to first encountered groundwater for possible temporary well installation (see Section 2.5). Soil samples will be collected at 0.5 foot, 4 feet, 10 feet, 15 feet, 20 feet bgs, and at every 5 feet thereafter, until bedrock is encountered, and analyzed for the compounds previously listed.

The field sampling program for the Howitzer Test Facility is summarized in Tables 2.2-4 and 2.2-7.

2.2.1.3 Ammunition Renovation/Primer Destruction Site.

There are two stockpiles (SP1 and SP2) within the Ammunition Renovation/Primer Destruction Site (see Figure 2.2-2). Because these stockpiles have been previously sampled, only one additional soil sample will be collected from each of the stockpiles, from 2 feet below the stockpile surface. Stockpile sampling frequencies will be according to thee protocol set forth in SW486. This sample will be analyzed for the following compounds:

- PAHs by EPA Method SW8310

- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A.

- Explosives, including nitroglycerin and PETN, by EPA Method SW8330

- Nitrate/nitrite as nitrogen by EPA Method 300.0

- TEPHs as diesel and motor oil by California LUFT Modified EPA Method SW8015

- TEPHs as kerosene by California LUFT Modified EPA Method SW8015.

- VOCs by EPA Method SW8260B

Six borings will be advanced within the Ammunition Renovation/Primer Destruction Site. Earth Tech will review Site historical information and identify sample locations to correspond with historical building footprint locations. Four of the borings (AR-1 through AR-4) will be advanced to competent bedrock or to rig refusal, whichever is encountered first. Soil samples will be collected at 0.5 foot, 4 feet, 10 feet, 15 feet, 20 feet bgs, and at every 5 feet thereafter, until total depth of hole, and analyzed for the compounds previously listed. The remaining two borings (TW-1 and TW-7) will be advanced to first encountered groundwater, to rig refusal, or to competent bedrock, whichever is encountered first, for possible temporary monitoring well installation (see Section 2.5). Soil samples will be collected at 0.5 foot, 4 feet, 10 feet, 15 feet, and 20 feet bgs and analyzed for the compounds previously listed. All soil samples collected from the six borings will also be analyzed for VOCs by EPA Method 8260B.

Stockpile samples will not be analyzed for VOCs, since it is assumed that any volatiles that may have been present in the stockpile soil will have long since volatilized.

Field sampling programs for the soil stockpiles and the Ammunition Renovation/ Primer Destruction Site are summarized in Tables 2.2-5 and 2.2-6.

2.2.1.4 North Valley Groundwater.

Up to nine borings for possible temporary monitoring well installations (TW-1 through TW-9) will be advanced in the North Valley to first encountered groundwater, to rig refusal, or to competent bedrock, whichever is encountered first (see Figure 2.1-2). First groundwater is anticipated to be encountered in the alluvium (if sufficient thickness is present) and/or the underlying weathered bedrock zone. A temporary monitoring well will be installed in those borings where groundwater is encountered. If, after advancing the boring, the hole is dry, the location will be grouted closed. Upon a second mobilization, permanent groundwater monitoring wells will be installed at those dry locations, based on the lithology, as if there were actually water in the field determined potential aquifer material. Well permits will be obtained from Solano County for all monitoring wells prior to well installation.

For those wells to be installed in and around the Howitzer Test Facility (TW-4, TW-5, and TW-6), soil samples will be collected from the borings and analyzed as described in Section 2.2.1.2. For those wells to be installed in the Ammunition Renovation/Primer Destruction Site (TW-1 and TW-7), soil samples will be collected from the borings and analyzed as described in Section 2.2.1.3.

Bulk soil samples will also be collected of the major lithologies encountered during advancement of borings for possible temporary monitoring wells TW-1 and TW-2. Bulk soil samples will be analyzed for the following:

- Total organic carbon by EPA Method SW9060
- Grain size by American Society of Testing and Materials (ASTM) Standard D422.

An additional temporary well, identified as TW-3, will be advanced down gradient of the North Valley Military Landfill. An additional two temporary wells, TW-8 and TW-9, will be advanced at the western end of the North Valley.

Groundwater, if present, will be collected and analyzed using the following methods:

- Dissolved CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A
- Explosives, including nitroglycerin and PETN, by EPA Method SW8330
- VOCs by EPA Method SW8260B
- Perchlorate by EPA Method E300
- PAHs by EPA Method SW8310
- TEPHs as diesel and motor oil by California LUFT Modified EPA Method SW8015
- TEPHs as kerosene by California LUFT Modified EPA Method SW8015
- General water chemistry (chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0; total phosphorous by EPA Method 365.2; total organic carbon by EPA Method 415.1; TDS by EPA Method 160.1; and TSS by EPA Method 160.2)
- Field parameters (temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1).

The field sampling program for the North Valley groundwater is summarized in Table 2.2-7.

2.2.1.5 Ridge Stockpiles.

Soil samples will be collected from nine stockpiles (RSP-1 through RSP-9) on the ridge between the North and South Valleys (see Figure 2.2-4). Four soil samples will be collected from each of the larger stockpiles (RSP-1 through RSP-5). Two soil samples will be collected from each of the smaller stockpiles (RSP-6 through RSP-9). Soil samples will be collected from 2 feet below the stockpile surface. Soil samples from each stockpile will be composited into one sample by the analytical laboratory and analyzed for the following compounds:

- TEPHs as diesel and motor oil by California LUFT Modified EPA Method SW8015
- Explosives by EPA Method SW8330
- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A.

Four near-surface soil/bedrock samples will also be collected from that portion of the Ridge historically occupied by the Dynamite Burn Site. Ridge samples will be composited into one sample by the analytical laboratory and analyzed for nitroglycerin and PETN by EPA Method SW8330 and for nitrate/nitrite as nitrogen by EPA Method 300.0.

Samples of the Dynamite Burn Site will not be composited. Sampling will take into consideration that portion of the Dynamite Burn Site that may not have been disturbed. Additionally, samples from the gully will be obtained if the gully can be located.

The field sampling program for the Ridge and Ridge Soil Stockpiles is summarized in Table 2.2-8.

2.2.1.6 Flare Site.

Three borings will be advanced at the Flare Site (see Figure 2.2-3). One boring (FA-4) will be advanced toward the periphery of the Flare Site in an upslope direction. One boring (FA-5) will be advanced toward the periphery of the Flare Site in a downslope direction. The remaining boring (FA-6) will be advanced to as close to the center of the Flare Site as possible. If OE clearance permits, the borings will be advanced to a maximum depth of 10 feet bgs, or to competent bedrock, whichever is encountered first. Soil samples will be collected from the central boring location at 1 foot, 2 feet, 5 feet, and 10 feet bgs. Soil samples will be collected from the peripheral boring locations at the surface, and at 1 foot, 2 feet, 5 feet, and 10 feet bgs. Flare Site samples will be analyzed for the following compounds:

- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A.

- Total phosphorous by EPA Method 365.2.

In addition, the 1-foot sample from the central boring location will also be analyzed for PAHs by EPA Method SW8310, for explosives, including nitroglycerin and PETN, by EPA Method SW8330, nitrate/nitrite as nitrogen by EPA Method 300.0, and for dioxins/furans by EPA Method SW8290.

The field sampling program for the Flare Site is summarized in Table 2.2-9.

Maximum boring depths and sample collection depths at the Flare Site may need to be modified in the field based on OE clearance.

2.2.1.7 Demolition Sites.

Demolition Site #1. Two soil samples will be collected from the sidewall of the incised channel that passes through Demolition Site #1. Sidewall samples will be analyzed for the following compounds:

- PAHs by EPA Method SW8310

- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, AND SW7471A.

- Explosives including nitroglycerin and PETN by EPA Method SW8330

- Nitrate/nitrite as nitrogen by EPA Method 300.0.

Field sampling programs for Demolition Site #1 is summarized in Table 2.2-10.

Demolition Site #3. Four additional borings will be advanced at Demolition Site #3 (see Figure 2.2-3). Two of the borings (DA3-3 and DA3-4) will be advanced toward the downslope periphery of the demolition area, through undisturbed soils. The remaining two borings (DA3-5 and DA3-6) will be advanced toward the center of the demolition area through previously disturbed soils (i.e., backfill material) into the underlying alluvium and/or weathered bedrock. The borings will be advanced to competent bedrock or rig refusal, whichever is encountered first. Selected sample depths will be retained for chemical analysis at major changes in lithology or at a minimum of 5-foot intervals.

For the central borings, samples will be retained, at a minimum, from the disturbed fill material, immediately below the fill material, and immediately above the competent bedrock. Soil samples will be analyzed for PAHs, CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium and explosives by the test methods previously listed. The sample collected immediately below the fill material will also be analyzed for nitroglycerin and PETN by EPA Method SW8330, and nitrate/nitrite as nitrogen by EPA Method 300.0.

The field sampling program for Demolition Site #3 is summarized in Table 2.2-11.

2.2.1.8 South Valley Wetlands Sediment and Surface Water.

Sediment and surface water samples will be collected from several locations in the Wetlands (see Figure 2.2-3). Sediment and surface water samples will be collected upgradient (WET-1 and SW-1) and downgradient (WET-2 and SW-2), respectively, of the Demolition Sites and the Flare Site.

Sediment samples will be analyzed for the following compounds:

- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A
- PAHs by EPA Method SW8310
- Explosives, including nitroglycerin and PETN, by EPA Method SW8330.
- Nitrate/nitrite as nitrogen by EPA Method 300.0
- Total phosphorous by EPA Method 365.2

The downgradient sediment sample will also be analyzed for dioxins/furans by EPA Method SW8290.

Surface water samples will be analyzed for the following compounds:

- Total and dissolved CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A
- PAHs by EPA Method SW8310
- Explosives, including nitroglycerin and PETN, by EPA Method SW8330
- General water chemistry (chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0; total phosphorous by EPA Method 365.2; total organic carbon by EPA Method 415.1; TDS by EPA Method 160.1; and TSS by EPA Method 160.2)

- Field parameters (temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1).

Field sampling programs for the wetlands sediment and surface water are summarized in Table 2.2-12.

2.2.1.9 South Valley Groundwater and Seeps/Springs.

Three borings for possible temporary monitoring well installations will be advanced in the South Valley; at the western end of the South Valley upgradient of the Demolition Sites and Flare Site (TW-10), immediately downgradient of the Flare Site (TW-11), and downgradient of the McAllister Drive Land Bridge (TW-12), respectively (see Figure 2.2-3 and Plate 2.2-1). At these locations, groundwater is anticipated to be close to the ground surface due to the proximity of the Wetlands. TW-12 will be installed as a permanent groundwater monitoring well. The duration and frequency of long term groundwater monitoring will be determined from this initial work.

Groundwater samples will be analyzed for the following compounds:

- VOCs by EPA Method SW8260B
- PAHs by EPA Method SW8310
- Dissolved CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A
- Explosives, including nitroglycerin and PETN, by EPA Method SW8330
- General water chemistry (chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0; total phosphorous by EPA Method 365.2; total organic carbon by EPA Method 415.1; TDS by EPA Method 160.1; and TSS by EPA Method 160.2)
- Field parameters (temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1).

Three potential seeps/springs (SPS-1 through SPS-3), situated along the north sideslope of the South Valley, will be inspected to see if there is any seep water present from which a surface seep sample can be collected (see Figure 2.1-3). Surface seep samples will be analyzed for the compounds previously listed.

Field sampling programs for the South Valley groundwater and seeps/springs are summarized in Table 2.2-12.

2.2.1.10 Additional Sampling.

Additional sampling will be conducted in the Land Bridge as follows: Samples will be collected from three locations on each side of the McAllister Drive Land Bridge, near the toe of the fill. Samples will be collected from an approximate depth of five feet bgs and analyzed for nitroglycerin and PETN by EPA Method SW8330, and for nitrate/nitrite as nitrogen by EPA Method 300.0.

Approximately twenty background samples will be collected from the west end of the South Valley, from the area at the northwest end of the Ridge, from the area northwest of the TNT Strips, and from the hill on the east side of the Site (north of the two ordnance pieces).

2.2.1.11 Field Mapping.

To supplement existing geological data, the Project Site will be walked to identify any outcrops, and in particular, any exposures in the graded ridge area between the North and South valleys. The outcrops will be mapped, including but not limited to lithology, and if bedrock is exposed, preferential bedding planes or fracture patterns. Field mapping will be conducted by a State of California registered geologist.

2.3 PRE-FIELD INVESTIGATION ACTIVITIES

The tasks outlined in the following subsections will be conducted prior to the start of any field investigation activities at the Project Site.

2.3.1 Permits

No permits are required by the Solano County Department of Environmental Management (DEM) for exploratory borings. The Solano County DEM may require well permits for installation and abandonment of temporary groundwater monitoring wells (see Section 2.6.3). The well permit application, if required, must include the following information:

- Applicant's name, address, and current phone number
- Statement that the contractor performing the work is licensed under the provisions of Chapter 9 of Division 3 of the Business and Professions Code as a well drilling contractor possessing a C-57 Water Well Drilling Contractor's License
- Estimated or proposed depth of the well, casing material, sealing material, sealing method, intended use of the well, and drilling method to be used

- Location of the Project Site, including Assessor's Parcel Number, and location of the well to be installed
- Legal project site property owner
- Figure indicating the location of the well with respect to the following items:
    - Project site property lines
    - Sewage disposal systems
    - Bodies of surface water
    - Drainage pattern of the project site
    - Existing wells within 100-foot radius of the proposed well
    - Access roads
    - Structures
    - Animal enclosures
    - Underground storage tanks containing hazardous substances.

A copy of the Well Permit Application that may be required for both temporary groundwater monitoring well installation and abandonment is included in Appendix F. A minimum of 2 working days must be allowed for the Solano County DEM to process a Well Permit Application.

2.3.2 Site-Specific Safety and Health Plan

All field activities performed at the Project Site as part of this Work Plan will be conducted in accordance with the requirements of the Site-Specific Safety and Health Plan (SSHP). All field activities will be performed by personnel meeting the requirements of Title 8 California Code of Regulations (CCR) Section 5192 (29 Code of Federal Regulations [CFR] Part 1910.120) (Hazardous Waste Operations and Emergency Response [HAZWOPER]). Prior to the start of any field investigation activities, all field personnel and authorized visitors will be required to read and sign the SSHP. A site safety meeting will be held each morning in accordance with the guidelines in the SSHP.

2.3.3 Utility Clearance

All proposed investigation locations will be pre-marked and cleared of any subsurface obstructions. Geophysical data for the Project Site will be reviewed to identify underground utilities. Underground Services Alert (USA) will also be notified a minimum of 72 hours before any subsurface work is to begin, as required by law.

2.3.4 Ordnance and Explosives Avoidance

All proposed investigation sample locations will be located using standard OE avoidance techniques as describe in the Site-Wide Safety and Health Plan. An OE specialist will also act as the Site Safety Coordinator (SSC) and will accompany each sampling crew during all field investigation activities. Procedures for dealing with any OE encountered during the field investigation activities are presented in Section 6.7 of the SSHP.

2.4 DRILLING METHODS

All subsurface drilling activities will be conducted under the direct supervision of a California state-registered geologist and an OE specialist. The two types of drilling methods presented in the following two subsections may be deployed at the Project Site. The choice of drilling method will depend on drill rig availability at the time of the field sampling program, boring location access (the Project Site terrain limits the types of drill rigs that can be deployed), proposed depth of boring, and the nature of the alluvium/weathered bedrock. Advancement of any of the borings into the competent bedrock is not proposed. It is initially proposed to use the direct push drill method for all borings to be advanced beyond 4 feet bgs, unless site conditions dictate changing to the hollow-stem auger (HSA) method. Site conditions that may dictate changing to the HSA method include, but are not limited to, difficulty in advancing borings through the alluvium (especially if gravels are present) and the nature of the weathered bedrock. Refusal due to competent bedrock will not require a change in drilling method. Borings to be advanced less than 4 feet bgs will typically be hand augered (see Section 2.7.2).

No drilling fluids or lubricants are used in either drilling method; this minimizes the potential for cross-contamination or infiltration of materials into the formation. All downhole drilling equipment will be decontaminated between boring/ temporary well locations in accordance with the equipment decontamination procedures presented in Section 2.15.1.

2.4.1 Direct Push

Most direct push rigs use either static push, a combination of static push and percussion hammer, or a combination of static push and percussion hammer and high-frequency vibration to advance a boring. Static push relies on the weight of the rig to push the drill rods into the ground. This weight applied to the drill rods is commonly referred to as the "reactive weight." The rate of penetration and maximum boring depth are directly proportional to the reactive weight applied to the drill rods. When used in combination with percussion hammering or high-frequency vibration, up to 20,000 pounds of reactive weight can be applied, which dramatically increases the force applied to the cutting shoe, enabling boring advancement to greater depths and through more consolidated types of materials.

Hydraulic percussion hammers can deliver up to 500 foot-pounds of impact force. An anvil on the bottom of the hydraulic hammer transmits the striking force to the drill rods. The hammer slides out of the way when not in use, providing access to the drill rods. The vibrators used to advance the drill rods are twin, hydraulically operated, eccentric cam-type vibrators that clamp onto the outside of the drill rods. Each vibrator spins up to 3,600 revolutions per minute (rpm), creating a multidirectional vibration. When mounted opposed to one another, opposing vibrations are canceled out, resulting in a unidirectional, up-and-down vibration. In certain types of materials, vibrating the drill rods as the reactive weight is applied results in better sample recovery and a dramatic increase in the rate of penetration.

The reactive weight (i.e., weight of the rig) is applied using hydraulic cylinders that press the hydraulic hammer and vibratory head on the drill rods. The hydraulic hammer and/or vibrators can be used in conjunction with the reactive weight, depending on the type of material being penetrated.

The direct push method is most often used for collecting continuous core samples (see Section 2.7.3); however, use of an internal retractable "displacement point" allows depth-specific "discrete" sample collection. The sampler or displacement point is attached to the bottom of the drill rods, which in turn are attached to the drive head, enabling advancement of the boring when pressure is applied to the drill rods. The boring can be advanced with or without a retractable outer drive casing. Use of a drive casing prevents the boring from collapsing, thereby reducing the possibility of cross-contamination.

The direct push drilling method produces a smaller-diameter boring (typically 2.5 to 3.5 inches in diameter) and creates significantly less soil cuttings than the HSA method. The only soil cuttings generated are from those portions of the continuous core samples not retained for chemical analysis. Soil cuttings are placed in an appropriate container, pending analytical results and a determination of proper disposal (see Section 2.16.1).

2.4.2 Hollow-Stem Auger Method

The HSA drilling method technique involves drilling a boring (typically 6 to 8 inches in diameter) by simultaneously rotating and axially advancing the auger column into unconsolidated or poorly consolidated formations. As the auger flights are rotated and advanced into the ground, they act as a casing to stabilize the boring. The pilot bit and teeth on the auger head drill into the soil and direct the cuttings to the auger flights. As the auger flights are rotated, the soil cuttings are brought to the surface by movement along the continuous flights on the outside of the hollow stem. The drill cuttings are removed from the ground surface by a shovel and placed in an appropriate container, pending analytical results and a determination of proper disposal (see Section 2.16.1). A pilot bit at the bottom of the auger flights is used to plug the hollow core of the augers during drilling unless soil sampling is being performed (see Section 2.7.3). During HSA drilling, the augers act as a temporary casing and prevent the boring from collapsing, thereby reducing the possibility of cross-contamination.

2.5 TEMPORARY GROUNDWATER MONITORING WELL INSTALLATION

Based on the proposed locations of the temporary groundwater monitoring wells, it is anticipated that shallow groundwater, if present, will be encountered either in the valley alluvium or the underlying weathered bedrock zone. Borings for temporary well installations will be advanced to competent bedrock using one of the drilling methods described in Section 2.4. If groundwater is encountered, a temporary monitoring well will be installed to allow static water level measurement (see Section 2.13) and to collect groundwater samples for analysis (see Section 2.7.5). The temporary wells may be left in-place for up to 5 days to allow stabilization of the groundwater table and to collect groundwater samples. The temporary wells will then be abandoned according to the protocols and procedures presented in Section 2.6.3.

The length of well screen to be used for the temporary wells will be determined in the field based on site conditions. The temporary well riser will extend 2 to 3 feet above the ground surface and will be covered by a protective slip cap. The temporary well head will be clearly flagged to prevent any damage that may be caused by vehicular or other field-related activities, until abandonment.

All well screen and riser casing sections will either be (1) certified clean by the supplier and left in the original plastic wrapping; (2) decontaminated and wrapped in clean plastic prior to drilling activities; or (3) steam cleaned at an Equipment Decontamination Area established at the Project Site, and then wrapped in plastic for transportation to the temporary well location. The well screen and riser casing will be kept covered, either on a clean plastic ground cover or in the original plastic wrapping, to avoid contamination before the well screen and riser casing are lowered into the boring.

Temporary well construction details will be recorded on the Test Boring Logs and Water Table Well Installation Diagram Form (see Section 2.18 and Appendix F) by the field geologist who supervised the well installation. Temporary well construction activities will also be summarized in the Daily Field Report (see Appendix F). Any changes from the planned well construction will be noted.

Pre-pack well screens will be used for the temporary well installations. Conformatory grain-size analysis will not be performed for the temporary monitoring well installations. Bulk soil samples will be collected, per the field sampling program (see Section 2.2.1), for grain-size analysis. This data will be used to construct more permanent groundwater monitoring wells at a later date, if required.

2.5.1 Direct Push Temporary Monitoring Well Installation

A pilot boring (up to 3.5 inches in diameter) will be advanced to the target depth (i.e., competent bedrock) for temporary well installation using the direct push method described in Section 2.4.1. Continuous soil cores (see Section 2.7.3) will be obtained during pilot boring advancement, and discrete soil samples will be retained for chemical analysis from the appropriate depths per the field sampling program described in Section 2.2.1. Continuous cores from the boring will be lithologically logged by the field geologist working under the supervision of a California state-registered geologist (see Section 2.18.3) in order to optimize the length and placement of the temporary well screen interval.

The temporary wells will be installed using a dual-tube or "cased" direct push sampling system. This system uses a small-diameter (up to 3.5 inches) drive casing to prevent the boring from collapsing, thereby eliminating the potential for cross-contamination. Once the drive casing has been advanced to the target depth, a temporary well will be installed through the drive casing. The temporary well will consist of a pre-pack well screen consisting of 0.010-inch factory slotted Schedule 40 polyvinyl chloride (PVC) surrounded by a 20 by 40 silica sand pack with an outer 65 mesh stainless steel screen connected to flushed threaded Schedule 40 PVC blank riser casing to the ground surface. The pre-pack well screen is manufactured in 2.5-foot and 5-foot lengths. Each pre-pack well screen section is flush threaded with an O-ring seal to allow easy assembly of longer screens. A compressible foam seal wrapped in a polyethylene sleeve will be attached immediately above the pre-pack well screen. The drive casing will be retracted to just above the foam seal to expose the pre-pack well screen to the water-bearing zone. As the foam seal exits the bottom of the drive casing, it expands instantly to provide positive placement of a temporary barrier that prevents any materials above the well screen from entering the screen interval. The drive casing may then be removed or left in-place. The diameter of the temporary well will depend on the diameter of boring and drive casing able to be advanced given the site conditions. It is anticipated that either a 3/4- or a 2-inch-diameter well will be installed using the direct push method.

2.5.2 Hollow-Stem Auger Temporary Monitoring Well Installation

If site conditions are such that the direct push method cannot be used to install the temporary wells, they will be installed using the HSA method. Site conditions that may warrant use of the HSA method include direct push refusal and the need for a larger-diameter boring/well installation to obtain the volume of water necessary for groundwater sample collection (see Section 2.7.5).

An 8-inch-diameter pilot boring will be advanced to the target depth (i.e., competent bedrock) for temporary well installation using the HSA method described in Section 2.4.2. During HSA drilling, soil samples will be collected and retained for chemical analysis at a minimum of 5-foot intervals or less (per the field sampling program [see Section 2.2.1]) using an 18-inch-long, 1.5- or 2.5-inch-diameter split-spoon sampler (see Section 2.7.3). The boring will be lithologically logged using a combination of the soil samples and drill cuttings by the field geologist working under the supervision of a California state-registered geologist (see Section 2.18.3) in order to optimize the length and placement of the well screen interval.

Temporary wells completed using the HSA method will be installed through the auger flights. A 2-inch-diameter temporary well consisting of a pre-pack well screen, as described in Section 2.5.1, attached to blank riser casing will be lowered through the auger flights. The auger flights will then be retracted to just below the top of the screen interval, exposing the pre-pack well screen to the water-bearing zone. The auger flights will be left in-place to act as a temporary conductor casing to prevent any material from above the well screen from entering the water-bearing zone.

If the auger flights cannot be left in the ground as a temporary conductor casing, additional sand compatible with the pre-pack sand will be placed around the pre-pack well screen, and a temporary bentonite seal will be placed above the filter pack so the auger flights can be removed without introducing material from above the well screen into the water-bearing zone. The procedures for placement of the additional filter pack and temporary bentonite seal are as follows:

The auger flights will be retracted to just above the pre-pack well screen. Additional sand will be poured or tremied into the annular space left by retracted auger flights, allowing the additional filter pack material to settle out through the bottom of the auger flights and around the pre-pack well screen. The depth of the filter pack material will be measured relative to the bottom of the auger flights to confirm that the filter material has settled out through the bottom of the flight augers. A small amount of filter pack material will always be maintained above the bottom of the auger flights or drive casing. The additional filter pack will be placed to 2 feet above the top of the well screen.

The additional filter pack will be closely monitored by constantly probing the depth of the filter pack material. Periodic depth probing will also locate any points of bridging between the well casing and the boring or auger flights.

Approved potable water of documented quality may be poured down the annular space to break bridges if they are encountered. The amount of potable water introduced into the well will be kept to a minimum, and the quantities will be recorded on the Water Table Well Installation Diagram Form (see Appendix F) and reported in the final report. A sample of any potable water supply used will be collected and analyzed for all groundwater sampling analytes to document the quality of the potable water.

A 1-foot (minimum) temporary bentonite seal consisting of 100-percent pure sodium bentonite pellets or chips will be placed above the additional filter pack to form a temporary seal. The bentonite pellets or chips will be free of additives that may affect water quality. If the bentonite seal is to be placed in unsaturated conditions, bentonite pellets or chips will be placed into the annular space above the filter pack and hydrated with either distilled water or approved potable water of documented quality. If the bentonite seal is to be placed in saturated conditions (i.e., below the water table), the bentonite pellets or chips will be placed above the filter pack in a manner that prevents bridging in the annular space. The bentonite pellets or chips will be allowed to hydrate per the manufacturer's specifications.

After the temporary bentonite seal has hydrated, the remaining auger flights will be removed. Due to the temporary nature of the monitoring wells, a grout sanitary seal will not be used.

2.5.3 Temporary Monitoring Well Development

Once static water level measurements (see Section 2.13) have been obtained, the temporary groundwater monitoring wells will be developed as part of the purging process prior to groundwater sample collection, as described in Section 2.7.5.

2.6 BORING AND TEMPORARY GROUNDWATER MONITORING WELL ABANDONMENT

2.6.1 Shallow Hand Auger Borings

Shallow borings (typically up to 4 feet bgs) advanced using a hand auger will be abandoned by backfilling the boring after completion of soil sample collection activities. Shallow borings will be backfilled to the ground surface with bentonite chips, which will be hydrated with either distilled water or approved potable water of documented quality.

2.6.2 Deep Borings

Deep borings will be advanced using one of the two drilling methods described in Section 2.4. If a deep boring cannot be completed to the target depth, the boring will be abandoned by backfilling it with bentonite chips (see Section 2.6.1) or a neat, nonshrinking, cement grout, depending on the depth of the boring. The grout will consist of from 2 pounds to not more than 4 pounds of 100-percent pure sodium bentonite powder and from 5 gallons to not more than 8 gallons of approved potable water for each 94-pound sack of Type II Portland cement (or equivalent).

Depending on the depth of the boring to be abandoned, the grout will be either poured into the boring or tremied through the auger flights, drive casing, or open boring. As the grout is placed, any auger flights or drive casing in the boring will be retracted. The discharge end of the auger flights or drive casing will be submerged at all times until final removal of the auger flights or drive casing has occurred. Additional grout will be added from the surface to maintain the level of grout at the ground surface as settlement occurs. Where feasible, a pressurized tremie pipe will be used to grout during decommissioning activities, including all borings.

2.6.3 Temporary Groundwater Monitoring Wells

If Well Permit Applications are submitted to the Solano County DEM (see Section 2.3.1), the necessary groundwater monitoring well abandonment permit will also be obtained from the Solano County DEM prior to any well abandonment activities.

Abandonment procedures for the temporary groundwater monitoring wells will depend on the method used to install the well. Based on the well installation procedures described in Sections 2.5.1 and 2.5.2, the following three types of temporary well construction may require abandonment: pre-pack well with foam seal installed through the direct push drive casing (drive casing may or may not have been left in-place); pre-pack well installed through auger flights (auger flights left in-place); and pre-pack well with additional filter pack and temporary bentonite seal installed through auger flights (auger flights removed).

For temporary wells installed via the direct push method, the drill rods will be placed inside the well casing and used to punch out the well bottom cap. The well casing will then be used as a tremie pipe to grout the boring as the pre-pack well screen, riser casing, and drive casing (if present) are retracted from the boring.

For temporary wells installed through auger flights that have been left in place, the drill rods will be placed inside the well casing and used to punch out the well bottom cap. The well casing will then be used as a tremie pipe to grout the boring as the pre-pack well screen, riser casing and flight augers are retracted from the boring. The discharge end of the auger flights will be submerged at all times until final removal of the auger flights has occurred.

For temporary wells installed through auger flights that have been removed, the drill rods will be placed inside the well casing and used to punch out the well bottom cap. The well casing will then be used as a tremie pipe to initially pressure grout the boring by applying external pressure in excess of hydrostatic pressure. Pressure will be maintained by sealing the well casing while pumping the grout into the casing with a positive displacement pump and monitoring pressures at the surface with a gauge. Pressure grouting will be considered complete when a pressure of 25 pounds per square inch (psi) is maintained at the well head for 5 minutes. The pressure applied to the grout will be sufficient to penetrate both the pre-pack and the additional filter pack installed around the pre-pack well screen. The well casing will then be used as a tremie pipe to grout the boring as the pre-pack well screen and riser casing are retracted from the boring.

If for any reason grouting cannot be successfully performed as described above, the temporary wells will be overdrilled to just below the well depth in order to remove the well casing and construction materials. The boring created as a result of the overdrilling activities will be abandoned as described in Section 2.6.2.

In all cases, additional grout will be added from the surface to maintain the level of grout at the ground surface as settlement occurs.

2.7 FIELD SAMPLING ACTIVITIES

All field sampling activities will be conducted under the direct supervision of an OE specialist (see Section 2.3.4).

Various types of samples (e.g., soil, sediment, surface water, groundwater) will be collected for chemical analysis. Soil and sediment samples will also be logged in the field by the geologist supervising the sample collection activities (see Section 2.18.3) and the information recorded on the Test Boring Log (see Appendix F). Immediately following sample collection, the samples will be handled and shipped as described in Section 2.11. All field sampling equipment (including purging equipment) will be decontaminated between sampling locations as described in Section 2.15.1.

2.7.1 Sediment Sample Collection Procedures

Sediment samples will be collected by using an Ekman Dredge. The sediment will be removed from the Ekman Dredge, mixed in a stainless steel mixing bowl with a stainless steel spoon, and placed into laboratory-supplied, pre-cleaned sample containers.

If the Ekman Dredge method does not produce enough useable sample, a Teflon™ spoon, scoop, or spatula can be used to collect the sediment sample; however, when using these alternative methods, care must be taken to prevent the fine sediments from being washed away by the overlying water when bringing the sample to the surface. The sediment sample, retrieved via a spoon, scoop, or spatula, will be placed directly into a certified, pre-cleaned sample container.

Sediment sample collection activities will be recorded on the Surface Water/Sediment Data Form (see Appendix F).

2.7.2 Surface, Shallow, and Stockpile Soil Sample Collection Procedures

2.7.2.1 Surface and Shallow Samples.

Surface samples will be collected using a hand-held drive sampler. A 6-inch-long by 2.5-inch-diameter drive sampler will be attached to the sampling rods. The sampler will contain one 6-inch-long by 2-inch-diameter, certified, pre-cleaned, stainless steel liner. The sampler will not be allowed to drop onto the soil being sampled. A hand-driven slide hammer will be attached to the top of the sampling rods. The dead weight of the sampler, rods, and slide hammer will rest on the ground surface (or bottom of the boring) and a seating blow applied. The sample rods will be marked at 6-inch increments so the advance of the sampler can be observed. The sampler will be driven into the undisturbed formation with blows from the slide hammer. Blows will be applied until the sampler has advanced 6 inches, or until it is determined that no visible advancement is being made. After the sampler is driven to the desired depth, it will be removed from the boring, opened, and the liner removed. The percent of recovery will be recorded on either the Test Boring Log or in the Daily Field Report (see Appendix F).

If for any reason the hand-held drive sampler cannot be advanced, surface scraping may be used to collect soil, sediment, or bedrock samples from the ground surface. The only location from which bedrock samples will be collected is the Ridge. A thin layer of soil/sediment will be scraped using a stainless steel spoon. A stainless steel chisel may be used to collect bedrock chips. The samples will be placed directly into a pre-cleaned sample container.

Shallow samples will be collected using a hand auger equipped with a 3-inch-diameter cylindrical stainless steel bit. Hand augering will be used to collect shallow soil samples up to 4 feet bgs and from the soil stockpiles. The hand auger will be used to advance the borings to the desired depth. Prior to sample collection, excessive cuttings from the bottom of the boring will be removed. Soil samples will then be collected with the hand-held slide hammer, as described above.

2.7.2.2 Stockpile Samples.

Samples collected from the soil stockpile areas will be collected by removing 2 feet of topsoil/debris from the proposed stockpile sampling location using a pick and shovel, if necessary, then collecting an undisturbed soil sample using the hand drive sample method described in Section 2.7.2.1. Since the Ridge Soil Stockpiles have not been previously sampled, a four-point composite sample will be collected from each of the larger stockpiles, and a two-point composite sample will be collected from each of the smaller stockpiles per the field sampling program (see Section 2.2.1). The samples will be collected from each stockpile as previously described. The samples from each stockpile will be composited by the analytical laboratory prior to analysis.

2.7.3 Soil Sample Collection Procedures During Direct Push and Hollow-Stem Auger Drilling

Deep borings (greater than 4 feet bgs) will be advanced using one of the two drilling methods described in Section 2.4. During drilling, subsurface samples will be collected either continuously (using the direct push method) or at discrete intervals (using the HSA method). When continuous cores are collected, discrete samples will be retained from the continuous cores for chemical analysis from the appropriate depths per the field sampling program (see Section 2.2.1). During

HSA drilling, discrete samples will be collected at a minimum of 5-foot intervals or less per the field sampling program (see Section 2.2.1).

A combination of the soil cuttings, cores and samples will be used to lithologically log the boring using the Test Boring Log (see Appendix F).

In order to collect continuous cores using the direct push method, a dual-tube or "cased" system will be used. A small-diameter drive casing (up to 3.5 inches) and an inner sample barrel will be simultaneously pushed, pounded, or vibrated into the ground by the direct push rig. The sample barrel is made of a 3-foot-long section of thin-walled steel tubing. The sample barrel has an outside diameter (OD) slightly smaller than the inside diameter (ID) of the drive casing to allow it to be raised and lowered freely inside the drive casing. The bottom of the sample barrel rests on a shoulder cut into the drive shoe. Either six 6-inch-long certified, pre-cleaned, stainless steel liners or one certified, pre-cleaned clear plastic liner will be placed inside the sample barrel. A basket catcher will be affixed to the bottom of the sample barrel, if necessary, to prevent loose soil from falling out of the sample liner when the sample barrel is retrieved. In order for the sample barrel and drive casing to be advanced into the ground simultaneously, an effective means of coupling the inner sample barrel with the outer drive casing is required. This is achieved by the internal rods, which keep the inner sample barrel seated against the drive shoe. The internal rods (3-foot sections of small-diameter steel sampling rods) serve several purposes. First, they are used to lower the empty sample barrel to the bottom of the steel-cased boring. Then, the rods are placed in compression inside of the drive casing by attaching the drive head; this keeps the bottom of the sample barrel snug against the shoulder of the drive shoe. Finally, after the drive casing and sample barrel have been simultaneously advanced 3 feet, the internal rods and sample barrel will be retrieved, providing access to the sample liner(s). Continuous cores will be collected by repeating the sample collection process every 3 feet.

Discrete samples can also be collected using the direct push method, by attaching a displacement point to the drill rods instead of the sample barrel until the target depth for sample collection is reached. The displacement point is then retrieved and the sample barrel inserted for discrete sample collection; however, it is generally more effective to collect continuous core samples with the direct push method. The stainless steel sample liner, or a cut section of the plastic liner, is retained for sample analysis from the appropriate target sample depth.

To collect discrete soil (or weathered bedrock) samples using the HSA drilling method, the pilot bit is removed and, if necessary, the inside of the hollow stem is cleaned out. Soil samples will be collected by lowering a split-spoon sampler (fitted with certified, pre-cleaned, stainless steel liners), attached to the drill rods, to the bottom of the boring. The split-spoon sampler will then be driven into the undisturbed formation with a 140-pound hammer repeatedly dropped from a height of approximately 30 inches. The number of times required for the hammer to drop to collect 6 inches of samples will be recorded on the Test Boring Log (see

Appendix F) to provide qualitative information regarding the density of the material encountered. The nominal size of the split-spoon sampler will be either 1.5 or 2.5 inches ID, 18 inches in length, and manufactured of stainless steel. Three 6-inch-long, certified, pre-cleaned, stainless steel liners will be placed inside the split-spoon sampler. Upon sample retrieval, the split-spoon sampler will be opened and the lead sample liner retained for chemical analysis. The two remaining sample liners will be used for lithologic description.

Soil samples collected for VOC analysis by EPA Method SW8260B will be sampled using the Encore™ sampling system according to EPA Method SW5035.

2.7.4 Grab Surface Water and Seep/Spring Sample Collection Procedures

Grab surface water and seep/spring samples will be collected in laboratory-supplied, pre-cleaned sample bottles containing the appropriate preservatives, if applicable, for the proposed analytical test method (see Section 2.17). Grab surface water samples will be collected by holding the sample bottles at the desired depth within the water column in areas where water has ponded. If necessary, a Van Dorn® sampler or equivalent device may be used to collect the surface water samples, which will allow collection of surface water from a discrete depth. The water collected from the sampler will then be transferred to the laboratory-supplied, pre-cleaned sample bottles containing the appropriate preservatives. Depending on field conditions, grab surface seep/spring samples will be collected by holding the sample bottles beneath the seep/spring. If necessary, a stainless steel bowl or similar device will be used to help contain sufficient seep/spring water for sample collection. Grab surface water and seep/spring sample collection activities will be recorded on the Surface Water/Sediment Data Form (see Appendix F).

2.7.5 Groundwater Sample Collection Procedures

Groundwater samples will be collected from each of the temporary groundwater monitoring wells. Groundwater sample collection activities will be recorded on the Well Purging and Sample Collection Form (see Appendix F). Groundwater samples will be collected from the wells, and static water level measurements will be obtained (see Section 2.13).

Because the temporary wells are being used for a one-time groundwater sample collection event and will be abandoned immediately after groundwater sample collection, well development will be combined with the well purging activities.

2.7.5.1 Well Development/Purging.

Before well development/purging, the static water level will be measured using an electric sounder, as described in Section 2.13. After the static water level has been measured, the depth to the bottom of the well will be sounded.

After the static water level and well depth have been measured, purging will commence with either a peristaltic pump (or equivalent) or a Teflon™ or disposable polyethylene bailer. If the well is capable of yielding three well casing volumes, samples will be collected at regular intervals (5 to 15 minutes) during the development/purging and measured for pH, electrical conductivity (EC), temperature, and turbidity. Wells will be continually developed/purged until the following field parameters have stabilized and relatively sediment-free water is being produced from the well, or a minimum of three well casing volumes have been removed, whichever comes first:

- pH ± 0.1 pH units, for three consecutive readings
- EC ± 5 percent, for three consecutive readings
- Temperature ± 0.5 degree (°) Celsius (C) for three consecutive readings
- Turbidity ± 10 Nephelometric Turbidity Units (NTU) after at least 30 minutes.

During development/purging, values for each of the field parameters will be recorded on the Well Purging and Sample Collection Form (see Appendix F). Field instruments used to measure the field parameters will be calibrated according to the procedures presented in Section 2.14. Color and any odor observed will also be recorded. If the well recovers quickly, it will be sampled as soon as possible. If recharge is slow, groundwater samples will be collected after the water level has recovered to 80 percent of its static water level, or within 16 hours after completion of development/purging, whichever comes first. If the well is not capable of stabilizing or producing three well casing volumes, the well will be developed/purged until dry and the samples collected as soon as a sufficient amount of water has reentered the well.

All purge water will be appropriately contained pending groundwater analytical results and proper disposal (see Section 2.16.2).

2.7.5.2 Sample Withdrawal.

Containers to be used to collect each type of sample and their holding times are discussed in Section 2.10. Samples will be collected using a peristaltic pump (or equivalent) or Teflon™ or disposable polyethylene bailer. The peristaltic pump (or equivalent) will not be used to collect samples for VOC analysis. The portions of bailer lines that enter the water will be stainless steel or Teflon™-lined cable. Samples collected for chemical analysis will be collected in plastic or glass containers filled to capacity. If preservatives are in the containers, they will not be allowed to overflow while filling. The pH of the preserved samples will be checked in the field by pouring a small amount of the sample onto pH paper. The pH paper will not make contact with the sample container. The pH will be noted on the Chain-of-Custody (COC) Record to notify the laboratory that the addition of preservative may be required (see Appendix F).

All groundwater samples designated for metals analysis will be field filtered (i.e., dissolved metals) unless otherwise stated in the field sampling program (see Section 2.2.1). Samples collected for dissolved metals analysis will be field-filtered using 0.45-micron membrane filters by either nitrogen pressure filtration or in-line filtration. Nitrogen pressure filtration utilizes a pressure vessel, nitrogen gas, and a disposable in-line filter. In-line filtration utilizes a disposable, pressurized, polyethylene bailer and hand pump, and a disposable in-line filter. A field filter blank will be collected when field filtering is performed, as described in Section 2.9.2.2.

Groundwater samples will be collected in the following order:

- VOCs
- PAHs
- General water chemistry compounds
- Dioxins
- Explosives
- Total metals
- Filtered metals.

Field parameters (i.e., pH, EC, temperature, turbidity) will be measured and recorded after sample collection to document the stability of the water over the sampling period. Water levels will be measured after sample collection and after well conditions have stabilized prior to well abandonment.

2.7.5.3 Grab Groundwater Sample Collection.

In the event that a temporary groundwater monitoring well cannot be installed using one of the methods described in Section 2.5, or the depth to groundwater is so shallow that a temporary well is unable to be installed (potentially in the South Valley), a grab groundwater sample will be collected from the boring, by inserting a piece of pre-pack well screen and riser casing into the open boring and collecting a grab groundwater sample with a Teflon™ or disposable polyethylene bailer through the PVC casing. No development/purging will be conducted prior to collection of a grab groundwater sample. Grab groundwater samples will then be collected as described in Section 2.7.5.2.

2.8 FIELD TESTING

2.8.1 On-Site Mobile Laboratory

A California state-certified on-site mobile laboratory will be used to provide screening-level (and, if appropriate, definitive-level) data, if the volume of sample collection during the field sampling program makes its use cost effective. Field tasks well suited to the use of an on-site mobile laboratory for rapid sample turnaround include (but are not limited to) the TNT step-out boring program. An on-site mobile laboratory is capable of providing rapid turnaround of soil and groundwater utilizing the most appropriate technology and the requirements in Section 3.2.4.2.

Sample collection and sample handling protocols and procedures for the on-site mobile laboratory are the same as for an off-site laboratory. Samples will be collected with decontaminated sampling equipment, preserved in the appropriate sample containers, labeled, and transported to the on-site mobile laboratory in an ice chest (at approximately 4°C ±2°C: Note: Sample received may not be able to reach 4°C between time of sample collection and delivery to the on-site mobile laboratory) under COC protocol. An on-site mobile laboratory will be subject to the same instrument calibration and maintenance requirements as an off-site analytical laboratory and must be able to conduct calibration blanks, method blanks, matrix spike and matrix spike duplicates, internal standards, and surrogate and duplicate samples consistent with the requirements specified in the QAPP (see Chapter 3.0).

One source water sample shall be obtained at the beginning of each field effort for each source of water used for rinsing. If source water is obtained from an on-site source water outlet (i.e., potable water), the collection frequency will generally be once per field effort. If bottled water (i.e., deionized [DI] water) is used, the frequency will be one per vendor lot. This sample may be collected as the first equipment blank on the first day of sampling. The sample will be analyzed for all contaminants of concern, which must be less than their respective PQLs. Source water sample analyses may be placed on hold for EPA Method SW8290, pending detection of target analytes during analysis of equipment rinsate blanks using the same water. Source water will be monitored on an ongoing basis by the evaluation of equipment blanks. If equipment blanks detect any contaminants of concern, an additional source water sample will be analyzed for the contaminants of concern to determine if the water or the decontamination procedures are the source of contamination.

2.9 FIELD QUALITY CONTROL

Ridge Soil (Bedrock) Samples - Soil (bedrock) samples collected from the Ridge between the North and South Valleys (see Figure 2.2-4) will use the following unique numbering system:

RI-A

where: RI = Ridge

A = First sampling location (subsequent sampling locations associated with the Ridge will be designated B, C, and D). The four samples will be composited by the analytical laboratory into a single sample for analysis.

Field QC samples will be collected during the field investigation activities to assess the influence of sampling procedures, equipment, and handling on the reported results, as discussed in Section 3.2.5.1 of the QAPP. The following types of QC samples will be collected.

2.9.1 Duplicate Samples

Field duplicates are samples collected separately at a particular location and time, in order to assess errors associated with sample heterogeneity, sampling methodology applicability, and sample handling techniques. Collocated duplicates are collected separately and placed directly into sample containers. Theoretically, each sample equally represents the medium at a given time and location. This is the required type of sample for volatiles analyses and most water samples. Homogenized duplicates are duplicates of nonaqueous matrices whose subsequent analysis permits prior homogenization of the media, and are obtained in sufficient volume to fill all sample containers. The media is then homogenized, divided into two or more equal parts, and aliquots of each part are used to fill each sample container.

Since more information can be obtained from samples with detectable concentrations, efforts will be made to select duplicate samples from those areas anticipated to have the highest potential for contamination. Field duplicate samples for each matrix will number 10 percent of the original sample number per field effort or field event, with a focus on critical sampling areas. The number of field duplicate samples to be collected is specified in Tables 2.9-1 through 2.9-9; however, field sampling technicians have the authority to make minor changes to designated samples based on field conditions. The duplicate samples will be collected, labeled, packaged, and sealed in the same manner as the original field samples and submitted "blind" to the analytical laboratory. The duplicate samples will be analyzed for the same parameters as the original field samples.

Collected duplicates are defined as two samples collected independently at a single sampling location during a single act of sampling for analysis at one laboratory for each specified method. Field duplicate water samples will be collected independently (i.e., from separate bailers) at a well location during one act of sampling. Duplicate water samples will be collected by sequentially filling a sample bottle for a particular analysis and then the identical sample bottle for the duplicate sample. This procedure will be continued for each type of sample bottle until all sample bottles are filled.

Field duplicate soil samples will generally be collected from two consecutive sample liners collected at one boring or sampling location during a single act of sampling. However, depending on the required sample volume, the soil stratigraphy being sampled, or other considerations, two separate aliquots of soil may be collected from a single liner and placed into two separate containers.

Field duplicates for DTSC and the United States Army Core of Engineers (USACE) for subsurface samples, and splits for surface samples, will be collected at the following frequencies: 10 percent for DTSC and 5 percent for the USACE.

2.9.2 Equipment Blanks, Filter Blanks, Temperature Blanks, and Trip Blanks

2.9.2.1 Equipment Blanks.

Equipment blanks will be used to evaluate decontamination procedures for field sampling equipment. One set of equipment blanks will be collected each day of soil sampling for each sampling crew. For water samples collected with Teflon™ bailers, one equipment blank will be collected per day. For samples collected with disposable bailers, daily rinsate samples will not be required. One disposable bailer blank will be collected per lot of bailers used. For water samples pumped through a sampling device (except for metal filtration chambers, which require a filtration blank), one equipment blank will be collected per pump each day of sampling.

Equipment blanks are samples of Type II reagent-grade or equivalent water that has been poured through (in the case of bailers and split-spoon samplers) or pumped through (in the case of pumps) the sampling device, transferred into the appropriate sample bottles, and transported to the laboratory for analysis. Equipment blanks will be prepared immediately after the sampling device has been decontaminated, preferably between two sample collection points where target analyte detection is expected, rather than at the start or completion of the sampling day. Equipment blank samples will be collected, labeled, packaged, and sealed in the same manner as the original field samples and submitted "blind" to the analytical laboratory. Equipment blank samples will be analyzed for all analyses performed on associated samples of the associated matrix.

Soil samples collected in certified, pre-cleaned, stainless steel liners driven directly into the sample medium without possible cross-contamination from other equipment will not require an equipment blank.

Equipment blank analyses for some methods, such as EPA Method SW8290, may be placed on hold for analysis if the associated field samples include detected results. Equipment rinsate blank results will be routinely monitored to assess the effectiveness of decontamination procedures. If rinsate results are detected, field procedures will require revisions to address the source of contamination. If results are routinely nondetected, the frequency of equipment blank sampling may be reduced with permission of the regulators.

One source water sample shall be obtained at the beginning of each field effort for each source of water used for rinsing. If the source water is obtained from an on-site source water outlet (i.e., potable water), the collection frequency will be once per field effort. If bottled water (i.e., deionized [DI] water) is used, the frequency will be one per vendor lot. This sample may be collected as the first equipment blank on the first day of sampling. The sample will be analyzed for all contaminants of concern, which must be less than their respective practical quantitation limits (PQLs). Source water sample analyses may be placed on hold for EPA Method SW8290, pending detection of target analytes during analysis of equipment rinsate blanks using the same water. Source water will be monitored on an ongoing basis by the evaluation of equipment blanks. If equipment blanks detect any contaminants of concern, an additional source water sample will be analyzed for the contaminants of concern to determine if the water or the decontamination procedures are the source of contamination.

2.9.2.2 Filter Blanks.

Filter blanks will be required for this project. Filter blanks will be prepared from one of every ten filters per filter lot and will be analyzed for the same parameters as the associated filtered samples. For water samples pumped through a metal filtration chamber, one field filter blank will be collected per filter unit each day of sampling. Field filter blanks are prepared by filtering Type II reagent-grade or equivalent water through a clean 0.45-micron membrane filter, collecting the water in the appropriate sample containers, and transporting it to the laboratory for inorganic analysis.

2.9.2.3 Temperature Blanks.

Temperature blanks will accompany each cooler shipment of water samples, soil samples, or soil and water samples sent to the laboratory for analysis by methods requiring sample preservation by cooling. A temperature blank is a sample bottle containing water. One temperature blank will accompany each cooler containing either water samples, soil samples, or water and soil samples.

2.9.2.4 Trip Blanks.

Trip blanks will accompany each cooler shipment of water samples, soil samples, or soil and water samples sent to the laboratory for analysis of VOCs (EPA Methods SW8260B). A trip blank is a set of VOA vials containing Type II analyte-free water that is prepared in the laboratory, taken to the sampling site, and returned to the laboratory with samples submitted for analysis of VOCs. Trip blanks shall not be opened in the field. One trip blank will accompany each cooler containing either water samples, soil samples, or water and soil samples to be analyzed for VOCs. The trip blank shall be analyzed by the same VOC analytical methods as the samples, and (in the case of water samples) shall be part of the same preparation batch as the samples.

2.9.3 Field-Designated Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike (MS)/matrix spike duplicate (MSD) samples should be field-designated by the sampler for each shipment of samples. For every analytical batch of 20 or fewer soil samples within a sampling event from a major lithological type or from a major, distinct aqueous matrix, the laboratory will prepare and analyze an MS/MSD pair from a project sample collected by Earth Tech. The sampler will designate one or more of the samples in each shipment by noting on the COC Record (see Appendix F) that the sample(s) are for MS/MSD (in the Remarks column but not on the sample). It is important to provide a sufficient volume of MS/MSD water samples. Three times the usual volume, or more if specified by the laboratory, should be provided for the MS/MSD and marked on the COC Record. For water samples that require multiple containers (usually one for each analysis), a single sample number will apply to all containers of that sample. Samples designated for MS/MSD analysis should be typical of the matrix and should not be highly contaminated in order to minimize MS/MSD imprecision resulting from high levels of environmental contamination. In order to minimize the effects of soil heterogeneity, the laboratory will use a single or adjacent liners.

2.9.4 Field Audits

At least once in the course of each phase of field investigation for this project, the QCSM or his representative will designate an Earth Tech field auditor not associated with the project team to be on site to perform an independent field QA audit to ascertain adherence to the field protocols and procedures set forth in this FSP, as specified in Section 3.3.2.3 of the QAPP. Additional follow-up audits may be required upon initiation of different phases that involve previously unaudited field activities, or to follow-up on corrective actions. Any deviations from the field protocols and procedures that could compromise the quality of the data obtained will be reported by the field geologist to the PM, who will decide what action to take. Any such deviations will be documented on a Nonconformance Report (NCR) (see Section 3.3.2.4, Figure 3.3-1) to include a description of the problem, how it was discovered, the corrective action, the follow-up and confirmation, and the appropriate signatures of those involved.

2.10 SAMPLE STORAGE, PRESERVATION, AND HOLDING TIMES

Sample bottles pre-cleaned and treated according to EPA specifications for the appropriate methods will be supplied by the analytical laboratory. Certified, pre-cleaned, stainless steel liners will be used for soil/sediment sample collection.

Detailed requirements for sample containers and preservatives are presented in Section 3.2.8 of the QAPP. Table 2.10-1 lists the recommended sample containers, and the preservation and holding times for each proposed analytical test method and matrix.

2.11 SAMPLE HANDLING AND SHIPMENT

2.11.1 Sample Sealing

Each sample container will be sealed immediately after sample collection. In the case of soil liners, each end of the liner will be covered with Teflon™ sheeting and plastic end caps and secured with Teflon™ tape. In the case of the bottles used for water samples, sample bottle lids will not be mixed, and all sample lids will stay with the original bottles. If the water sample volume is low due to limited sample availability, the water level will be marked on the side of the sample bottle with a grease pencil. This procedure will help the laboratory determine if any leakage occurred during shipment.

2.11.2 Sample Identification System

All samples collected will be assigned a unique sample identification number. The following unique sample identification system will be used for the Project Site. Other sample numbers may be substituted, based on field conditions, provided the sample numbers used remain unique. Field QC samples (i.e., duplicates, equipment blanks, filter blanks, etc.) will be sent blind to the laboratory; therefore, field location aliases will be required. Samples specified for laboratory QC (MS/MSD) should be clearly marked with an asterisk and noted in the Comments section of the COC Record.

TNT Strips - Soil samples collected from the five TNT strips (see Figure 2.2-1) will use the following unique numbering system:

TNT-1A/1

where: TNT-1 = TNT Strip #1 (other strips will be designated 2, 3, 4, 5)

A = First sampling location (subsequent sampling locations associated with TNT Strip #1 will be designated B, C, D, E, etc.)

1 = Sample collection depth in feet bgs ("0" will represent surface samples). Consecutive depths will be used for duplicate/QC samples.

If soil samples are being collected from step-out borings centered on a previous boring location (see Figure 2.2-1), soil samples from the step-out borings will use the following unique numbering system:

TNT-1C2/1

where: TNT-1 = TNT Strip #1 (other strips will be designated 2, 3, 4, 5)

C = Previous sampling location

2 = Step-out sampling location (other step-out sampling locations will be designated 3, 4, 5, etc.)

1 = Sample collection depth in feet bgs ("0" will represent surface samples). Consecutive depths will be used for duplicate/QC samples.

Demolition Sites - Soil samples collected from the two demolition sites (see Figure 2.2-3) will use the following unique numbering system:

DA1-3W1

where: DA1 = Demolition Site #1 (other areas will be designated 2, 3, etc.)

1 = First sampling location (subsequent sampling locations associated with Demolition Site #1 will be designated 2, 3, 4, etc.)

W1 = Sidewall sample (subsequent samples will be designated W2, W3, etc.).

Flare Site - Soil samples collected from the Flare Site (see Figure 2.2-3) will use the following unique numbering system:

FA-1/1

where: FA = Flare Site

1 = First sampling location (subsequent sampling locations associated with Flare Site will be designated 2, 3, 4, etc.)

1 = Sample collection depth in feet bgs ("0" will represent surface samples). Consecutive depths will be used for duplicate/QC samples.

Stockpiles - Soil samples collected from the two stockpiles at the Ammunition Renovation/Primer Destruction Site (see Figure 2.2-2) will use the following unique numbering system:

SP1-A

where: SP1 = Soil Stockpile #1

A = First sampling location (subsequent sampling locations associated with Soil Stockpile #1 will be designated B, C, etc.)

Ridge Stockpiles - Soil samples collected from the nine Ridge Stockpiles between the North and South Valleys (see Figure 2.2-4) will use the following unique numbering system:

RSP1-A

where: RSP1 = Ridge Soil Stockpile #1

A = First sampling location (subsequent sampling locations associated with soil Ridge Soil Stockpile #1 will be designated B, C, and D). The four samples will be composited by the analytical laboratory into a single sample for analysis.

Ridge Soil (Bedrock) Samples - Soil (bedrock) samples collected from the Ridge between the North and South Valleys (see Figure 2.2-4) will use the following unique number system:

R1-A

where: R1 = Ridge Area #1

A = First sampling location (subsequent sampling locations associated with the Ridge will be designated B, C, and D). The four samples will be composited by the analytical laboratory into a single sample for analysis.

Ammunition Renovation/Primer Destruction Site - Soil samples collected from the Ammunition Renovation/Primer Destruction Site (see Figure 2.2-2) will use the following unique numbering system:

AR-1/1

where: AR = Ammunition Renovation/Primer Destruction Site

1 = First sampling location (subsequent sampling locations associated with Ammunition Renovation/Primer Destruction Site will be designated 2, 3, 4, etc.)

1 = Sample collection depth in feet bgs ("0" will represent surface samples). Consecutive depths will be used for duplicate/QC samples.

Howitzer Test Facility - Soil samples collected from the Howitzer Test Facility (see Figure 2.2-2) will use the following unique numbering system:

HF-1/1

where: HF = Howitzer Test Facility

1 = First sampling location (subsequent sampling locations associated with Howitzer Test Facility will be designated 2, 3, 4, etc.)

1 = Sample collection depth in feet bgs ("0" will represent surface samples). Consecutive depths will be used for duplicate/QC samples.

Wetlands Sediment and Surface Water - Two types of samples, sediment and surface water, will be collected from the South Valley Wetlands (see Figure 2.2-3). Sediment samples collected from the South Valley Wetlands will use the following unique numbering system:

WET-1/0

where: WET = Wetlands (sediment)

1 = First sampling location (subsequent sampling locations associated with the Wetlands will be designated 2, 3, 4, etc.)

0 = Sample collection depth in feet bgs ("0" will represent surface samples). Consecutive depths will be used for duplicate/QC samples.

Grab surface water samples collected from the South Valley Wetlands will use the following unique numbering system:

SW-1

where: SW = Wetlands (grab surface water)

1 = First sampling location (subsequent sampling locations will be designated 2, 3, 4, etc.)

A = A, B, C, etc., will be added for duplicate/QC samples

Surface Seeps/Springs - Surface seep/spring water samples collected from the designated Seep/Springs (see Figure 2.2-3) will use the following unique numbering system:

SPS-1

where: SPS = Surface Seep/Spring

1	=	First sampling location (subsequent sampling locations will be designated 2, 3, 4, etc.)
A	=	A, B, C, etc., will be added for duplicate/QC samples

Temporary Groundwater Monitoring Wells - Soil samples and groundwater samples collected from the pilot boring and temporary groundwater monitoring wells (see Figures 2.2-2 and 2.2-3) will use the following unique numbering system:

TW-1/1

where:	TW	=	Boring (correspond to well number)
	1	=	Boring number (correspond to well number)
	1	=	Sample collection depth in feet bgs ("0" will represent surface samples). Consecutive depths will be used for duplicate/QC samples.

TW-1

where:	TW	=	Temporary Monitoring Well
	1	=	Well number
	A	=	A, B, C, etc., will be added for duplicate/QC samples

Field QC Samples - Duplicate samples will be labeled as previously discussed. MS/MSD are regular samples except additional volume will be collected and will be labeled as a regular sample. Field QC samples that require water samples to be collected (i.e., equipment blanks, filter blanks) will be labeled with a site identification (i.e., TNT-1, FA) and a sequentially numbered suffix (i.e., W1, W2, etc.).

2.11.3 Sample Labeling

Each sample will be labeled immediately after the sample is collected and the sample container is sealed. Information recorded on the sample label will include the following:

- Project name
- Project number
- Unique sample identification number
- Date and time of sample collection
- Sampler's name or initials
- Preservatives used
- Analysis required.

Sample labels will be affixed by the sampler to the sample containers. Sample labels will be covered, if necessary, with clear tape after being affixed to the sample container, to protect the label from moisture.

2.11.4 Sample Packaging and Shipment

U.S. Department of Transportation (DOT) regulations will be followed for packaging and shipment. Samples will be properly packaged for shipment and submitted to the designated analytical laboratory for analysis, under strict COC protocol (see Section 2.18.2). All glass sample bottles will be wrapped in bubble-wrap or equivalent and sealed in self-sealing plastic bags to minimize the potential for cross-contamination and breakage during shipment. Soil samples contained in stainless steel liners will be sealed in self-sealing plastic bags.

Each cooler will be filled with the sealed and bubble-wrapped sample containers. Additional packaging will be used to prevent sample containers from moving or from making contact during shipment. Enough double-bagged ice or blue ice will be added to the coolers to maintain sample temperature at 4° ±2°C during shipment. A temperature blank will be placed in each cooler along with the samples.

2.11.4.1 Shipment by Commercial Carrier or Courier Service.

If the sample coolers are to be shipped by a commercial carrier or courier service (other than the analytical laboratory), the COC Record (see Appendix F) accompanying the coolers to the analytical laboratory will be placed inside a sealed plastic bag and taped to the inside of the cooler lid. The coolers will then be secured and custody-sealed for shipment to the analytical laboratory. The custody seal will consist of a regular paper custody seal or filament tape wrapped around the cooler at least twice, with the tape end signed before the cooler is shipped. Wide, clear tape will be placed over paper custody seals to help ensure against accidental breakage. Custody seals will be used for all sample containers shipped by either a commercial carrier (i.e., Federal Express) or a courier service.

The coolers will be transported as environmental samples to the analytical laboratory as expeditiously as possible (e.g., via Federal Express overnight delivery service, if necessary). If the samples are sent by a commercial carrier, a bill of lading will be used. Receipts of the bills of lading will be retained as part of the permanent documentation. Commercial carriers/courier services are not required to sign-off on the COC Record as long as the form is sealed inside the sample cooler and the custody seals remain intact. A standard airbill will be necessary in order to ship environmental samples by a commercial carrier.

2.11.4.2 Shipment by Earth Tech or Analytical Laboratory.

If the samples are delivered directly to the analytical laboratory by Earth Tech field personnel, or picked up from either the Project Site or Earth Tech's San Jose office by the analytical laboratory, the COC Record need not be secured inside the cooler lid. The COC Record will be handed directly to the analytical laboratory personnel after COC sign-off protocols have been completed. Custody seals will not be required for coolers delivered by Earth Tech or picked up by the analytical laboratory.

2.12 SURVEYING

All boring and temporary or permanent groundwater monitoring well locations will be surveyed to a standard horizontal and vertical control by a surveyor licensed in the state of California. Boring and temporary monitoring well elevations will be measured to the ground surface. All elevations will be surveyed to the nearest 0.01 foot and referenced to msl. The horizontal locations will be surveyed to plus or minus two inches and referenced to the California State Plane Coordinate System.

2.13 MEASUREMENT OF WATER LEVELS

Water levels in the temporary groundwater monitoring wells will be measured to establish depth to groundwater. Measurements will be recorded as feet below the surveyed measuring point (i.e., ground surface), and recorded as feet above msl. Water level measurements will be collected after the groundwater monitoring wells are installed and the water level has been allowed to stabilize prior to any combined well development/purging activities (see Section 2.7.5.1). Water level measurements will also be recorded before and after groundwater sampling activities. To reduce the potential for the water level tape to come into contact with the sides of the well casing, it will be lowered slowly into the well. Separate measurements will be made until two sequential measurements differ by no more than 0.01 foot. Water level measurements will be recorded on the Water Elevation Form (see Appendix F).

2.14 FIELD TEST EQUIPMENT

Field test equipment procedures for various meters that will be used to obtain field data during the investigation activities are presented in this section and summarized in Table 2.14-1. Procedures for using health and safety field monitoring equipment (i.e., magnetometer) are presented in the SSHP. Field instruments will be calibrated prior to use, and the calibration information will be recorded on either the Instrument Calibration Log or the Field Meter Instrument Calibration Log - Temperature, Conductivity, Dissolved Oxygen (see Appendix F). All field instruments will be maintained, calibrated or checked, and operated according to the manufacturers' specifications and guidelines. Test equipment, calibration frequencies, and field QC procedures are summarized in Tables 2.14-1, 2.14-2, and 2.14-3. The sensitivity of the field test equipment being used will be recorded, on either the Instrument Calibration Log or the Field Meter Instrument Calibration Log.

2.14.1 pH Meter

The pH meter, which will be used to measure pH according to EPA Method 150.1, will be calibrated at the beginning and end of each sampling day. The calibration will include setting of a range with a 7.0-pH buffer solution and a 4.0-pH or a 10.0-pH buffer solution, depending on whether acidic or alkaline water conditions are expected. The calibrating standards will be checked to ensure they do not exceed any expiration dates. The battery will be checked regularly. The pH electrode will contain sufficient liquid, and the outside of the probe will be kept moist. The electrode will be rinsed with deionized (DI) water after each reading and the storage cap replaced. The pH meter will be checked periodically during the sampling period. If drifting occurs (i.e., the reading varies by more than one-tenth of a unit between calibration checks), the probe will be cleaned and the meter recalibrated.

2.14.2 Electrical Conductivity Meter

The EC meter will be used to measure EC according to EPA Method 120.1. The EC meter will be calibrated over the operating range expected in the field. Calibration will be made with a potassium chloride solution at the beginning and end of each sampling day. The calibrating standard will be checked to ensure it does not exceed any expiration date. The battery will be checked regularly. The electrode will be rinsed with DI water after each reading, and the electrode will be kept clean.

2.14.3 Temperature Meter

Water temperature will be measured according to EPA Method 170.1, using the temperature compensation probe on the pH meter, EC meter, or with a digital thermometer that will be rinsed with DI water after each use. The field digital thermometer will be checked for accuracy once per year using a National Institute of Standards and Technology (NIST)-traceable thermometer. If the field thermometer does not read within ±1 °C, a new field thermometer will be used.

2.14.4 Turbidity Meter

The turbidity meter will be used to measure turbidity according to EPA Method 180.1. The turbidity meter will be calibrated at the beginning and end of each sampling day using factory-supplied standards. The meter will be calibrated against the standard closest to the anticipated value of the sample (i.e., typically 0 NTUs to 10 NTUs). Care will be taken to ensure that no air bubbles are in the standard solution and that the outside of the vial is clean of all marks that may affect the reading, including fingerprints. Sample vials will be kept free of smudges and dirt and will be rinsed with DI water between samples. The battery will be checked regularly.

2.14.5 Water Level Meter

The water level meter tape will be calibrated before commencement of field activities by checking the markings on the tape against a steel tape. Water level readings will be recorded to the nearest 0.01 foot. The alarm function will be checked before use by immersion in water.

2.15 DECONTAMINATION PROCEDURES

2.15.1 Equipment Decontamination

The purpose of decontamination procedures during drilling, well installation, and soil/sediment and water sampling is to prevent foreign contamination of samples and cross-contamination between sampling locations. Before use, all drilling equipment and sampling equipment will be decontaminated by steam-cleaning, or alternatively by washing with a nonphosphate detergent such as Liquinox® or Alconox™ (or equivalent). Equipment washed with a non-phosphate detergent will be double rinsed using potable water and DI (or Type II reagent-grade) water. Steam cleaning will be acceptable for drill rigs and drilling rods. The decontamination procedure for sampling equipment will incorporate a detergent wash, potable water rinse, rinse with pesticide-grade methanol, rinse with DI water, and a final rinse with Type II reagent-grade water. As an alternative to use of reagent-grade water, analytical data may be collected to indicate that DI water to be used for the final rinse is free of the contaminants of concern for this project above the level of detection for the relevant analyses. The following item-specific decontamination procedures will be followed:

- **Heavy equipment (i.e., drill rig)** - Remove loose material with a brush and steam clean with high-pressure water or portable high-pressure steam spray followed by a soap and water rinse prior to drilling at each new Project Site

- **Auger flights and/or drive casing, drill rods, etc.** - Steam clean with high-pressure water or portable high-pressure steam spray followed by a soap and water rinse prior to drilling each boring

- **Downhole abandonment equipment (i.e., tremie pipes)** - Steam clean with high-pressure water or portable high-pressure steam spray followed by a soap and water rinse between each well

- **Hand augers** - Nonphosphate detergent wash followed by a double rinse with water; then DI (or Type II reagent-grade) water between each boring

- **Samplers** - Steam clean with high-pressure water or portable high-pressure steam spray followed by a soap and water rinse or nonphosphate detergent wash followed by a double rinse with potable water; rinse with pesticide-grade methanol, then DI (or Type II reagent-grade) water between each sampling location

- **Well casing and screen** - Steam clean with high-pressure water or portable high-pressure steam spray followed by a soap and potable water rinse before installation unless sealed in plastic and certified clean by the manufacturer

- **Nondisposable Teflon™ bailer** - Steam clean or non-phosphate detergent wash followed by a double rinse with potable water; rinse with pesticide-grade methanol, then DI (or Type II reagent-grade) water between each sampling location

- **Water level meter** - Nonphosphate detergent wash followed by a double rinse with potable water; rinse with pesticide-grade methanol, then DI (or Type II reagent-grade) water between each measurement location

- **Field instrument probes** - Wipe with a damp, disposable paper wipe and/or rinse with DI (or Type II reagent-grade) water.

- **Slide hammer** - Nonphosphate detergent wash followed by a double rinse with potable water; then DI (or Type II reagent- grade) water between each sample when soil samples are collected in certified, pre-cleaned, stainless steel liners driven directly into the sample medium with a slide hammer.

Sampling equipment that is not readily decontaminated will be discarded after each use. Discarded materials, including decontamination solutions, will be accumulated and stored in appropriate containers pending proper disposal (see Section 2.16).

Pumps will be decontaminated by flushing/pumping a nonphosphate detergent-water solution, potable water; then DI (or Type II reagent-grade) water through the components. The pumps will be disassembled as far as possible (down to the check valve,) steam cleaned with a hot water and nonphosphate detergent solution, and then rinsed with hot water. The pump will then be reassembled, submerged in a nonphosphate detergent-water mixture, and allowed to pump 20 to 30 gallons through its components. The pump will then be steam cleaned again, and 20 to 30 gallons of potable water will be pumped through the components. The exterior of the pump inlet hose will be steam cleaned. If dedicated polyethylene tubing is utilized for well development/purging activities, the exterior of the pump will be cleaned with a nonphosphate detergent-water mixture and rinsed with DI water.

A sample of the potable and DI water will be collected and analyzed for all target compounds in accordance with Section 2.9.2.1.

2.15.2 Personnel Decontamination

Decontamination procedures will be performed by all field personnel who have been in contact with contaminated or potentially contaminated materials. Procedures for decontamination of field personnel are presented in Section 10.1 of the SSHP.

2.16 INVESTIGATION-DERIVED WASTE

This section outlines the procedures to be used for proper collection, characterization, storage, containerization, and transport and disposal (if necessary) of investigation-derived waste (IDW). IDW is defined as waste generated during the field investigation activities that has the potential to be hazardous and thus requires special handling.

Proper collection and disposal characterization procedures for soil, development/purgewater, decontamination rinsate, disposable protective clothing, and plastic ground covers are presented in the following sections.

2.16.1 Soil

IDW soil will be placed into DOT-approved 55-gallon drums or other approved containers (i.e., roll-off bins), and appropriately labeled, pending the results of the field sampling program (see Section 2.16.5). The results of the field sampling program will be used as a first step in determining appropriate disposal. Based on the analytical results, additional samples may need to be collected from the IDW containers for analysis in order to further classify the IDW for disposal as either RCRA hazardous waste, non-RCRA California hazardous waste, designated or special waste, or nonhazardous waste. Additional sampling and analysis of the IDW may also be required in order to satisfy the requirements of a licensed disposal facility. If no contamination is detected in any of the samples associated with a particular IDW container, the soil from that container may be disposed of on the Project Site. IDW soil samples will be handled and shipped to the analytical laboratory in the same manner as the field samples. Hazardous soil will be transported by a licensed hazardous waste hauler and disposed of at a licensed disposal facility.

2.16.2 Water

IDW water derived from water sampling activities (including well development/ purgewater) and decontamination rinsate will be placed in DOT-approved 55-gallon drums or other approved containers and appropriately labeled, as described in Section 2.16.5. IDW water samples will be collected from selected containers. If more than one container contains water from the same source, only one of the containers will be sampled. IDW water samples will be handled and shipped to the analytical laboratory in the same manner as the field samples. The analytical results will be used to determine appropriate disposal as described in Section 2.16.1. Additional sampling and analysis of the IDW water may also be required in order to satisfy the requirements of a licensed disposal facility. If no contamination is detected in any of the samples collected from the IDW containers, the water may be discharged directly to the ground surface, on a portion of the Project Site that has not been affected by contaminants, in a manner to prevent surface ponding and runoff. Hazardous water will be transported by a licensed hazardous waste hauler and disposed of at a licensed disposal facility.

2.16.3 Disposable Protective Clothing and Ground Covers

Other wastes include disposable protective clothing, plastic ground covers, and nonreusable sampling equipment (e.g., disposable bailers) that have come in contact with contaminated or potentially contaminated soil or water. These wastes will be collected, placed in a DOT-approved 55-gallon drum or other approved container, and labeled, pending appropriate disposal. These wastes will not be mixed with the IDW soil or water.

2.16.4 Waste Containers and Storage

IDW soils and other solid wastes will be containerized in DOT-approved 17H 55-gallon drums with removable lids, or other approved containers. Liquid wastes will be containerized in DOT-approved 17H 55-gallon drums with non-removable lids, or in a portable tank. All IDW containers will be inspected for physical integrity before filling.

2.16.5 Labeling of Containers

All IDW containers will be clearly labeled as follows, with a grease pencil:

- Matrix (i.e., soil, water, PPE)
- Date waste generated
- Where waste generated (i.e., site, boring/well locations)
- "Nonhazardous, Pending Analysis."

If the analytical results characterize the IDW container contents as hazardous, a hazardous waste label will be placed on the container and the IDW disposed of within 90 days of the date the waste was generated.

2.16.6 Waste Handling and Off-Site Disposal

Waste handling, including loading and transport, will be conducted by a licensed waste disposal contractor. Whenever possible, waste characterized as hazardous will be disposed of in a manner by which a "Certification of Destruction" can be issued by the disposal facility. Granite will be identified as the waste generator. Hazardous and Nonhazardous Waste Manifests and Bills of Lading will be filled out and signed by Granite, or their designated agent.

2.17 ANALYTICAL TEST METHODS (Robert add the test methods for Pesticides and Perchlorate)

The analyses expected to be required for this project include the following: CAM 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A; TEPH as diesel, kerosene, and motor oil (30 weight) by California LUFT modified EPA Method SW8015; volatile organic compounds (VOCs) by EPA Method SW8260B; polyaromatic hydrocarbons (PAHs) by EPA Method SW8310; dioxins and furans by EPA Method SW8290; nitroaromatics and nitroamines, including PETN and nitroglycerin (explosives) by EPA Method SW8330; total organic carbon (TOC) by EPA Method SW9060 for soils or EPA Method 415.1 for waters; total suspended solids (TSS) by EPA Method 160.1; total dissolved solids (TDS) by EPA Method 160.2; common anions (chloride, nitrate-N, nitrite-N, and sulfate) by EPA Method 300.0; and total phosphorous by EPA Method 365.2 or 365.3. In general, SVOCs by EPA Method SW8270C will only be used for the determination of PAHs when severe interference is encountered during analysis of PAHs by EPA Method SW8310. A brief description of the digestion and analytical methods to be used is presented in Section 3.2.4.2.

2.18 GENERAL FIELD AND LABORATORY DOCUMENTATION

The following field data documentation will be used to record all field investigation activities at the Project Site. Measurements made and samples collected will be recorded in either the Daily Field Report or on an appropriate field activity form. Examples of field forms anticipated to be used during the field investigation activities are included in Appendix F. Other forms may be added or substituted, provided they contain all the relevant information required to adequately document the field investigation activities. All entries on field forms will be made in indelible ink, and no white-out will be allowed. If an incorrect entry is made on any field form, the information will be crossed out with a single strike mark, initialed, and date-marked. All equipment used to make measurements will be identified, along with the date of calibration. All field forms will be signed and dated by field personnel responsible for their completion.

2.18.1 Daily Field Reports

Daily Field Reports or log books will provide the means of recording investigation and data collection activities on a daily basis. As such, entries will be described in as much detail as possible so that persons going to the Project Site will be able to reconstruct a particular situation without reliance on memory. Daily Field Reports/log books will contain, but not be limited to, the following information (it is acceptable for some of this information to be recorded on other field activity forms to avoid duplication):

- Project name/site
- Date
- Weather conditions
- Field personnel performing investigation activities
- Subcontractors
- Work performed
- Location of work (i.e., boring/well location)
- Sampling performed, including specifics (e.g., number and type of samples collected, borings advanced, wells installed)
- Field parameter measurements, including calibration checks
- Decontamination procedures
- IDW containment procedures (i.e., number of storage drums)
- Names and affiliation of visitors to the Project Site
- Problems encountered and corrective actions
- Other pertinent comments.

2.18.2 Chain-of-Custody Record

COC procedures provide an accurate written record tracing possession of individual samples from the time of field collection through to analytical laboratory analysis. A sample is considered in custody if it is:

- In a person's possession
- In a secure area after having been in a person's physical possession
- In a designated secure area restricted to authorized personnel.

The COC Record will be used to document the samples taken and the analyses requested. Information that field personnel will record on the COC Record (in indelible ink) includes the following:

- Project name/site
- Sampling location and/or well designation
- Name and signature of sampler(s)

- Dates and times of sample collection
- Sample designation (grab or composite)
- Matrix
- Container types and preservatives
- Number of sample containers
- Analyses to be performed
- Special instructions (i.e., short holding times)
- Signatures of individuals involved in custody (including, date and times of transfer)
- Airbill number, if appropriate.

Corrections may be made on the COC Record by drawing one line through the incorrect entry, entering the correction information, and initialing and dating the change.

If the samples are shipped by commercial carrier or courier service, the COC Record initiated in the field will be signed and dated, placed in a sealed plastic bag, and taped to the inside of the cooler lid. Signed airbills will serve as evidence of custody transfer between the field personnel and commercial carrier/courier service and the analytical laboratory. Copies of the COC Record and the airbill will be retained by the field personnel prior to shipment. Upon receipt of the cooler, analytical laboratory personnel will sign, date, and retain one copy of the COC Record and the airbill for their records, returning the completed COC Record and signed airbill to Earth Tech.

If the samples are either delivered directly to the analytical laboratory by Earth Tech field personnel or picked up from either the Project Site or Earth Tech's San Jose office by the analytical laboratory, the COC Record initiated in the field will be signed and dated as relinquished by the field personnel, and signed and dated as received by the analytical laboratory. Copies of the COC Record will be retained by the field personnel prior to relinquishment of the samples to the analytical laboratory.

Information that will be recorded on the COC Record, or another appropriate document (e.g., laboratory logbook or Laboratory Information Management System), at the time of sample receipt by the analytical laboratory will include the following:

- Status of custody seals, if used
- Temperature of the temperature blank

- Identification number of broken sample containers, if any
- Description of discrepancies between the COC Record, sample labels, and requested analyses
- pH of aqueous samples to determine if samples are properly preserved.

When the laboratory receives and logs in the contents of the shipping containers, the laboratory's sample control supervisor or the laboratory PM will fax the completed COC Records with a sample log-in summary and completed cooler receipt forms to Earth Tech's quality control systems manager (QCSM) or project chemist within 24-48 hours. The cooler receipt forms will be used by the laboratory for each cooler to verify sample condition, including proper sample containers, volumes, preservation, and any other pertinent information. Laboratory personnel will contact Earth Tech's QCSM regarding any discrepancies in the paperwork and sample preservation and will document nonconformance and corrective actions according to the analytical laboratory's standard operating procedures.

2.18.3 Geologic Logs

The on-site field geologist will prepare and maintain a geologic log for all soil borings advanced by either a drill rig (see Section 2.4) or a hand auger (see Section 2.7.2). Soil cuttings/samples will be classified in accordance with the ASTM D 2488 *Description and Identification of Soils (Visual-Manual Procedures).* Bedrock cutting/samples will be identified and recorded using the standard nomenclature in the *Classification of Rocks* (Colorado School of Mines, 1955). The geologic log will record, but not be limited to, the following information:

- Project name/site
- Date/time
- Weather conditions
- Field personnel performing investigation activities
- Drilling contractor
- Drilling and sampling method
- Reference elevation for all depth measurements
- Depth of each change of stratum
- Thickness of each stratum
- Soil or rock description

- Depth interval from which sample was collected

- Nominal boring diameter

- Location of any fractures, joints, faults, cavities, or weathered zone if cored

- Well construction details

- Depth to first encountered groundwater

- Depth to static water level upon completion of well.

Each geologic log will be reviewed and approved by a California state-registered geologist supervising the project.

2.18.4 Water Well Installation Diagram

The Water Well Installation Diagram Form will be used to provide a diagrammatic representation of the temporary groundwater monitoring well construction. The form will record, but not be limited to, the following information:

- Well construction details, including:

  - Depth and type of well casing

  - Description of well screen (length, location, diameter, slot size)

  - Filter pack depth and type

  - Bentonite seal depth

  - Grout seal depth

  - Type of cement grout.

- Volumes of construction materials used
- Volume of water used, if any
- Manufacturer information for well construction materials.

2.18.5 Surface Water/Sediment Form

The Surface Water/Sediment Form will be used to record grab surface water, surface seep/spring, and sediment sample collection activities. The form will record, but not be limited to, the following information:

- Project name/site

- Date/time

- Weather conditions
- Field personnel performing investigation activities
- Field parameters (pH, EC, temperature and turbidity) (surface water and surface seep samples only)
- Sample numbers
- Sampling equipment
- Physical description of sampling location.

2.18.6 Well Purging and Sample Collection Form

Groundwater development/purging and sample collection activities will be recorded on the Well Purging and Sample Collection Form. The form will record, but not be limited to, the following information:

- Project name/site
- Date/time
- Weather conditions
- Field personnel performing investigation activities
- Well number
- Static water level prior to and after purging
- Static water level after sampling
- Depth to bottom of the well
- Standing water column
- Volume of purge water removed
- Purge and sampling method
- Field parameters (pH, EC, temperature and turbidity)
- Comments (i.e., conditions that may affect development).

2.18.7 Instrument Calibration Logs

Field instrument calibration information will be recorded on either the Instrument Calibration Log or the Field Meter Instrument Calibration Log - Temperature, Conductivity, Dissolved Oxygen. The logs will record, but not be limited to, the following information:

- Date calibrated
- Field personnel performing the calibration
- Instrument and model
- Standards calibrated
- Adjustments made
- Comments.

2.18.8 Water Level Form

Groundwater level measurements may also be recorded on the Water Elevation Form. The form will record, but not be limited to, the following information:

- Project name/site
- Date/time
- Weather conditions
- Well number
- Depth to standing water
- Depth to bottom of well
- Elevation of well casing
- Well integrity (i.e., locked, capped, cracked, obstructions)
- Comments.

2.18.9 Health and Safety Data Forms

Health and safety activities conducted during the field investigation activities will be documented on the appropriate health and safety forms presented in the SSHP.

2.18.10 Photographs

Photographs will be recorded in the Construction Photo Log. The log will record, but not be limited to, the following information:

- Project name/site
- Date/time taken
- Picture number
- Photographer
- Description (i.e., location, subject, names of any personnel included in the photograph).

2.19 FIELD DATA MANAGEMENT

General guidance for field data recording, validation, reporting, and assessment is presented in this section. General guidance for laboratory data management is included in the QAPP (see Chapter 3.0).

2.19.1 Data Recording

Field data will be recorded either in the Daily Field Report or on the appropriate field activity forms (see Section 2.18). A unique field identification number will be assigned to each sample throughout the field investigation program, as indicated in Section 2.11.2. Sample COC documentation will be completed, as described in Section 2.18.2, to document chain of possession and track the samples throughout shipping, handling, and analysis. A corresponding laboratory identification number will be assigned and will be used to track each sample through the analytical process.

All field forms will be signed and dated by the person entering the data, using indelible ink and no white-out. All changes to documentation will be performed by striking out the incorrect data with a single line and initialing and dating the correction.

Field data will be validated through the review of the field documentation to identify inconsistencies or anomalous values. Earth Tech's project manager (PM), or designee, will be responsible for performing daily reviews of all field documentation for accuracy, legibility, and completeness, and for maintaining such information in the project file. Any inconsistencies discovered will be resolved immediately, if possible, by seeking clarification from personnel responsible for the data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this chapter and the QAPP (see Chapter 3.0) to ensure that accurate and defensible data are obtained.

2.19.2 Data Reporting

Measurement data generated during the field investigation activities will be reported in tabular form to support data use and interpretation. The report formats will vary depending on the objectives of the field investigation. In general, data will be presented according to sampling location, analytical method, parameter, and/or matrix.

2.19.3 Data Assessment

Measurement data will be assessed and documented to quantitatively assess data quality, identify possible limitations on data use, and assess whether the site-specific DQOs have been met. The use of standard field, analytical, and QC procedures is designed to control the sampling processes in order to produce data of sufficient quality for the project needs. If a problem occurs in spite of these controls, the data assessment must identify the problem, determine which data are affected, state how use may be limited, and make recommendations for corrective actions as necessary. Corrective actions may include, but not be limited to, resampling at a particular location.

Table 2.1-1. Data Collection Rationale

TNT Strips

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Soil	115 from 2 borings to 10' bgs and 32 step-out borings to 6' bgs ≤ 25 (based on detected TNT/TNB/DNT using Field Soil Test)	TNT/TNB/DNT Explosives EPA SW8515 (Field Soil Test) Explosives EPA SW8330 PAHs EPA SW8310* Metals EPA SW6010B/SW7470A, SW7471A	• Delineate vertical extent at identified TNT hot spot • Delineate lateral and vertical extent upslope and downslope at identified TNT hot spot • Determine lateral and vertical extent upslope and downslope at disturbed area (firebreak across TNT-1) • Assess impact in observed gaps along TNT-1 • Determine lateral and vertical extent upslope and downslope at downslope extent of site • Confirm/deny transport of contaminants via precipitation runoff and infiltration and via surface soil movement • Estimate volume of soil to be remediated based on action levels on Table 2.1-2 as decision rule criteria
Water			See Table 2.1-1 (Page 10 of 10) for North Valley Hydrogeologic Data Collection

Previous Investigations:	• Analyzed contaminants include explosives, metals, PAHs, dioxins/furans; detected contaminants include explosives, metals, PAHs, dioxins/furans • 4' bgs vertical extent of sampling; 100' lateral extent of sampling upslope and downslope • Limited lateral and vertical migration

Notes: TNT = Trinitrotoluene
TNB = Trinitrobenzene
DNT = Dinitrotoluene
* = EPA Method SW8270C for semi-volatile organic compounds (SVOCs) will be used for the determination of PAHs when severe interference is encountered during analysis of PAHs by SW8310.
EPA Method SW8515 for explosives
EPA Method SW8330 for explosives
EPA Method SW8310 for polyaromatic hydrocarbons (PAHs)
EPA Method SW6010B for metals by inductively coupled plasma (ICP)
EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption
California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium..
Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.
See Section 2.2.1.1 for field sampling program details including field soil testing criterion.

Table 2.1-1. Data Collection Rationale
(Page 2 of 10)

Howitzer Test Facility

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Soil	30 from 6 borings to bedrock	Explosives EPA SW8330 PAHs EPA SW8310* Metals EPA SW6010B/SW7470A, SW7471A TEPH-D/MO/K EPA SW8015M VOCs EPA SW8260B	• Determine if contaminants are present • Delineate lateral and vertical extent across site • Confirm/deny transport of contaminants via precipitation runoff and infiltration and via surface soil movement • Estimate volume of soil to be remediated based on action levels on Table 2.1-2 as decision rule criteria
Water			See Table 2.1-1 (Page 10 of 10) for North Valley Hydrogeologic Data Collection
Previous Investigations:		• Analyzed contaminants include explosives, metals, PAHs; detected contaminants include explosives, metals, PAHs • Sampling limited to stockpiles • Limited impact	

Notes: * = EPA Method SW8270C for semi-volatile organic compounds (SVOCs) will be used for the determination of PAHs when severe interference is encountered during analysis of PAHs by SW8310.

EPA Method SW8330 for explosives
EPA Method SW8310 for polyaromatic hydrocarbons (PAHs)
EPA Method SW6010B for metals by inductively coupled plasma (ICP)
EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption
California Leaking Underground Fuel Tank (LUFT) Modified EPA Method SW8015M for total extractable petroleum hydrocarbons (TEPH) as diesel, kerosene and motor oil
EPA Method SW8260B for volatile organic compounds (VOCs)
California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.
See Section 2.2.1.2 for field sampling program details.

Table 2.1-1. Data Collection Rationale
(Page 3 of 10)

Ammunition Renovation Area/Primer Destruction Site

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Soil	30 from 6 borings to bedrock and 2 from stockpiles at 2' depth	Explosives EPA SW8330 PAHs EPA SW8310* Metals EPA SW6010B/SW7470A, SW7471A TEPH-D/MO/K EPA SW8015M	• Determine if contaminants are present • Delineate lateral and vertical extent across site • Confirm/deny transport of contaminants via precipitation runoff and infiltration and via surface soil movement • Estimate volume of soil to be remediated based on action levels on Table 2.1-2 as decision rule criteria
Water			See Table 2.1-1 (Page 10 of 10) for North Valley Hydrogeologic Data Collection
Previous Investigations:		• Analyzed contaminants include explosives, metals, PAHs, phosphate, nitrate/nitrite; detected contaminants include explosives, metals, PAHs, phosphate, nitrate/nitrite • Sampling limited to stockpiles • Limited impact	

Notes: * = EPA Method SW8270C for semi-volatile organic compounds (SVOCs) will be used for the determination of PAHs when severe interference is encountered during analysis of PAHs by SW8310.

EPA Method SW8330 for explosives
EPA Method SW8310 for polyaromatic hydrocarbons (PAHs)
EPA Method SW6010B for metals by inductively coupled plasma (ICP)
EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption
California Leaking Underground Fuel Tank (LUFT) Modified EPA Method SW8015M for total extractable petroleum hydrocarbons (TEPH) as diesel, kerosene and motor oil
California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.
See Section 2.2.1.3 for field sampling program details.

Table 2.1-1. Data Collection Rationale
(Page 4 of 10)

Flare Site

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Soil	14 from 3 borings to 10' bgs (note: depth may be restricted by OE clearance)	Explosives EPA SW8330** PAHs EPA SW8310* ** Metals EPA SW6010B/SW7470A, SW7471A Dioxins/Furans EPA SW8290** Total Phosphorous EPA E365.2	• Delineate vertical extent at center • Delineate lateral and vertical extent upslope and downslope • Confirm/deny transport of contaminants via precipitation runoff and infiltration and via surface soil movement • Estimate volume of soil to be remediated based on action levels on Table 2.1-2 as decision rule criteria
Water			See Table 2.1-1 (Page 9 of 10) for South Valley Hydrogeologic Data Collection

Previous Investigations:

- Analyzed contaminants include explosives, metals, PAHs, dioxins/furans; detected contaminants include metals, dioxins/furans
- 2.5' bgs vertical extent of sampling; lateral extent of sampling near periphery, upslope and crossslope
- Limited impact in surface soils

Notes: * = EPA Method SW8270C for semi-volatile organic compounds (SVOCs) will be used for the determination of PAHs when severe interference is encountered during analysis of PAHs by SW8310.
** = One sample
EPA Method SW8330 for explosives
EPA Method SW8310 for polyaromatic hydrocarbons (PAHs)
EPA Method SW6010B for metals by inductively coupled plasma (ICP)
EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption
EPA Method SW8290 for dioxins/furans
EPA Method E365.2 for total phosphorous
California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.
See Section 2.2.1.6 for field sampling program details.

Table 2.1-1. Data Collection Rationale

Demolition Sites

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Demolition Area 1:			
Soil	2 from sidewall	Explosives EPA SW8330 PAHs EPA SW8310* Metals EPA SW6010B/SW7470A, SW7471A	• Delineate vertical extent at center • Confirm/deny transport of contaminants via precipitation infiltration • Extrapolate data from Site 3 to conceptual models for these sites • Estimate volume of soil to be remediated based on action levels on Table 2.1-2 as decision rule criteria
Water			See Table 2.1-1 (Page 9 of 10) for South Valley Hydrogeologic Data Collection
Demolition Area 3:			
Soil	16 from 4 borings to bedrock	Explosives EPA SW8330 PAHs EPA SW8310* Metals EPA SW6010B/SW7470A, SW7471A	• Delineate vertical extent at center • Determine vertical extent at downslope periphery • Confirm/deny transport of contaminants via precipitation infiltration • Estimate volume of soil to be remediated based on action levels on Table 2.1-2 as decision rule criteria
Water			See Table 2.1-1 (Page 9 of 10) for South Valley Hydrogeologic Data Collection

Previous Investigations:

- Analyzed contaminants include explosives, metals, PAHs, phosphate, nitrate/nitrite; detected contaminants include explosives, metals, one PAH, phosphate, nitrate/nitrite
- 4' bgs vertical extent of sampling; lateral extent of sampling near periphery and 60' downslope for Site 1, center, periphery and 50' downslope for Site 3
- Limited impact in surface soils

Notes: * = EPA Method SW8270C for semi-volatile organic compounds (SVOCs) will be used for the determination of PAHs when severe interference is encountered during analysis of PAHs by SW8310.
** = Two samples
EPA Method SW8330 for explosives
EPA Method SW8310 for polyaromatic hydrocarbons (PAHs)
EPA Method SW6010B for metals by inductively coupled plasma (ICP)
EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption
California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.
See Section 2.2.1.7 for field sampling program details.

Table 2.1-1. Data Collection Rationale

(Page 6 of 10)

Ridge Soil Stockpiles

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Soil	9 5 ea. from 4-point composite at 2' depth and 4 ea. from 2-point composite at 2' depth	Explosives EPA SW8330 Metals EPA SW6010B/SW7470A, SW7471A TEPH-D/MO EPA SW 8015M	• Assess impact on stockpiled soils • Estimate volume of soil to be remediated based on action levels on Table 2.1-2 as decision rule criteria
Previous Investigations:	• None		

Notes: EPA Method SW8330 for explosives
EPA Method SW6010B for metals by inductively coupled plasma (ICP)
EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption
California Leaking Underground Fuel Tank (LUFT) Modified EPA Method SW8015M for total extractable petroleum hydrocarbons (TEPH) as diesel and motor oil
California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.
See 2.2.1.5 for field sampling program details.

Table 2.1-1. Data Collection Rationale

Dynamite Burn Site

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Soil	10 4 point samples near surface 6 soil samples along toe of Land Bridge, 3 on eastside, 3 on west side	Nitroglycerin/Pentaeryythritol Tetraanitrate EPA SW8330M, Nitrate/Nitrite EPA E300N-NO2N Metals (one sample from Land Bridge) EPA SW6010B/SW7470A, SW7471A	• Assess impact of soils on ridge • Assess if Land Bridge Soils have been impacted • Estimate volume of soil to be remediated based on action levels on Table 2.1-2 as decision rule criteria
Previous Investigations:		• None	

Notes: EPA Method SW8330 for explosives
EPA Method SW6010B for metals by inductively coupled plasma (ICP)
EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption
California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.
See 2.2.1.5 for field sampling program details.

Table 2.1-1. Data Collection Rationale
(Page 8 of 10)

Wetlands

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Soil	2 from 2 sediment sampling locations	Explosives EPA SW8330 Metals EPA SW6010B/SW7470A, SW7471A PAHs EPA SW8310* Dioxins/Furans EPA SW8290	• Assess impact from upslope sites • Confirm/deny transport of contaminants via precipitation runoff and via surface soil movement • Estimate volume of soil to be remediated based on action levels on Table 2.1-2 as decision rule criteria
Water	2 from 2 surface water sampling locations	Explosives EPA SW8330 Metals (Total and Dissolved) EPA SW6010B/SW7470A, SW7471A General Water Chemistry Field Parameters	• Assess impact from upslope sites • Confirm/deny transport of contaminants via precipitation runoff
Previous Investigations:		• Analyzed contaminants include explosives, metals, PAHs; detected contaminants include metals • 1 sediment sample • No impact	

Notes: * = EPA Method SW8270C for semivolatile organic compounds (SVOCs) may be used for the determination of PAHs when severe interference is encountered during analysis of PAHs by SW8310.

EPA Method SW8330 for explosives
EPA Method SW8310 for polyaromatic hydrocarbons (PAHs)
EPA Method SW8290 for dioxins/furans
EPA Method SW6010B for metals by inductively coupled plasma (ICP)
EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption
California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
General water chemistry includes (1) chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0; total phosphorous by EPA Method 365.2; total organic carbon by EPA Method 415.1; total dissolved solids (TDS) by EPA Method 160.1; and total suspended solids (TSS) by EPA Method 160.2; and (2) Field parameters - temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1.
Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.
See Section 2.2.1.8 for field sampling program details.

Table 2.1-1. Data Collection Rationale

(Page 9 of 10)

South Valley Hydrogeologic

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Water	3 from 3 borings at locations upgradient of Demolition & Flare Sites, downgradient of Flare Site, downgradient of McAllister Drive Landbridge and TBD* from seep/spring locations	Explosives EPA SW8330 PAHs EPA SW8310** Metals EPA SW6010B/7000A VOCs EPA SW8260B General Water Chemistry Field Parameters	• Obtain depth to groundwater and soil profile information • Obtain background information • Assess impact downgradient from sites • Confirm/deny transport of contaminants via precipitation runoff and infiltration • Determine whether groundwater remediation is required based on action levels on Table 2.1-2 as decision rule criteria
Previous Investigations:		• None	

Notes: * = To be determined (TBD) based on field conditions; one sample will be collected from each seep/spring capable of producing sufficient water for sample collection

EPA Method SW8270C for semi-volatile organic compounds (SVOCs) will be used for the determination of PAHs when severe interference is encountered during analysis of PAHs by SW8310.

EPA Method SW8330 for explosives

EPA Method SW 8310 for polyaromatic hydrocarbons (PAHs)

EPA Method SW6010B for metals by inductively coupled plasma (ICP)

EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption

EPA Method SW8260B for volatile organic compounds (VOCs)

California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.

General water chemistry includes (1) chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0, total phosphorous by EPA Method 365.2, total organic carbon by EPA Method 415.1, total dissolved solids (TDS) by EPA Method 160.1, and total suspended solids (TSS) by EPA Method 160.2; and (2) Field parameters - temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1.

Sample results will be reported on a dry weight basis.

All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

See Section 2.2.1.8 for field sampling program details.

Table 2.1-1. Data Collection Rationale
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North Valley Hydrogeologic

Matrix	Proposed Number and Type of Samples	Parameter and Method	Site-specific Purpose
Water	4 from 2 wells at locations downgradient on either side of the topographic divide 3 from 3 wells at locations at the center, southern end and downgradient of the Howitzer Test Facility Site 2 from 2 wells at locations upgradient and downgradient of the Ammunition Renovation/Primer Destruction Area	Explosives EPA SW8330 PAHs EPA SW8310* Metals EPA SW6010B/7000A VOCs EPA SW8260B TEPH-D/MO/K EPA SW8015M General Water Chemistry Field Parameters	• Obtain depth to groundwater and soil profile information • Obtain background information • Assess impact downgradient from sites • Confirm/deny transport of contaminants via precipitation runoff and infiltration • Determine whether groundwater remediation is required based on action levels on Table 2.1-2 as decision rule criteria
Soil	TBD from major lithologies at 2 well borings	Total Organic Carbon EPA SW9060 Grain Size ASTM D422	• Information for fate and transport analyses

Previous Investigations: • None

Notes: * EPA Method SW8270C for semi-volatile organic compounds (SVOCs) will be used for the determination of PAHs when severe interference is encountered during analysis of PAHs by SW8310.
EPA Method SW8330 for explosives
EPA Method SW8310 for polyaromatic hydrocarbons (PAHs)
EPA Method SW6010B for metals by inductively coupled plasma (ICP)
EPA Method SW7470A/SW7471A for mercury analysis by cold vapor atomic absorption
EPA Method SW8260B for volatile organic compounds (VOCs)
California Leaking Underground Fuel Tank (LUFT) Modified EPA Method SW8015M for total extractable petroleum hydrocarbons (TEPH) as diesel, kerosene and motor oil
California Assessment Manual (CAM) 17 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
General water chemistry includes (1) chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0, total phosphorous by EPA Method 365.2, total organic carbon by EPA Method 415.1, total dissolved solids (TDS) by EPA Method 160.1, and total suspended solids (TSS) by EPA Method 160.2; and (2) Field parameters - temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1.
Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.
See Section 2.2.1.4 for field sampling program details.

Table 2.1-2. Action Level Reference Guidance
(Page 1 of 15)

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
SOIL						
Metals						
Aluminum	SW6010B	mg/kg	40	76,000	--	PRG
Antimony	SW6010B	mg/kg	3.0	31	--	PRG
Arsenic	SW6010B	mg/kg	0.8 / 0.28	0.39	TBD	PRG or Background[2]
Barium	SW6010B	mg/kg	1.0	5,400	--	PRG
Beryllium	SW6010B	mg/kg	0.4	150	--	PRG
Cadmium	SW6010B	mg/kg	1.0	**9.0**	--	PRG
Calcium	SW6010B	mg/kg	200	--	--	--
Chromium, Total	SW6010B	mg/kg	2.0	210	--	PRG
Cobalt	SW6010B	mg/kg	2.0	4,700	--	PRG
Copper	SW6010B	mg/kg	3.0	2,900	--	PRG
Iron	SW6010B	mg/kg	15	23,000	TBD	PRG or Background[2]
Lead	SW6010B	mg/kg	0.6	400	--	PRG
Magnesium	SW6010B	mg/kg	100	--	--	--
Manganese	SW6010B	mg/kg	1.0	1,800	--	PRG
Mercury	SW7471A	mg/kg	0.1	23	--	PRG
Molybdenum	SW6010B	mg/kg	4.0	390	--	PRG
Nickel	SW6010B	mg/kg	4.0	**150**	--	PRG
Potassium	SW6010B	mg/kg	200	--	--	--
Selenium	SW6010B	mg/kg	2.0	390	--	PRG
Silver	SW6010B	mg/kg	2.0	390	--	PRG
Sodium	SW6010B	mg/kg	200	--	--	--
Thallium	SW6010B	mg/kg	2.0	--	--	--
Vanadium	SW6010B	mg/kg	5.0	550	--	PRG
Zinc	SW6010B	mg/kg	4.0	23,000	--	PRG

Table 2.1-2. Action Level Reference Guidance
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Parameter	Method	Units	PQL/MDL[(1)]	Reference Concentrations		Action Level
				PRG	Background	
PAHs						
Acenaphthene	SW8270	mg/kg	1	3,700	--	PRG
Acenaphthylene	SW8270	mg/kg	1	--	--	--
Anthracene	SW8270	mg/kg	1	22,000	--	PRG
Benzo(a)anthracene	SW8270	mg/kg	1 / *	0.62	--	PRG
Benzo(a)pyrene	SW8270	mg/kg	1 / *	0.062	--	PRG
Benzo(b)fluoranthene	SW8270	mg/kg	1 / *	0.62	--	PRG
Benzo(g,h,i)perylene	SW8270	mg/kg	1	--	--	--
Benzo(k)fluoranthene	SW8270	mg/kg	1 / *	0.61	--	PRG
Chrysene	SW8270	mg/kg	1	6.1	--	PRG
Dibenzo(a,h)anthracene	SW8270	mg/kg	1	0.062	--	PRG
Fluoranthene	SW8270	mg/kg	1	2,300	--	PRG
Fluorene	SW8270	mg/kg	1	2,600	--	PRG
Indeno(1,2,3-c,d)pyrene	SW8270	mg/kg	1 / *	0.62	--	PRG
Naphthalene	SW8270	mg/kg	1	56	--	PRG
Phenanthrene	SW8270	mg/kg	1	--	--	--
Pyrene	SW8270	mg/kg	1	2,300	--	PRG
Acenaphthene	SW8310	mg/kg	0.4	3,700	--	PRG
Acenaphthylene	SW8310	mg/kg	0.4	--	--	--
Anthracene	SW8310	mg/kg	0.14	22,000	--	PRG
Benzo(a)anthracene	SW8310	mg/kg	0.02	0.62	--	PRG
Benzo(a)pyrene	SW8310	mg/kg	0.02	0.062	--	PRG
Benzo(b)fluoranthene	SW8310	mg/kg	0.03	0.62	--	PRG
Benzo(g,h,i)perylene	SW8310	mg/kg	0.02	--	--	--
Benzo(k)fluoranthene	SW8310	mg/kg	0.02	**0.61**	--	PRG
Chrysene	SW8310	mg/kg	0.04	**6.10**	--	PRG
Dibenzo(a,h)anthracene	SW8310	mg/kg	0.04	0.062	--	PRG
Fluoranthene	SW8310	mg/kg	0.05	2,300	--	PRG
Fluorene	SW8310	mg/kg	0.04	2,600	--	PRG
Indeno(1,2,3-c,d)pyrene	SW8310	mg/kg	0.04	0.62	--	PRG
Naphthalene	SW8310	mg/kg	0.4	56	--	PRG
Phenanthrene	SW8310	mg/kg	0.12	--	--	--
Pyr	SW8310	m	0.06	2,300	--	PRG

Table 2.1-2. Action Level Reference Guidance
(Page 3 of 15)

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
Dioxins / Furans						
Heptachlorinated dibenzo-p-dioxins, Total	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	SW8290	mg/kg	5.0e-06	--	TBD	TBD
Heptachlorinated dibenzofurans, Total	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,4,6,7,8-Heptachlorodibenzofuran	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,4,7,8,9-Heptachlorodibenzofuran	SW8290	mg/kg	5.0e-06	--	TBD	TBD
Hexachlorinated dibenzo-p-dioxins, Total	SW8290	mg/kg	5.0e-06	7.8e-05	TBD	PRG or Background[2]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	SW8290	mg/kg	5.0e-06	--	TBD	TBD
Hexachlorinated dibenzofurans, Total	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,4,7,8-Hexachlorodibenzofuran	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,6,7,8-Hexachlorodibenzofuran	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,7,8,9-Hexachlorodibenzofuran	SW8290	mg/kg	5.0e-06	--	TBD	TBD
2,3,4,6,7,8-Hexachlorodibenzofuran	SW8290	mg/kg	5.0e-06	--	TBD	TBD
Octachlorodibenzo-p-dioxin	SW8290	mg/kg	1e-05	--	TBD	TBD
Octachlorodibenzofuran	SW8290	mg/kg	1e-05	--	TBD	TBD
Pentachlorinated dibenzo-p-dioxins, Total	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	SW8290	mg/kg	5.0e-06	--	TBD	TBD
Pentachlorinated dibenzofurans, Total	SW8290	mg/kg	5.0e-06	--	TBD	TBD
1,2,3,7,8-Pentachlorodibenzofuran	SW8290	mg/kg	5.0e-06	--	TBD	TBD
2,3,4,7,8-Pentachlorodibenzofuran	SW8290	mg/kg	5.0e-06	--	TBD	TBD
Tetrachlorinated dibenzo-p-dioxins, Total	SW8290	mg/kg	2.0e-06	--	TBD	TBD
2,3,7,8-Tetrachlorodibenzo-p-dioxin	SW8290	mg/kg	2.0e-06	3.9e-06	TBD	PRG or Background[2]
Tetrachlorinated dibenzofurans, Total	SW8290	mg/kg	2.0e-06	--	TBD	TBD
2,3,7,8-Tetrachlorodibenzofuran	SW8290	mg/kg	2.0e-06	--	TBD	TBD

Table 2.1-2. Action Level Reference Guidance

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations: PRG	Reference Concentrations: Background	Action Level
Explosives						
2-Amino-4,6-dinitrotoluene	SW8330	mg/kg	0.4	--	--	--
4-Amino-2,6-dinitrotoluene	SW8330	mg/kg	0.4	--	--	--
1,3-Dinitrobenzene	SW8330	mg/kg	0.4	6.1	--	PRG
2,4-Dinitrotoluene	SW8330	mg/kg	0.4	120	--	PRG
2,6-Dinitrotoluene	SW8330	mg/kg	0.4	61	--	PRG
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	SW8330	mg/kg	0.4	--	--	--
Nitrobenzene	SW8330	mg/kg	0.4	20	--	PRG
Nitroglycerin	SW8330	mg/kg	0.5	35	--	PRG
2-Nitrotoluene	SW8330	mg/kg	0.4	370	--	PRG
3-Nitrotoluene	SW8330	mg/kg	0.4	370	--	PRG
4-Nitrotoluene	SW8330	mg/kg	0.4	370	--	PRG
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	Sw8330	mg/kg	0.4	3,100	--	PRG
Pentaerythritol tetranitrate	SW8330	mg/kg	0.5 or 1.0[3]	--	--	--
Tetryl	SW8330	mg/kg	0.4	610	--	PRG
1,3,5-Trinitrobenzene	SW8330	mg/kg	0.4	1,800	--	PRG
2,4,6-Trinitrotoluene	SW8330	mg/kg	0.4	16	--	PRG
VOCs						
Acetone	SW8260	mg/kg	0.020	1600	--	PRG
Benzene	SW8260	mg/kg	0.005	0.67	--	PRG
Bromobenzene	SW8260	mg/kg	0.005	28	--	PRG
Bromochloromethane	SW8260	mg/kg	0.005	--	--	--
Bromodichloromethane	SW8260	mg/kg	0.005	1.0	--	PRG
Bromoform	SW8260	mg/kg	0.005	62	--	PRG
Bromomethane	SW8260	mg/kg	0.010	3.9	--	PRG
2-Butanone	SW8260	mg/kg	0.020	7,300	--	PRG
n-Butylbenzene	SW8260	mg/kg	0.005	140	--	PRG
sec-Butylbenzene	SW8260	mg/kg	0.005	110	--	PRG
tert-Butylbenzene	SW8260	mg/kg	0.005	130	--	PRG
Carbon Disulfide	SW8260	mg/kg	0.005	360	--	PRG
Carbon Tetrachloride	SW8260	mg/kg	0.005	0.24	--	PRG
Chlorobenzene	SW8260	mg/kg	0.005	150	--	PRG

Table 2.1-2. Action Level Reference Guidance

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
Chloroethane	SW8260	mg/kg	0.010	3.0	--	PRG
2-Chloroethyl vinyl ether	SW8260	mg/kg	0.005	--	--	--
Chloroform	SW8260	mg/kg	0.005	0.24	--	PRG
Chloromethane	SW8260	mg/kg	0.010	1.2	--	PRG
2-Chlorotoluene	SW8260	mg/kg	0.005	--	--	--
4-Chlorotoluene	SW8260	mg/kg	0.005	--	--	--
Dibromochloromethane	SW8260	mg/kg	0.005	1.1	--	PRG
1,2,-Dibromo-3-chloropropane	SW8260	mg/kg	0.010	**0.062**	--	PRG
1,2-Dibromoethane	SW8260	mg/kg	0.005	0.0069	--	PRG
Dibromomethane	SW8260	mg/kg	0.005	--	--	--
1,2-Dichlorobenzene	SW8260	mg/kg	0.005	370	--	PRG
1,3-Dichlorobenzene	SW8260	mg/kg	0.005	130	--	PRG
1,4-Dichlorobenzene	SW8260	mg/kg	0.005	3.4	--	PRG
Dichlorodifluoromethane	SW8260	mg/kg	0.010	94	--	PRG
1,1-Dichloroethane	SW8260	mg/kg	0.005	590	--	PRG
1,2-Dichloroethane	SW8260	mg/kg	0.005	0.35	--	PRG
1,1-Dichloroethene	SW8260	mg/kg	0.005	0.054	--	PRG
cis-1,2-Dichloroethene	SW8260	mg/kg	0.005	43	--	PRG
trans-1,2-Dichloroethene	SW8260	mg/kg	0.005	63	--	PRG
1,2-Dichloropropane	SW8260	mg/kg	0.005	0.35	--	PRG
1,3-Dichloropropane	SW8260	mg/kg	0.005	--	--	--
2,2-Dichloropropane	SW8260	mg/kg	0.005	--	--	--
1,1-Dichloropropene	SW8260	mg/kg	0.005	0.082	--	PRG
cis-1,3-Dichloropropene	SW8260	mg/kg	0.005	0.082	--	PRG
trans-1,3-Dichloropropene	SW8260	mg/kg	0.005	0.082	--	PRG
Ethylbenzene	SW8260	mg/kg	0.005	230	--	PRG
Hexachlorobutadiene	SW8260	mg/kg	0.005	6.2	--	PRG
2-Hexanone	SW8260	mg/kg	0.020	--	--	--
Isopropylbenzene	SW8260	mg/kg	0.005	160	--	PRG
p-Isopropyltoluene	SW8260	mg/kg	0.005	--	--	--
Methylene chloride	SW8260	mg/kg	0.020	8.9	--	PRG
4-Methyl-2-pentanone	SW8260	mg/kg	0.020	790	--	PRG
Methyl(tert)butylether	SW8260	mg/kg	0.005	--	--	--
Naphthalene	SW8260	mg/kg	0.010	56	--	PRG

Table 2.1-2. Action Level Reference Guidance

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
n-Propylbenzene	SW8260	mg/kg	0.005	140	--	PRG
Styrene	SW8260	mg/kg	0.005	1700	--	PRG
1,1,1,2-Tetrachloroethane	SW8260	mg/kg	0.005	3.0	--	PRG
1,1,2,2-Tetrachloroethane	SW8260	mg/kg	0.005	0.38	--	PRG
Tetrachloroethene	SW8260	mg/kg	0.005	5.7	--	PRG
Toluene	SW8260	mg/kg	0.005	520	--	PRG
1,2,3-Trichlorobenzene	SW8260	mg/kg	0.005	--	--	--
1,2,4-Trichlorobenzene	SW8260	mg/kg	0.005	650	--	PRG
1,1,1-Trichloroethane	SW8260	mg/kg	0.005	770	--	PRG
1,1,2-Trichloroethane	SW8260	mg/kg	0.005	0.84	--	PRG
Trichloroethene	SW8260	mg/kg	0.005	2.8	--	PRG
Trichlorofluoromethane	SW8260	mg/kg	0.010	390	--	PRG
1,2,3-Trichloropropane	SW8260	mg/kg	0.005 / *	0.0014	--	PRG
1,1,2-Trichlorotrifluoroethane	SW8260	mg/kg	0.005	5,600	--	PRG
1,2,4-Trimethylbenzene	SW8260	mg/kg	0.005	5.7	--	PRG
1,3,5-Trimethylbenzene	SW8260	mg/kg	0.005	21	--	PRG
Vinyl Acetate	SW8260	mg/kg	0.010	430	--	PRG
Vinyl Chloride	SW8260	mg/kg	0.010	0.022	--	PRG
m & p-Xylene	SW8260	mg/kg	0.010	210	--	PRG
o-Xylene	SW8260	mg/kg	0.005	210	--	PRG
Inorganic						
Phosphorus	E365.2	mg/kg	2.0	--	--	--
TEPH						
as Diesel	SW8015M	mg/kg	1.0	--	--	--
as Kerosene	SW8015M	mg/kg	1.0	--	--	--
as Motor Oil	SW8015M	mg/kg	1.0	--	--	--

Table 2.1-2. Action Level Reference Guidance

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
Pesticides (Soil)						
Aldrin	SW8081A	mg/kg	0.0017	0.029	--	PRG
alpha-BHC	SW8081A	mg/kg	0.0017	---	--	PRG
beta-BHC	SW8081A	mg/kg	0.0017	---	--	PRG
delta-BHC	SW8081A	mg/kg	0.0017	---	--	PRG
gamma-BHC (Lindane)	SW8081A	mg/kg	0.0017	---	--	PRG
alpha-Chlordane	SW8081A	mg/kg	0.0017	1.6**	--	PRG
gamma-Chlordane	SW8081A	mg/kg	0.0017	1.6**	--	PRG
4,4'-DDD	SW8081A	mg/kg	0.0034	2.4	--	PRG
4,4'-DDE	SW8081A	mg/kg	0.0034	1.7	--	PRG
4,4'-DDT	SW8081A	mg/kg	0.0017	1.7	--	PRG
Dieldrin	SW8081A	mg/kg	0.0034	0.03	--	PRG
Endosulfan I	SW8081A	mg/kg	0.0017	370**	--	PRG
Endosulfan II	SW8081A	mg/kg	0.0034	370**	--	PRG
Endosulfan sulfate	SW8081A	mg/kg	0.0034	---	--	PRG
Endrin	SW8081A	mg/kg	0.0034	18	--	PRG
Endrin aldehyde	SW8081A	mg/kg	0.0034	---	--	PRG
Endrin ketone	SW8081A	mg/kg	0.0034	---	--	PRG
Heptachlor	SW8081A	mg/kg	0.0017	0.11	--	PRG
Heptachlor epoxide	SW8081A	mg/kg	0.0017	0.053	--	PRG
Methoxychlor	SW8081A	mg/kg	0.017	310	--	PRG
Toxaphene	SW8081A	mg/kg	0.067	0.44	--	PRG

Table 2.1-2. Action Level Reference Guidance
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Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
WATER						
Metals						
Aluminum	SW6010B	μg/L	200	36,000	--	PRG
Antimony	SW6010B	μg/L	60	150	--	PRG
Arsenic	SW6010B	μg/L	10.0 / 4.2	0.045	TBD	PRG or Background[2]
Barium	SW6010B	μg/L	10	2,600	--	PRG
Beryllium	SW6010B	μg/L	2.0	73	--	PRG
Cadmium	SW6010B	μg/L	5.0	18	--	PRG
Calcium	SW6010B	μg/L	1,000	--	--	--
Chromium, Total	SW6010B	μg/L	10	--	--	--
Cobalt	SW6010B	μg/L	20	2,200	--	PRG
Copper	SW6010B	μg/L	25	1,400	--	PRG
Iron	SW6010B	μg/L	200	11,000	TBD	PRG or Background[2]
Lead	SW6010B	μg/L	3.0	--	--	--
Magnesium	SW6010B	μg/L	500	--	--	--
Manganese	SW6010B	μg/L	5.0	880	--	PRG
Mercury	SW7471A	μg/L	0.2	11	--	PRG
Molybdenum	SW6010B	μg/L	20	180	--	PRG
Nickel	SW6010B	μg/L	20	730	--	PRG
Potassium	SW6010B	μg/L	1,000	--	--	--
Selenium	SW6010B	μg/L	5.0	180	--	PRG
Silver	SW6010B	μg/L	10	180	--	PRG
Sodium	SW6010B	μg/L	1,000	--	--	--
Thallium	SW6010B	μg/L	10	--	--	--
Vanadium	SW6010B	μg/L	15	260	--	PRG
Zinc	SW6010B	μg/L	20	11,000	--	PRG

Table 2.1-2. Action Level Reference Guidance

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
PAHs						
Acenaphthene	SW8270	µg/L	10	370	--	PRG
Acenaphthylene	SW8270	µg/L	10	--	--	--
Anthracene	SW8270	µg/L	10	1,800	--	PRG
Benzo(a)anthracene	SW8270	µg/L	10 / *	0.092	--	PRG
Benzo(a)pyrene	SW8270	µg/L	10 / *	**0.0015**	--	PRG
Benzo(b)fluoranthene	SW8270	µg/L	10 / *	0.092	--	PRG
Benzo(g,h,i)perylene	SW8270	µg/L	10	--	--	--
Benzo(k)fluoranthene	SW8270	µg/L	10 / *	0.92	--	PRG
Chrysene	SW8270	µg/L	10	9.2	--	PRG
Dibenzo(a,h)anthracene	SW8270	µg/L	10	0.0092	--	PRG
Fluoranthene	SW8270	µg/L	10	1,500	--	PRG
Fluorene	SW8270	µg/L	10	240	--	PRG
Indeno(1,2,3-c,d)pyrene	SW8270	µg/L	10 / *	0.092	--	PRG
Naphthalene	SW8270	µg/L	10	6.2	--	PRG
Phenanthrene	SW8270	µg/L	10	--	--	--
Pyrene	SW8270	µg/L	10	180	--	PRG
Acenaphthene	SW8310	µg/L	2.5	370	--	PRG
Acenaphthylene	SW8310	µg/L	5.0	--	--	--
Anthracene	SW8310	µg/L	0.7	1,800	--	PRG
Benzo(a)anthracene	SW8310	µg/L	0.3 / *	0.092	--	PRG
Benzo(a)pyrene	SW8310	µg/L	0.3 / *	**0.0015**	--	PRG
Benzo(b)fluoranthene	SW8310	µg/L	0.5 / *	0.092	--	PRG
Benzo(g,h,i)perylene	SW8310	µg/L	0.5	--	--	--
Benzo(k)fluoranthene	SW8310	µg/L	0.3	0.92	--	PRG
Chrysene	SW8310	µg/L	0.3	9.2	--	PRG
Dibenzo(a,h)anthracene	SW8310	µg/L	1.0 / *	0.0092	--	PRG
Fluoranthene	SW8310	µg/L	0.5	1,500	--	PRG
Fluorene	SW8310	µg/L	0.5	240	--	PRG
Indeno(1,2,3-c,d)pyrene	SW8310	µg/L	0.5 / *	0.092	--	PRG
Naphthalene	SW8310	µg/L	2.5	6.2	--	PRG
Phenanthrene	SW8310	µg/L	0.6	--	--	--
Pyrene	SW8310	µg/L	0.5	180	--	PRG

Table 2.1-2. Action Level Reference Guidance
(Page 10 of 15)

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations PRG	Background	Action Level
Dioxins / Furans						
Heptachlorinated dibenzo-p-dioxins, Total	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	SW8290	μg/L	5e-05	--	TBD	TBD
Heptachlorinated dibenzofurans, Total	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,4,6,7,8-Heptachlorodibenzofuran	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,4,7,8,9-Heptachlorodibenzofuran	SW8290	μg/L	5e-05	--	TBD	TBD
Hexachlorinated dibenzo-p-dioxins, Total	SW8290	μg/L	5e-05 / N/A	1.1e-05	TBD	PRG or Background[2]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	SW8290	μg/L	5e-05	--	TBD	TBD
Hexachlorinated dibenzofurans, Total	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,4,7,8-Hexachlorodibenzofuran	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,6,7,8-Hexachlorodibenzofuran	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,7,8,9-Hexachlorodibenzofuran	SW8290	μg/L	5e-05	--	TBD	TBD
2,3,4,6,7,8-Hexachlorodibenzofuran	SW8290	μg/L	5e-05	--	TBD	TBD
Octachlorodibenzo-p-dioxin	SW8290	μg/L	1e-04	--	TBD	TBD
Octachlorodibenzofuran	SW8290	μg/L	1e-04	--	TBD	TBD
Pentachlorinated dibenzo-p-dioxins, Total	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	SW8290	μg/L	5e-05	--	TBD	TBD
Pentachlorinated dibenzofurans, Total	SW8290	μg/L	5e-05	--	TBD	TBD
1,2,3,7,8-Pentachlorodibenzofuran	SW8290	μg/L	5e-05	--	TBD	TBD
2,3,4,7,8-Pentachlorodibenzofuran	SW8290	μg/L	5e-05	--	TBD	TBD
Tetrachlorinated dibenzo-p-dioxins, Total	SW8290	μg/L	2e-05	--	TBD	TBD
2,3,7,8-Tetrachlorodibenzo-p-dioxin	SW8290	μg/L	2e-05/1.2e-06	4.7e-07	TBD	PRG or Background[2]
Tetrachlorinated dibenzofurans, Total	SW8290	μg/L	2e-05	--	TBD	TBD
2,3,7,8-Tetrachlorodibenzofuran	SW8290	μg/L	2e-05	--	TBD	TBD

Table 2.1-2. Action Level Reference Guidance

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
Explosives						
2-Amino-4,6-dinitrotoluene	SW8330	μg/L	5.0	--	--	--
4-Amino-2,6-dinitrotoluene	SW8330	μg/L	5.0	--	--	--
1,3-Dinitrobenzene	SW8330	μg/L	5.0	6.1	--	PRG
2,4-Dinitrotoluene	SW8330	μg/L	5.0	120	--	PRG
2,6-Dinitrotoluene	SW8330	μg/L	5.0	61	--	PRG
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	SW8330	μg/L	5.0	--	--	--
Nitrobenzene	SW8330	μg/L	5.0	20	--	PRG
Nitroglycerin	SW8330	μg/L	25	35	--	PRG
2-Nitrotoluene	SW8330	μg/L	5.0	370	--	PRG
3-Nitrotoluene	SW8330	μg/L	5.0	370	--	PRG
4-Nitrotoluene	SW8330	μg/L	5.0	370	--	PRG
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	Sw8330	μg/L	5.0	3,100	--	PRG
Pentaerythritol tetranitrate	SW8330	μg/L	50	--	--	--
Tetryl	SW8330	μg/L	5.0	360	--	PRG
1,3,5-Trinitrobenzene	SW8330	μg/L	5.0	1,800	--	PRG
2,4,6-Trinitrotoluene	SW8330	μg/L	5.0	16	--	PRG
VOCs						
Acetone	SW8260	μg/L	10	610	--	PRG
Benzene	SW8260	μg/L	1 / *	0.41	--	PRG
Bromobenzene	SW8260	μg/L	1	20	--	PRG
Bromochloromethane	SW8260	μg/L	1	--	--	--
Bromodichloromethane	SW8260	μg/L	1 / *	0.18	--	PRG
Bromoform	SW8260	μg/L	1	8.5	--	PRG
Bromomethane	SW8260	μg/L	2	8.7	--	PRG
2-Butanone	SW8260	μg/L	10	1,900	--	PRG
n-Butylbenzene	SW8260	μg/L	1	61	--	PRG
sec-Butylbenzene	SW8260	μg/L	1	61	--	PRG
tert-Butylbenzene	SW8260	μg/L	1	61	--	PRG
Carbon Disulfide	SW8260	μg/L	1	1,000	--	PRG
Carbon Tetrachloride	SW8260	μg/L	1 / *	0.17	--	PRG
Chlorobenzene	SW8260	μg/L	1	110	--	PRG

Table 2.1-2. Action Level Reference Guidance
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Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations: PRG	Reference Concentrations: Background	Action Level
Chloroethane	SW8260	μg/L	2	4.6	--	PRG
2-Chloroethyl vinyl ether	SW8260	μg/L	2	--	--	--
Chloroform	SW8260	μg/L	1 / *	0.16	--	PRG
Chloromethane	SW8260	μg/L	2 / *	1.5	--	PRG
2-Chlorotoluene	SW8260	μg/L	1	--	--	--
4-Chlorotoluene	SW8260	μg/L	1	--	--	--
Dibromochloromethane	SW8260	μg/L	1 / *	0.13	--	PRG
1,2,-Dibromo-3-chloropropane	SW8260	μg/L	2 / *	**.0047**	--	PRG
1,2-Dibromoethane	SW8260	μg/L	1 / *	.00076	--	PRG
Dibromomethane	SW8260	μg/L	1	--	--	--
1,2-Dichlorobenzene	SW8260	μg/L	1	370	--	PRG
1,3-Dichlorobenzene	SW8260	μg/L	1	5.5	--	PRG
1,4-Dichlorobenzene	SW8260	μg/L	1 / *	0.50	--	PRG
Dichlorodifluoromethane	SW8260	μg/L	2	390	--	PRG
1,1-Dichloroethane	SW8260	μg/L	3	810	--	PRG
1,2-Dichloroethane	SW8260	μg/L	1 / *	0.12	--	PRG
1,1-Dichloroethene	SW8260	μg/L	1 / *	0.046	--	PRG
cis-1,2-Dichloroethene	SW8260	μg/L	1	61	--	PRG
trans-1,2-Dichloroethene	SW8260	μg/L	1	120	--	PRG
1,2-Dichloropropane	SW8260	μg/L	1 / *	0.16	--	PRG
1,3-Dichloropropane	SW8260	μg/L	1	--	--	--
2,2-Dichloropropane	SW8260	μg/L	1	--	--	--
1,1-Dichloropropene	SW8260	μg/L	1 / *	0.081	--	PRG
cis-1,3-Dichloropropene	SW8260	μg/L	1	0.081	--	PRG
trans-1,3-Dichloropropene	SW8260	μg/L	1	0.081	--	PRG
Ethylbenzene	SW8260	μg/L	1	1300	--	PRG
Hexachlorobutadiene	SW8260	μg/L	1 / *	0.86	--	PRG
2-Hexanone	SW8260	μg/L	10	--	--	--
Isopropylbenzene	SW8260	μg/L	1	660	--	PRG
p-Isopropyltoluene	SW8260	μg/L	1	--	--	--
Methylene chloride	SW8260	μg/L	2	4.3	--	PRG
4-Methyl-2-pentanone	SW8260	μg/L	10	160	--	PRG
Methyl(tert)butylether	SW8260	μg/L	2	20	--	PRG
Naphthalene	SW8260	μg/L	1	6.2	--	PRG

Table 2.1-2. Action Level Reference Guidance

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
n-Propylbenzene	SW8260	μg/L	1	61	--	PRG
Styrene	SW8260	μg/L	1	1600	--	PRG
1,1,1,2-Tetrachloroethane	SW8260	μg/L	1 / *	0.43	--	PRG
1,1,2,2-Tetrachloroethane	SW8260	μg/L	1 / *	0.055	--	PRG
Tetrachloroethene	SW8260	μg/L	1	1.1	--	PRG
Toluene	SW8260	μg/L	1	720	--	PRG
1,2,3-Trichlorobenzene	SW8260	μg/L	1	--	--	--
1,2,4-Trichlorobenzene	SW8260	μg/L	1	190	--	PRG
1,1,1-Trichloroethane	SW8260	μg/L	1	790	--	PRG
1,1,2-Trichloroethane	SW8260	μg/L	1 / *	0.20	--	PRG
Trichloroethene	SW8260	μg/L	1	1.6	--	PRG
Trichlorofluoromethane	SW8260	μg/L	2	1300	--	PRG
1,2,3-Trichloropropane	SW8260	μg/L	2 / *	0.0016	--	PRG
1,1,2-Trichlorotrifluoroethane	SW8260	μg/L	1	59,000	--	PRG
1,2,4-Trimethylbenzene	SW8260	μg/L	1	12	--	PRG
1,3,5-Trimethylbenzene	SW8260	μg/L	1	12	--	PRG
Vinyl Acetate	SW8260	μg/L	5	410	--	PRG
Vinyl Chloride	SW8260	μg/L	2 / *	0.0020	--	PRG
m & p-Xylene	SW8260	μg/L	1	1400	--	PRG
o-Xylene	SW8260	μg/L	1	1400	--	PRG
Inorganic						
Phosphorus	E365.2	μg/L	1,000 / *	--	--	--
TEPH						
as Diesel	SW8015M	μg/L	50	--	--	--
as Kerosene	SW8015M	μg/L	50	--	--	--
as Motor Oil	SW8015M	μg/L	500	--	--	--

Table 2.1-2. Action Level Reference Guidance

Parameter	Method	Units	PQL/MDL[1]	Reference Concentrations		Action Level
				PRG	Background	
Pesticides (Water)						
Aldrin	SW8081A	µg/L	0.05/0.006	0.004	--	MCL*
alpha-BHC	SW8081A	µg/L	0.05	---	--	MCL*
beta-BHC	SW8081A	µg/L	0.05	---	--	MCL*
delta-BHC	SW8081A	µg/L	0.05	---	--	PQL
gamma-BHC (Lindane)	SW8081A	µg/L	0.05	---	--	MCL
alpha-Chlordane	SW8081A	µg/L	0.05	0.19**	--	MCL
gamma-Chlordane	SW8081A	µg/L	0.05	0.19**	--	MCL
4,4'-DDD	SW8081A	µg/L	0.1	0.28	--	PRG
4,4'-DDE	SW8081A	µg/L	0.1	0.20	--	PRG
4,4'-DDT	SW8081A	µg/L	0.1	0.20	--	PRG
Dieldrin	SW8081A	µg/L	0.1/0.02	0.0042	--	MCL*
Endosulfan I	SW8081A	µg/L	0.1	220**	--	PRG**
Endosulfan II	SW8081A	µg/L	0.05	220**	--	PRG**
Endosulfan sulfate	SW8081A	µg/L	0.1	---	--	PQL
Endrin	SW8081A	µg/L	0.1	11	--	MCL
Endrin aldehyde	SW8081A	µg/L	0.1	---	--	PQL
Endrin ketone	SW8081A	µg/L	0.1	---	--	PQL
Heptachlor	SW8081A	µg/L	0.05/0.007	0.015	--	MCL
Heptachlor epoxide	SW8081A	µg/L	0.05/0.008	0.0074	--	MCL
Methoxychlor	SW8081A	µg/L	2	180	--	MCL
Toxaphene	SW8081A	µg/L	2/1.4	0.061	--	MCL

Table 2.1-2. Action Level Reference Guidance

Notes:

(1) MDL is indicated for use when PQL > action level. If MDL > action level, use laboratory reported MDL below which parameter is assumed not to be present.

(2) Whichever is greater

(3) 1.0 PQL may be reported for some samples not associated with the TNT Strips

PQL = Practical quantitation limit. Uncorrected laboratory limit is shown; laboratory limit for each soil sample analysis is corrected for moisture.

MDL = Method detection limit. Uncorrected laboratory limit is shown; laboratory limit for each soil sample analysis is corrected for moisture.

PRG = Preliminary Remediation Goals established by United States Environmental Protection Agency (EPA) Region IX (October 1999). Bold PRGs are California Environmental Protection Agency (Cal-EPA) modified values.

-- = No established value (per EPA Region IX PRG table)

TBD = To be determined

mg/kg = Milligrams per kilogram, or parts per million

μg/L = Micrograms per liter, or parts per billion

N/A = Not applicable

* = MDL will be provided for parameter upon final selection of laboratory

California Assessment Manual (CAM) 17 Metals include antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc.

EPA Method SW6010B for metals by inductively coupled plasma (ICP)

EPA Method SW7471A/SW7470A for mercury analysis by cold vapor atomic absorption

EPA Method SW8270C for semi-volatile organic compounds (SVOCs)

EPA Method SW8260B for volatile organic compounds (VOCs)

EPA Method SW8310 for polynuclear aromatic hydrocarbons (PAHs)

EPA Method SW8290 for dioxins/furans

EPA Method SW8330 for explosives

EPA Method SW8260 for volatile organic compounds (VOCs)

EPA Method E365.2 for total phosphorous

California Leaking Underground Fuel Tank (LUFT) Modified EPA Method SW8015M for total extractable petroleum hydrocarbons (TEPH)

Table 2.2-1. Field Sampling Program North Valley TNT Strip #1

			Chemical Analyses/EPA Test Methods				
			Field TNT Soil Test[a]	Dioxins Furans	Explosives	PAHs	Metals[b]
Sample ID	Sample Depth (ft bgs)	Sample Matrix	SW8515	SW8290	SW8330	SW8310	SW6010B, SW7470A, SW7471A
TNT-1C2/0	0.0-0.5	Soil	X		(1)	(1)	(1)
TNT-1C2/1	1.0-1.5	Soil	X	X	(1)	(1)	(1)
TNT-1C2/2	2.0-2.5	Soil	X		(1)	(1)	(1)
TNT-1C2/4	4.0-4.5	Soil	X		(1)	(1)	(1)
TNT-1C2/6	6.0-6.5	Soil	X		(1)	(1)	(1)
TNT-1C2/8	8.0-8.5	Soil	X		(1)	(1)	(1)
TNT-1C2/10	10.0-10.5	Soil	X		(1)	(1)	(1)
TNT-1C3/0	0.0-0.5	Soil	X		(1)	(1)	(1)
TNT-1C3/1	1.0-1.5	Soil	X		(1)	(1)	(1)
TNT-1C3/4	4.0-4.5	Soil	X		(1)	(1)	(1)
TNT-1C3/6	6.0-6.5	Soil	X		(1)	(1)	(1)
TNT-1C4/0	0.0-0.5	Soil	X		(1)	(1)	(1)
TNT-1C4/1	1.0-1.5	Soil	X		(1)	(1)	(1)
TNT-1C4/4	4.0-4.5	Soil	X		(1)	(1)	(1)
TNT-1C4/6	6.0-6.5	Soil	X		(1)	(1)	(1)
TNT-1C5/0	0.0-0.5	Soil	X		(1)	(1)	(1)
TNT-1C6/0	0.0-0.5	Soil	X		(1)	(1)	(1)
TNT-1C6/1	1.0-1.5	Soil	X		(1)	(1)	(1)
TNT-1C6/4	4.0-4.5	Soil	X		(1)	(1)	(1)

Table 2.2-1. Field Sampling Program North Valley TNT Strip #1

Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses/EPA Test Methods			
			Field TNT Soil Test[a]	Explosives	PAHs	Metals[b]
			SW8515	SW8330	SW8310	SW6010B, SW7470A, SW7471A
TNT-1C6/6	6.0-6.5	Soil	X	(1)	(1)	(1)
TNT-1C7/0	0.0-0.5	Soil	X	(1)	(1)	(1)
TNT-1C7/1	1.0-1.5	Soil	X	(1)	(1)	(1)
TNT-1C7/4	4.0-4.5	Soil	X	(1)	(1)	(1)
TNT-1C7/6	6.0-6.5	Soil	X	(1)	(1)	(1)
TNT-1C8/0	0.0-0.5	Soil	X	(1)	(1)	(1)
TNT-1D/0	0.0-0.5	Soil	X			
TNT-1D/1	1.0-1.5	Soil	X			
TNT-1D/4	4.0-4.5	Soil	X			
TNT-1D/6	6.0-6.5	Soil	X			
TNT-1E/0	0.0-0.5	Soil	X			
TNT-1E/1	1.0-1.5	Soil	X			
TNT-1E/4	4.0-4.5	Soil	X			
TNT-1E/6	6.0-6.5	Soil	X			
TNT-1F/0	0.0-0.5	Soil	X			
TNT-1F/1	1.0-1.5	Soil	X			
TNT-1F/2	2.0-2.5	Soil	X			
TNT-1F/4	4.0-4.5	Soil	X			
TNT-1F/6	6.0-6.5	Soil	X			
TNT-1F/8	8.0-8.5	Soil	X			

Table 2.2-1. Field Sampling Program North Valley TNT Strip #1

			Chemical Analyses/EPA Test Methods			
			Field TNT Soil Test[a]	Explosives	PAHs	Metals[b]
Sample ID	Sample Depth (ft bgs)	Sample Matrix	SW8515	SW8330	SW8310	SW6010B, SW7470A, SW7471A
TNT-1F/10	10.0-10.5	Soil	X			
TNT-1F2/0	0.0-0.5	Soil	X			
TNT-1F2/1	1.0-1.5	Soil	X			
TNT-1F2/4	4.0-4.5	Soil	X			
TNT-1F2/6	6.0-6.5	Soil	X			
TNT-1F3/0	0.0-0.5	Soil	X			
TNT-1F3/1	1.0-1.5	Soil	X			
TNT-1F3/4	4.0-4.5	Soil	X			
TNT-1F3/6	6.0-6.5	Soil	X			
TNT-1F4/0	0.0-0.5	Soil	X			
TNT-1F5/0	0.0-0.5	Soil	X			
TNT-1F5/1	1.0-1.5	Soil	X			
TNT-1F5/4	4.0-4.5	Soil	X			
TNT-1F5/6	6.0-6.5	Soil	X			
TNT-1F6/0	0.0-0.5	Soil	X			
TNT-1F6/1	1.0-1.5	Soil	X			
TNT-1F6/4	4.0-4.5	Soil	X			
TNT-1F6/6	6.0-6.5	Soil	X			
TNT-1F7/0	0.0-0.5	Soil	X			
TNT-1G/0	0.0-0.5	Soil	X			
TNT-1G/1	1.0-1.5	Soil	X			
TNT-1G/4	4.0-4.5	Soil	X			
TNT-1G/6	6.0-6.5	Soil	X			
TNT-1H/0	0.0-0.5	Soil	X			
TNT-1H/1	1.0-1.5	Soil	X			

Table 2.2-1. Field Sampling Program North Valley TNT Strip #1

			Chemical Analyses/EPA Test Methods				
			Field TNT Soil Test[a]	Dioxins Furans	Explosives	PAHs	Metals[b]
Sample ID	Sample Depth (ft bgs)	Sample Matrix	SW8515	SW8290	SW8330	SW8310	SW6010B, SW7470A, SW7471A
TNT-1H/4	4.0-4.5	Soil	X				
TNT-1H/6	6.0-6.5	Soil	X				

Notes:
(a) On-site mobile laboratory may be used, utilizing EPA Method SW8330.
(b) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.
(1) Sample will be submitted for analysis only if surface samples exceeds TNT nondetect field testing criterion (see Section 2.2.1.1).
EPA = Environmental Protection Agency
ft bgs = feet below ground surface
PAHs = polyaromatic hydrocarbons
TNT = trinitrotoluene

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-2. Field Sampling Program North Valley TNT Strip #4
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			Chemical Analyses/EPA Test Methods			
			Field TNT Soil Test[a]	Explosives	PAHs	Metals[b]
Sample ID	Sample Depth (ft bgs)	Sample Matrix	SW8515	SW8330	SW8310	SW6010B, SW7470A, SW7471A
TNT-4C1/0	0.0-0.5	Soil	X			
TNT-4C1/1	1.0-1.5	Soil	X			
TNT-4C1/4	4.0-4.5	Soil	X			
TNT-4C1/6	6.0-6.5	Soil	X			
TNT-4C2/0	0.0-0.5	Soil	X			
TNT-4C2/1	1.0-1.5	Soil	X			
TNT-4C2/4	4.0-4.5	Soil	X			
TNT-4C2/6	6.0-6.5	Soil	X			
TNT-4C3/0	0.0-0.5	Soil	X			
TNT-4C4/0	0.0-0.5	Soil	X			
TNT-4C4/1	1.0-1.5	Soil	X			
TNT-4C4/4	4.0-4.5	Soil	X			
TNT-4C4/6	6.0-6.5	Soil	X			
TNT-4C5/0	0.0-0.5	Soil	X			
TNT-4C5/1	1.0-1.5	Soil	X			
TNT-4C5/4	4.0-4.5	Soil	X			
TNT-4C5/6	6.0-6.5	Soil	X			
TNT-4C6/0	0.0-0.5	Soil	X			
TNT-4C7/0	0.0-0.5	Soil	X			

Table 2.2-2. Field Sampling Program North Valley TNT Strip #4
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Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses/EPA Test Methods			
			Field TNT Soil Test[(a)]	Explosives	PAHs	Metals[(b)]
			SW8515	SW8330	SW8310	SW6010B, SW7470A, SW7471A
TNT-4C7/1	1.0-1.5	Soil	X			
TNT-4C7/4	4.0-4.5	Soil	X			
TNT-4C7/6	6.0-6.5	Soil	X			
TNT-4C8/0	0.0-0.5	Soil	X			
TNT-4C8/1	1.0-1.5	Soil	X			
TNT-4C8/4	4.0-4.5	Soil	X			
TNT-4C8/6	6.0-6.5	Soil	X			
TNT-4C9/0	0.0-0.5	Soil	X			

Notes:
(a) On-site mobile laboratory may be used, utilizing EPA Method SW8330.
(b) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.

EPA = Environmental Protection Agency
ft bgs = feet below ground surface
PAHs = polyaromatic hydrocarbons
TNT = trinitrotoluene

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-3. Field Sampling Program North Valley TNT Strip #5
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Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses/EPA Test Methods			
			Field TNT Soil Test[a]	Explosives	PAHs	Metals[b]
			SW8515	SW8330	SW8310	SW6010B, SW7470A, SW7471A
TNT-5A1/0	0.0-0.5	Soil	X			
TNT-5A1/1	1.0-1.5	Soil	X			
TNT-5A1/4	4.0-4.5	Soil	X			
TNT-5A1/6	6.0-6.5	Soil	X			
TNT-5A2/0	0.0-0.5	Soil	X			
TNT-5A2/1	1.0-1.5	Soil	X			
TNT-5A2/4	4.0-4.5	Soil	X			
TNT-5A2/6	6.0-6.5	Soil	X			
TNT-5A3/0	0.0-0.5	Soil	X			
TNT-5A4/0	0.0-0.5	Soil	X			
TNT-5A4/1	1.0-1.5	Soil	X			
TNT-5A4/4	4.0-4.5	Soil	X			
TNT-5A4/6	6.0-6.5	Soil	X			
TNT-5A5/0	0.0-0.5	Soil	X			
TNT-5A5/1	1.0-1.5	Soil	X			
TNT-5A5/4	4.0-4.5	Soil	X			
TNT-5A5/6	6.0-6.5	Soil	X			
TNT-5A6/0	0.0-0.5	Soil	X			
TNT-5F/0	0.0-0.5	Soil	X			
TNT-5F/1	1.0-1.5	Soil	X			

Table 2.2-3. Field Sampling Program North Valley TNT Strip #5

Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses/EPA Test Methods			
			Field TNT Soil Test[a]	Explosives	PAHs	Metals[b]
			SW8515	SW8330	SW8310	SW6010B, SW7470A, SW7471A
TNT-5F/4	4.0-4.5	Soil	X			
TNT-5F/6	6.0-6.5	Soil	X			

Notes: (a) On-site mobile laboratory may be used, utilizing EPA Method SW8330.
(b) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.

EPA = Environmental Protection Agency
ft bgs = feet below ground surface
PAHs = polyaromatic hydrocarbons
TNT = trinitrotoluene

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-4. Field Sampling Program North Valley Howitzer Test Facility

			Chemical Analyses/EPA Test Methods							
			Explosives	Nitroglycerin PETN	TEPH-D/ MO	TEPH-K	Nitrate-N Nitrite-N	Metals[(a)]	PAHs	VOCs
Sample ID	Sample Depth (ft bgs)	Sample Matrix	SW8330	SW8330	LUFT Mod. SW8015	LUFT Mod. SW8015	E300.0	SW6010B, SW7470A, SW7471A	SW8310	SW8260B
HF-1/0.5	0.5-1.0	Soil	X	X	X	X	X	X	X	X
HF-1/4	4.0-4.5	Soil	X	X	X	X	X	X	X	X
HF-1/10	10.0-10.5	Soil	X	X	X	X	X	X	X	X
HF-1/15	15.0-15.5	Soil	X	X	X	X	X	X	X	X
HF-1/20	20.0-20.5	Soil	X	X	X	X	X	X	X	X
HF-2/0.5	0.5-1.0	Soil	X	X	X	X	X	X	X	X
HF-2/4	4.0-4.5	Soil	X	X	X	X	X	X	X	X
HF-2/10	10.0-10.5	Soil	X	X	X	X	X	X	X	X
HF-2/15	15.0-15.5	Soil	X	X	X	X	X	X	X	X
HF-2/20	20.0-20.5	Soil	X	X	X	X	X	X	X	X
HF-3/0.5	0.5-1.0	Soil	X	X	X	X	X	X	X	X
HF-3/4	4.0-4.5	Soil	X	X	X	X	X	X	X	X
HF-3/10	10.0-10.5	Soil	X	X	X	X	X	X	X	X
HF-3/15	15.0-15.5	Soil	X	X	X	X	X	X	X	X
HF-3/20	20.0-20.5	Soil	X	X	X	X	X	X	X	X

Notes: (a) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.

EPA = Environmental Protection Agency
ft bgs = feet below ground surface
LUFT = leaking underground fuel tank
PAHs = polyaromatic hydrocarbons
PETN = pentaerythritol tetranitrate
TEPH-D/MO = total extractable petroleum hydrocarbons as diesel and motor oil
TEPH-K = Total extractable petroleum hydrocarbons as kerosene
VOCs = volatile organic compounds

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-5. Field Sampling Program North Valley Soil Stockpiles

Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses/EPA Test Methods						
			Explosives	Nitroglycerin PETN	TEPH-D/MO	TEPH-K	Metals[a]	PAHs	Nitrate-N Nitrite-N
			SW8330	SW8330	LUFT Mod. SW8015	LUFT Mod. SW8015	SW6010B, SW7470A, SW74741A	SW8310	E300.0
SP1-C	2.0-2.5	Soil	X	X	X	X	X	X	X
SP2-C	2.0-2.5	Soil	X	X	X	X	X	X	X

Notes: (a) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.

EPA = Environmental Protection Agency
ft bgs = feet below ground surface
LUFT = leaking underground fuel tank
PAHs = polyaromatic hydrocarbons
TEPH-D/MO = total extractable petroleum hydrocarbons as diesel and motor oil
TEPH-K = total extractable petroleum hydrocarbons as kerosene

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-6. Field Sampling Program North Valley Ammunition Renovation Primer Destruction Site

			Chemical Analyses/EPA Test Methods							
			Explosives	Nitroglycerin PETN	TEPH-D/MO	TEPH-K	VOCs	Metals[a]	PAHs	Nitrate-N Nitrite-N
Sample ID	Sample Depth (ft bgs)	Sample Matrix	SW8330	SW8330	LUFT Mod. SW8015	LUFT Mod. SW8015	SW8260B	SW6010B, SW7470A, SW74741A	SW8310	E300.0
AR-1/0.5	0.5-1.0	Soil	X	X	X	X	X	X	X	X
AR-1/4	4.0-4.5	Soil	X	X	X	X	X	X	X	X
AR-1/10	10-10.5	Soil	X	X	X	X	X	X	X	X
AR-1/15	15.0-15.5	Soil	X	X	X	X	X	X	X	X
AR-1/20	20.0-20.5	Soil	X	X	X	X	X	X	X	X
AR-2/0.5	0.5-1.0	Soil	X	X	X	X	X	X	X	X
AR-2/4	4.0-4.5	Soil	X	X	X	X	X	X	X	X
AR-2/10	10.0-10.5	Soil	X	X	X	X	X	X	X	X
AR-2/15	15.0-15.5	Soil	X	X	X	X	X	X	X	X
AR-2/20	20.0-20.5	Soil	X	X	X	X	X	X	X	X
AR-3/0.5	0.5-1.0	Soil	X	X	X	X	X	X	X	X
AR-3/4	4.0-4.5	Soil	X	X	X	X	X	X	X	X
AR-3/10	10.0-10.5	Soil	X	X	X	X	X	X	X	X
AR-3/15	15.0-15.5	Soil	X	X	X	X	X	X	X	X
AR-3/20	20.0-20.5	Soil	X	X	X	X	X	X	X	X
AR-4/0.5	0.5-1.0	Soil	X	X	X	X	X	X	X	X
AR-4/4	4.0-4.5	Soil	X	X	X	X	X	X	X	X

Table 2.2-6. Field Sampling Program North Valley Ammunition Renovation Primer Destruction Site
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			Chemical Analyses/EPA Test Methods							
			Explosives	Nitroglycerin PETN	TEPH-D/MO	TEPH-K	VOCs	Metals[a]	PAHs	Nitrate-N Nitrite-N
Sample ID	Sample Depth (ft bgs)	Sample Matrix	SW8330	SW8330	LUFT Mod. SW8015	LUFT Mod. SW8015	SW8260B	SW6010B, SW7470A, SW74741A	SW8310	E300.0
AR-4/10	10.0-10.5	Soil	X	X	X	X	X	X	X	X
AR-4/15	15.0-15.5	Soil	X	X	X	X	X	X	X	X
AR-4/20	20.0-20.0	Soil	X	X	X	X	X	X	X	X

Notes: (a) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.

EPA = Environmental Protection Agency
ft bgs = feet below ground surface
LUFT = leaking underground fuel tank
PAHs = polyaromatic hydrocarbons
TEPH-D/MO = total extractable petroleum hydrocarbons as diesel and motor oil
TEPH-K = total extractable petroleum hydrocarbons as kerosene
VOCs = volatile organic compounds

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-7. Field Sampling Program North Valley Temporary Wells

			Chemical Analyses/EPA Test Methods									
			General Water Chemistry	Nitrate-N Nitrite-N	VOCs	Explosives	Nitroglycerin PETN	TEPH-D/ MO	TEPH-K	Metals[b]	Metals[b] (Dissolved)	PAHs	Soil Properties
Sample ID	Sample Depth (ft bgs)	Sample Matrix	(a)	E300.0	SW8260B	SW8330	SW8330	LUFT Mod. SW8015	LUFT Mod. SW8015	SW6010B, SW7470A, SW7471A	SW6010B, SW7470A, SW7471A	SW8310	(c)
TW-1/0.5	0.5-1.0	Soil		X	X	X	X	X	X	X		X	
TW-1/4	4.0-4.5	Soil		X	X	X	X	X	X	X		X	
TW-1/10	10.0-10.5	Soil		X	X	X	X	X	X	X		X	
TW-1/15	15.0-15.5	Soil		X	X	X	X	X	X	X		X	
TW-1/20	20.0-20.5	Soil		X	X	X	X	X	X	X		X	
TW-1/B	(1)	Soil											X
TW-2/B	(1)	Soil											X
TW-4/0.5	0.5-1.0	Soil		X	X	X	X	X	X	X		X	
TW-4/4	4.0-4.5	Soil		X	X	X	X	X	X	X		X	
TW-4/10	10.0-10.5	Soil		X	X	X	X	X	X	X		X	
TW-4/15	15.0-15.5	Soil		X	X	X	X	X	X	X		X	
TW-5/20	20.0-20.5	Soil		X	X	X	X	X	X	X		X	
TW-5/0.5	0.5-1.0	Soil		X	X	X	X	X	X	X		X	
TW-5/4	4.0-4.5	Soil		X	X	X	X	X	X	X		X	
TW-5/10	10.0-10.5	Soil		X	X	X	X	X	X	X		X	
TW-5/15	15.0-15.5	Soil		X	X	X	X	X	X	X		X	
TW-6/0.5	0.5-1.0	Soil		X	X	X	X	X	X	X		X	
TW-6/4	4.0-4.5	Soil		X	X	X	X	X	X	X		X	
TW-6/10	10.0-10.5	Soil		X	X	X	X	X	X	X		X	
TW-6/15	15.0-15.0	Soil		X	X	X	X	X	X	X		X	
TW-6/20	20.0-20.5	Soil		X	X	X	X	X	X	X		X	
TW-7/0.5	0.5-1.0	Soil		X	X	X	X	X	X	X		X	
TW-7/4	4.0-4.5	Soil		X	X	X	X	X	X	X		X	
TW-7/10	10.0-10.5	Soil		X	X	X	X	X	X	X		X	

Table 2.2-7. Field Sampling Program North Valley Temporary Wells

			Chemical Analyses/EPA Test Methods									
			General Water Chemistry	Nitrate-N Nitrite-N	VOCs	Explosives	Nitroglycerin PETN	TEPH-D/ MO	TEPH-K	Metals[b]	Metals[b] (Dissolved)	PAHs	Soil Properties
Sample ID	Sample Depth (ft bgs)	Sample Matrix	(a)	E300.0	SW8260B	SW8330	SW8330	LUFT Mod. SW8015	LUFT Mod. SW8015	SW6010B, SW7470A, SW7471A	SW6010B, SW7470A, SW7471A	SW8310	(c)
TW-7/15	15.0-15.5	Soil		X	X	X	X	X	X	X		X	
TW-7/20	20.0-20.5	Soil		X	X	X	X	X	X	X		X	
TW-1	NA	Water	X		X	X	X	X	X		X	X	
TW-2	NA	Water	X		X	X	X	X	X		X	X	
TW-3	NA	Water	X		X	X	X	X	X		X	X	
TW-4	NA	Water	X		X	X	X	X	X		X	X	
TW-5	NA	Water	X		X	X	X	X	X		X	X	
TW-6	NA	Water	X		X	X	X	X	X		X	X	
TW-7	NA	Water	X		X	X	X	X	X		X	X	
TW-8	NA	Water	X		X	X	X	X	X		X	X	
TW-9	NA	Water	X		X	X	X	X	X		X	X	

Notes: (a) General water chemistry includes (1) chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0, total phosphorous by EPA Method 365.2, total organic carbon by EPA Method 415.1, total dissolved solids (TDS) by EPA Method 160.1, and total suspended solids (TSS) by EPA Method 160.2; and (2) Field parameters - temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1.

(b) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.

(c) Soil properties includes: grain size using American Society of Testing and Materials (ASTM) D422, and total organic carbon by EPA Method SW9060

(1) Bulk samples to be collected from major lithologies encountered.

EPA = Environmental Protection Agency
ft bgs = feet below ground surface
LUFT = leaking underground fuel tank
PAHs = polyaromatic hydrocarbons
TEPH-D/MO = total extractable petroleum hydrocarbons as diesel and motor oil
TEPH-K = total extractable petroleum hydrocarbons as kerosene
VOCs = volatile organic compounds

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-8. Field Sampling Program Ridge and Ridge Soil Stockpiles

Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses/EPA Test Methods				
			Explosives	Nitroglycerin PETN	Metals [a]	TEPH-D/MO	Nitrate-N Nitrite-N
			SW8330	SW8330	SW6010B, SW7470A, SW74741A	LUFT Mod. SW8015	E300.0
RSP1-A,-B,-C,-D	2.0-2.5	Soil	X		X	X	
RSP2-A,-B,-C,-D	2.0-2.5	Soil	X		X	X	
RSP3-A,-B,-C,-D	2.0-2.5	Soil	X		X	X	
RSP4-A,-B,-C,-D	2.0-2.5	Soil	X		X	X	
RSP5-A,-B,-C,-D	2.0-2.5	Soil	X		X	X	
RSP6-A,-B	2.0-2.5	Soil	X		X	X	
RSP7-A,-B	2.0-2.5	Soil	X		X	X	
RSP8-A,-B	2.0-2.5	Soil	X		X	X	
RSP9-A,-B	2.0-2.5	Soil	X		X	X	
R1-A, -B, -C, -D	0.0-0.5	Soil/Bedrock		X			X
LB-1	4.0-4.5	Soil	X	X			X
LB-2	14.0-14.5	Soil	X	X			X
LB-3	4.0-4.5	Soil	X	X	X		
LB-4	4.0-4.5	Soil	X	X			X
LB-5	4.0-4.5	Soil	X	X			X
LB-6	4.0-4.5	Soil	X	X			X

Notes: (a) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.

Four samples (A, B, C, D) will be collected in the field and composited into a single sample by the analytical laboratory.

Two samples (A, B) will be collected in the field and composited into a single sample by the analytical laboratory.

EPA = Environmental Protection Agency
ft bgs = feet below ground surface
LUFT = leaking underground fuel tank
PAHs = polyaromatic hydrocarbons
TEPH-D/MO = total extractable petroleum hydrocarbons as diesel and motor oil

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-9. Field Sampling Program South Valley Flare Site

Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses/EPA Test Methods						
			Explosives	Nitroglycerin PETN	PAHs	Dioxins Furans	Metals[a]	Total Phosphorous	Nitrate-N Nitrite-N
			SW8330	SW8330	SW8310	SW8290	SW6010B, SW7470A, SW74741A	E365.2	E300.0
FA-4/0 [1]	0.0-0.5[1]	Soil					X	X	
FA-4/1[1]	1.0-1.5[1]	Soil					X	X	
FA-4/2[1]	2.0-2.5[1]	Soil					X	X	
FA-4/5[1]	4.0-4.5[1]	Soil					X	X	
FA-4/10[1]	10.0-10.5[1]	Soil					X	X	
FA-5/0[1]	0.0-0.5[1]	Soil					X	X	
FA-5/1[1]	1.0-1.5[1]	Soil					X	X	
FA-5/2[1]	2.0-2.5[1]	Soil					X	X	
FA-5/5[1]	4.0-4.5[1]	Soil					X	X	
FA-5/10[1]	10.0-10.5[1]	Soil					X	X	
FA-6/1[1]	1.0-1.5[1]	Soil	X	X	X	X	X	X	X
FA-6/2[1]	2.0-2.5[1]	Soil					X	X	
FA-6/5[1]	5.0-5.0[1]	Soil					X	X	
FA-6/10[1]	10.0-10.5[1]	Soil					X	X	

Notes: (a) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.
(1) Depth may be modified based on field conditions and ordnance and explosives (OE) clearance (see Section 2.2.1.6.)
EPA = Environmental Protection Agency
ft bgs = feet below ground surface
PAHs = polyaromatic hydrocarbons
TNT = trinitrotoluene
PETN = pentaerythritol tetranitrate

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-10. Field Sampling Program South Valley Demolition Site #1

Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses/EPA Test Methods				
			Explosives	PAHs	Metals[(a)]	Nitroglycerin PETN	Nitrate-N Nitrite-N
			SW8330	SW8310	SW6010B, SW7470A, SW7471A	SW8330	E300.0
DA1-3W1	Sidewall	Soil	X	X	X	X	X
DA1-3W2	Sidewall	Soil	X	X	X	X	X

Notes: (a) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.

EPA = Environmental Protection Agency
ft bgs = feet below ground surface
PAHs = polyaromatic hydrocarbons
PETN = pentaerythritol tetranitrate

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-11. Field Sampling Program South Valley Demolition Site #3

Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses				
			Explosives	PAHs	Metals[a]	Nitroglycerin PETN	Nitrate-N Nitrite-N
			SW8330	SW8310	SW6010B, SW7470A, SW7471A	SW8330	E300.0
DA3-3/5[1]	5.0-5.5[1]	Soil	X	X	X		
DA3-3/10[1]	10.0-10.5[1]	Soil	X	X	X		
DA3-3/15[1]	150-15.5[1]	Soil	X	X	X		
DA3-3/20[1]	20.0-20.5[1]	Soil	X	X	X		
DA3-4/5[1]	5.0-5.5[1]	Soil	X	X	X		
DA3-4/10[1]	10.0-10.5[1]	Soil	X	X	X		
DA3-4/15[1]	15.5-15.5[1]	Soil	X	X	X		
DA3-4/20[1]	20.0-20.5[1]	Soil	X	X	X		
DA3-5/5[1]	5.0-5.5[1]	Soil	X	X	X		
DA3-5/10[1]	10.0-10.5[1]	Soil	X	X	X	(2)	(2)
DA3-5/15[1]	15.0-15.5[1]	Soil	X	X	X		
DA3-5/20[1]	20.0-20.5[1]	Soil	X	X	X		
DA3-6/5[1]	5.0-5.5[1]	Soil	X	X	X		
DA3-6/10[1]	10.0-10.5[1]	Soil	X	X	X	(2)	(2)

Table 2.2-11. Field Sampling Program South Valley Demolition Site #3
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Sample ID	Sample Depth (ft bgs)	Sample Matrix	Chemical Analyses				
			Explosives	PAHs	Metals[a]	Nitroglycerin PETN	Nitrate-N Nitrite-N
			SW8330	SW8310	SW6010B, SW7470A, SW7471A	SW8330	E300.0
DA3-6/15[1]	15.0-15.5[1]	Soil	X	X	X		
DA3-6/20[1]	20.0-20.5[1]	Soil	X	X	X		

Notes: (a) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.
(1) Depth may be modified based on field conditions (see Section 2.2.1.7).
(2) Sample to be collected immediately below fill material (see Section 2.2.1.7).
EPA = Environmental Protection Agency
ft bgs = feet below ground surface
PAHs = polyaromatic hydrocarbons
PETN = pentaerythritol tetranitrate

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.2-12. Field Sampling Program South Valley Wetlands Sediment and Surface Water, Groundwater, and Seeps/Springs
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			Chemical Analyses/EPA Test Methods									
			Explosives	Nitroglycerin PETN	VOCs	Dioxins Furans	PAHs	Metals[a] (Dissolved)	Metals[a]	Total Phosphorous	General Water Chemistry	Nitrate-N Nitrite-N
Sample ID	Sample Depth (ft bgs)	Sample Matrix	SW8330	SW8330	SW8260B	SW8290	SW8310	SW6010B, SW7470A, SW7471A	SW6010B, SW7470A, SW7471A	E365.2	(b)	E-300.0
TW-10	NA	Water	X	X	X		X	X			X	
TW-11	NA	Water	X	X	X		X	X			X	
TW-12	NA	Water	X	X	X		X	X			X	
SW-1	NA	Water	X	X			X	X	X		X	
SW-2	NA	Water	X	X				X	X		X	
SPS-1	NA	Water	X	X	X		X	X			X	
SPS-2	NA	Water	X	X	X		X	X			X	
SPS-3	NA	Water	X	X	X		X	X			X	
WET-1	0.0-0.5	Sediment	X	X			X		X	X		X
WET-2	0.0-0.5	Sediment	X	X		X	X		X	X		X

Notes: (a) California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc), plus aluminum, calcium, iron, manganese, potassium, and sodium.

(b) General water chemistry includes (1) chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0, total phosphorous by EPA Method 365.2, total organic carbon by EPA Method 415.1, total dissolved solids (TDS) by EPA Method 160.1, and total suspended solids (TSS) by EPA Method 160.2; and (2) Field parameters - temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1.

EPA = Environmental Protection Agency
ft bgs = feet below ground surface
LUFT = leaking underground fuel tank
PAHs = polyaromatic hydrocarbons
TEPH-D/MO = total extractable petroleum hydrocarbons as diesel and motor oil
TEPH-K = total extractable petroleum hydrocarbons as kerosene
TNT = trinitrotoluene
VOCs = volatile organic compounds

Sample results will be reported on a dry weight basis.
All EPA Test Methods will be performed according to the preparation and cleanup methods specified in Section 3.2.4.2.

Table 2.9-1
Summary of Duplicate (QC) Sampling Program
TNT Strips #1

EPA Test Method	Total Number of Samples				Total Number of Duplicate Samples			
	Soil	Groundwater	Sediment	Surface Water	Soil	Groundwater	Sediment	Surface Water
Field TNT Soil Test	66				7			
SW8330 Explosives	25				3			
SW8330 Nitroglycerin & PETN								
SW8310 PAHs	25				3			
Metals[a] SW601B/SW87470A, SW7471A	25				3			
LUFT Mod. SW8015 TEPH-D/MO								
LUFT Mod. SW8015 TEPH-K								
SW8260B VOCs								
E300.0 Nitrate/Nitrite								
E365.2 Total Phosphorous								
SW8290 Dioxins/Furans	1				-			
Groundwater Chemistry[b]								

Total No. Boring/Sample Locations: 18 borings

Notes:
[a] California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
[b] General water chemistry includes (1) chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0, total phosphorous by EPA Method 365.2, total organic carbon by EPA Method 415.1, total dissolved solids (TDS) by EPA Method 160.1, and total suspended solids (TSS) by EPA Method 160.2; and (2) Field parameters - temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1.

EPA = Environmental Protection Agency
LUFT = leaking underground fuel tank
PAHs = polyaromatic hydrocarbons
TEPH-D/MO = total extractable petroleum hydrocarbons as diesel and motor oil
TEPH-K = total extractable petroleum hydrocarbons as kerosene
VOCs = volatile organic compounds
PETN = pentaerythritol tetranitrate

Due to a combination of compositing and/or number of samples being collected, no duplicate samples will be collected from the stockpiles, Demolition Site #1, or the wetlands surface water/sediment.

Table 2.9-2
Summary of Duplicate (QC) Sampling Program
TNT Strips #4

EPA Test Method	Total Number of Samples				Total Number of Duplicate Samples			
	Soil	Groundwater	Sediment	Surface Water	Soil	Groundwater	Sediment	Surface Water
Field TNT Soil Test	27				3			
SW8330 Explosives								
SW8330 Nitroglycerin & PETN								
SW8310 PAHs								
Metals[a] SW601B/SW87470A, SW7471A								
LUFT Mod. SW8015 TEPH-D/MO								
LUFT Mod. SW8015 TEPH-K								
SW8260B VOCs								
E300.0 Nitrate/Nitrite								
E365.2 Total Phosphorous								
SW8290 Dioxins/Furans								
Groundwater Chemistry[b]								

Total No. Boring/Sample Locations: 9 borings

Notes:
[a] California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc) plus aluminum, calcium, iron, manganese, potassium, and sodium.
[b] General water chemistry includes (1) chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0, total phosphorous by EPA Method 365.2, total organic carbon by EPA Method 415.1, total dissolved solids (TDS) by EPA Method 160.1, and total suspended solids (TSS) by EPA Method 160.2; and (2) Field parameters - temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1.

EPA = Environmental Protection Agency
LUFT = leaking underground fuel tank
PAHs = polyaromatic hydrocarbons
TEPH-D/MO = total extractable petroleum hydrocarbons as diesel and motor oil
TEPH-K = total extractable petroleum hydrocarbons as kerosene
VOCs = volatile organic compounds
PETN = pentaerythritol tetranitrate

Due to a combination of compositing and/or number of samples being collected, no duplicate samples will be collected from the stockpiles, Demolition Site #1, or the wetlands surface water/sediment.