Nevada Environmental Restoration Project

DOE/NV--543

Corrective Action Investigation Plan for Corrective Action Unit 135: Area 25 Underground Storage Tanks Nevada Test Site, Nevada

Controlled Copy No: __

Revision No: 0

May 1999

Environmental Restoration Division

U.S. Department of Energy
Nevada Operations Office

Available to the public from -

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

Available electronically at ***http://www.doe.gov/bridge.*** Available to U.S. Department of Energy and its contractors in paper from -

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
(423) 576-8401

DOE/NV--543

CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 135: AREA 25 UNDERGROUND STORAGE TANKS NEVADA TEST SITE, NEVADA

DOE Nevada Operations Office
Las Vegas, Nevada

Controlled Copy No.: ____

Revision No.: 0

May 1999

CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 135:
AREA 25 UNDERGROUND STORAGE TANKS
NEVADA TEST SITE, NEVADA

Approved by: Signature Approved Date: 5/5/99

Janet Appenzeller-Wing, Project Manager
Industrial Sites Project

Approved by: Signature Approved Date: 5/5/99

Runore C. Wycoff, Division Director
Environmental Restoration Division

Table of Contents

Table of Contents *(Continued)*

Table of Contents (Continued)

List of Figures

List of Tables

List of Acronyms and Abbreviations

ALARA	As low as reasonably achievable
AST	Aboveground storage tank(s)
BN	Bechtel Nevada
CADD	Corrective Action Decision Document
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site(s)
CAU	Corrective Action Unit(s)
CFR	*Code of Federal Regulations*
cm	Centimeter(s)
COPC	Contaminant(s) of potential concern
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DOT	U.S. Department of Transportation
dpm	Disintegration(s) per minute
DQO	Data Quality Objectives
E-MAD	Engine Maintenance Assembly and Disassembly
EPA	U.S. Environmental Protection Agency
ERD	Environmental Restoration Division
FFACO	*Federal Facility Agreement and Consent Order*
ft	Foot (feet)
HASP	Health and Safety Plan
HWAA	Hazardous Waste Accumulation Area
IDW	Investigation-derived waste
in.	Inch(es)
ISMS	Integrated Safety Management System
IT	IT Corporation

List of Acronyms and Abbreviations (Continued)

km	Kilometer(s)
LLW	Low-level radioactive waste
m	Meter(s)
MARSSIM	*Multi-Agency Radiation Survey and Site Investigation Manual*
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per liter
mR/hr	MilliRoentgen(s) per hour
mi	Mile(s)
µCi/mL	Microcurie(s) per milliliter
µR/hr	MicroRoentgen(s) per hour
NAC	*Nevada Administrative Code*
NDEP	State of Nevada Division of Environmental Protection
NEPA	*National Environmental Policy Act*
NERVA	Nuclear Engine Rocket for Vehicular Application
NRDS	Nuclear Rocket Development Station
NTS	Nevada Test Site
NTSWAC	*Nevada Test Site Waste Acceptance Criteria*
PAL	Preliminary action level(s)
PCB	Polychlorinated biphenyl(s)
pCi/g	Picocurie(s) per gram
PID	Photoionization Detector
PPE	Personal protective equipment
ppm	Part(s) per million
PRG	Preliminary Remediation Goals
QA/QC	Quality Assurance and Quality Control
QAPP	Quality Assurance Project Plan

List of Acronyms and Abbreviations *(Continued)*

QC	Quality Control
RADCON	Radiological Control
RCA	Radiological Controlled Area
RCRA	*Resource Conservation Recovery Act*
REECo	Reynolds Electrical & Engineering Company, Inc.
RMA	Radioactive Materials Area
SAA	Satellite Accumulation Area
SSHASP	Site-specific health and safety plan
SVOC	Semivolitile organic compound(s)
TCA	Test Cell A Facility
TCC	Test Cell C Facility
TCLP	Toxicity Characteristic Leaching Procedure
TID	Tamper-indicating device(s)
TPH	Total petroleum hydrocarbon(s)
UST	Underground storage tank(s)
VOC	Volitile organic compound(s)

Executive Summary

The Corrective Action Investigation Plan for Corrective Action Unit 135, Area 25 Underground Storage Tanks, has been developed in accordance with the *Federal Facility Agreement and Consent Order* that was agreed to by the U.S. Department of Energy, Nevada Operations Office; the State of Nevada Division of Environmental Protection; and the U.S. Department of Defense. Corrective Action Unit 135 consists of the following three Corrective Action Sites:

- Corrective Action Site 25-02-01, Underground Storage Tanks
  (also referred to as the Engine Maintenance Assembly and Disassembly Waste Holdup Tanks and Vault)
- Corrective Action Site 25-02-03, Underground Electrical Vault
  (also referred to as the Deluge Valve Pit)
- Corrective Action Site 25-02-10, Underground Storage Tank
  (also referred to as the former aboveground storage tank at the Test Cell A Facility)

The Deluge Valve Pit and the former aboveground storage tank at the Test Cell A Facility were misidentified in the *Federal Facility Agreement and Consent Order* as underground storage tanks. Based on limited radiological surveys of the two Corrective Action Sites, neither site is radiologically contaminated. Furthermore, there are no structures or media related to the sites (i.e., nearby exposed piping, the Pump House [Building 3116], Deluge Valve Pit #2) specified in the *Federal Facility Agreement and Consent Order.* Closure of these sites will be addressed in the Closure Report for this Corrective Action Unit. Section 2.0 contains a more detailed explanation for this recommendation.

Prior to the investigation of the Engine Maintenance Assembly and Disassembly Waste Holdup Tank Vault, the vault will be opened, content of the tanks characterized, and tanks and ancillary piping exposed in the vault will be removed. Investigation activities discussed in this Corrective Action Investigation Plan will consist of a detailed radiological survey of the vault, collection of environmental samples from several locations within the vault if possible, and a visual inspection to assess the integrity of the vault and sump.

Based on the site history collected to support the Data Quality Objectives process, contaminants of potential concern include volatile organic compounds, semivolatile organic compounds,

polychlorinated biphenyls, petroleum hydrocarbons, radionuclides such as cobalt-60, strontium-90, cesium-137, uranium-235, uranium-238, and plutonium-239/240, and *Resource Conservation and Recovery Act* metals. A conceptual site model for the Corrective Action Unit was developed as follows:

- Sufficient information exists for Corrective Action Site 25-02-03 and Corrective Action Site 25-02-10; no further investigation will be required at these sites.
- Radiological and possibly hazardous liquid effluent associated with operations at the Engine Maintenance Assembly and Disassembly Facility was released to the waste holdup tanks at Corrective Action Site 25-02-01. Contaminants of potential concern may be located inside the two tanks, on the vault wall surfaces, in the sump, and associated with any ancillary piping related to the tanks.
- Lateral extent of the contaminants of potential concern related to Corrective Action Site 25-02-01 is limited to the vault interior.
- Vertical extent of the contaminants of potential concern is unknown; potential release to the underlying soil may have occurred if the sump is not contained or the integrity of the vault has been compromised.
- Depth to groundwater at three nearby wells ranges from approximately 226 to 318 meters (740 to 1,041 feet) below ground surface; groundwater impacts are not expected.
- Annual precipitation is approximately 15 centimeters (6 inches).
- Future use of Area 25 is defined as a research, test, and experiment zone as stated in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996a).
- A radiological work permit, bioassay plan, and confined space entry permit will be required for the investigation of Corrective Action Site 25-02-01.
- Potential exposure pathways are ingestion, inhalation, direct exposure, and dermal contact.

A more detailed conceptual model is presented in Section 3.0 of this Corrective Action Investigation Plan. The conceptual model serves as the basis for the sampling strategy.

The technical approach for investigating this Corrective Action Unit consists of the following activities:

- Tanks, ancillary piping inside the vault, and vault contents will be removed prior to commencement of the investigation to reduce safety hazards for project employees.
- Monitor air quality inside the vault.
- Conduct a radiological survey of the vault interior.
- Visually inspect the sump and integrity of the vault.
- Collect environmental samples from sediment in the sump and on the floor inside the vault if possible.
- Collect one additional environmental sample at depth (approximately 0.3 to 0.6 meters [1 to 2 feet] below vault floor surface) in the sump if it does not have a bottom.
- Field screen sediment for volatile organic compounds and radioactivity.
- Submit samples for laboratory analysis.

Field screening methods will be used to detect volatile organics and radionuclides in the sediment, if present. Radiological surveys will be used to identify radiological contamination on the walls and floor of the vault. Samples will be collected for laboratory analysis, if there is sufficient sediment, sludge, or liquid to retrieve. Additional sampling and analytical details are presented in Section 4.0, and details of the waste management strategy are included in Section 5.0 of this Corrective Action Investigation Plan.

Under the *Federal Facility Agreement and Consent Order,* the Corrective Action Investigation Plan will be submitted to the Nevada Division of Environmental Protection for approval. Field work will be conducted following approval of the plan. The results of the field investigation will support a defensible evaluation of corrective action alternatives in the Corrective Action Decision Document.

1.0 Introduction

This Corrective Action Investigation Plan (CAIP) has been developed in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the U.S. Department of Energy, Nevada Operations Office (DOE/NV); the State of Nevada Division of Environmental Protection (NDEP); and the U.S. Department of Defense (FFACO, 1996). The CAIP is a document that provides or references all of the specific information for investigation activities associated with Corrective Action Units (CAUs) or Corrective Action Sites (CASs). According to the FFACO, CASs are sites potentially requiring corrective action(s) and may include solid waste management units or individual disposal or release sites (FFACO, 1996). Corrective Action Units consist of one or more CASs grouped together based on geography, technical similarity, or agency responsibility for the purpose of determining corrective actions.

This CAIP contains the environmental sample collection objectives and the criteria for conducting site investigation activities at CAU 135, Area 25 Underground Storage Tanks (USTs), which is located on the Nevada Test Site (NTS). The NTS is approximately 105 kilometers (km) (65 miles [mi]) northwest of Las Vegas, Nevada (Figure 1-1). Corrective Action Unit 135 is comprised of the following CASs:

- CAS 25-02-01, Underground Storage Tanks (also referred to as the Engine Maintenance Assembly and Disassembly [E-MAD] Waste Holdup Tanks and Vault)
- CAS 25-02-03, Underground Electrical Vault (also referred to as the Deluge Valve Pit)
- CAS 25-02-10, Underground Storage Tank (also referred to as the former aboveground storage tanks [ASTs] at the Test Cell A [TCA] Facility)

All three CASs are located in Area 25, formerly known as the Nuclear Rocket Development Station (NRDS), on the NTS (Figure 1-2). All of these CASs were initially considered USTs by the FFACO, but are actually tanks or vaults/pits. The E-MAD Waste Holdup Tanks are located in the E-MAD Facility in a vault on the western side of Building 3900 (Figure 1-3). This CAS received liquid waste from all of the radioactive drains at the E-MAD Facility. The Deluge Valve Pit is located west of the Dewar Area at the TCA Facility (Figure 1-4). This vault contains piping and electronic controls for the water cooling system of the Dewar Area at the TCA Facility. The former AST at TCA is located

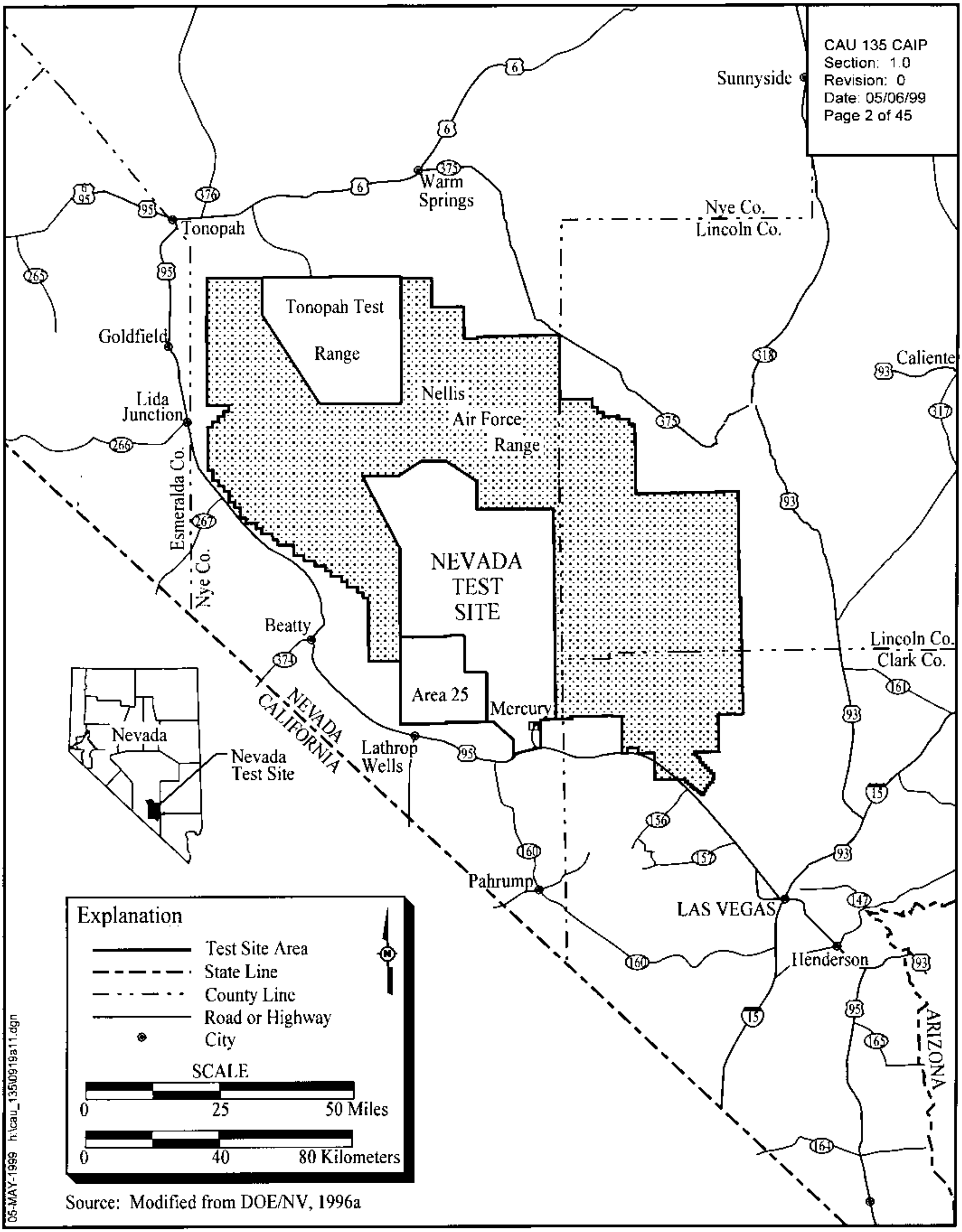
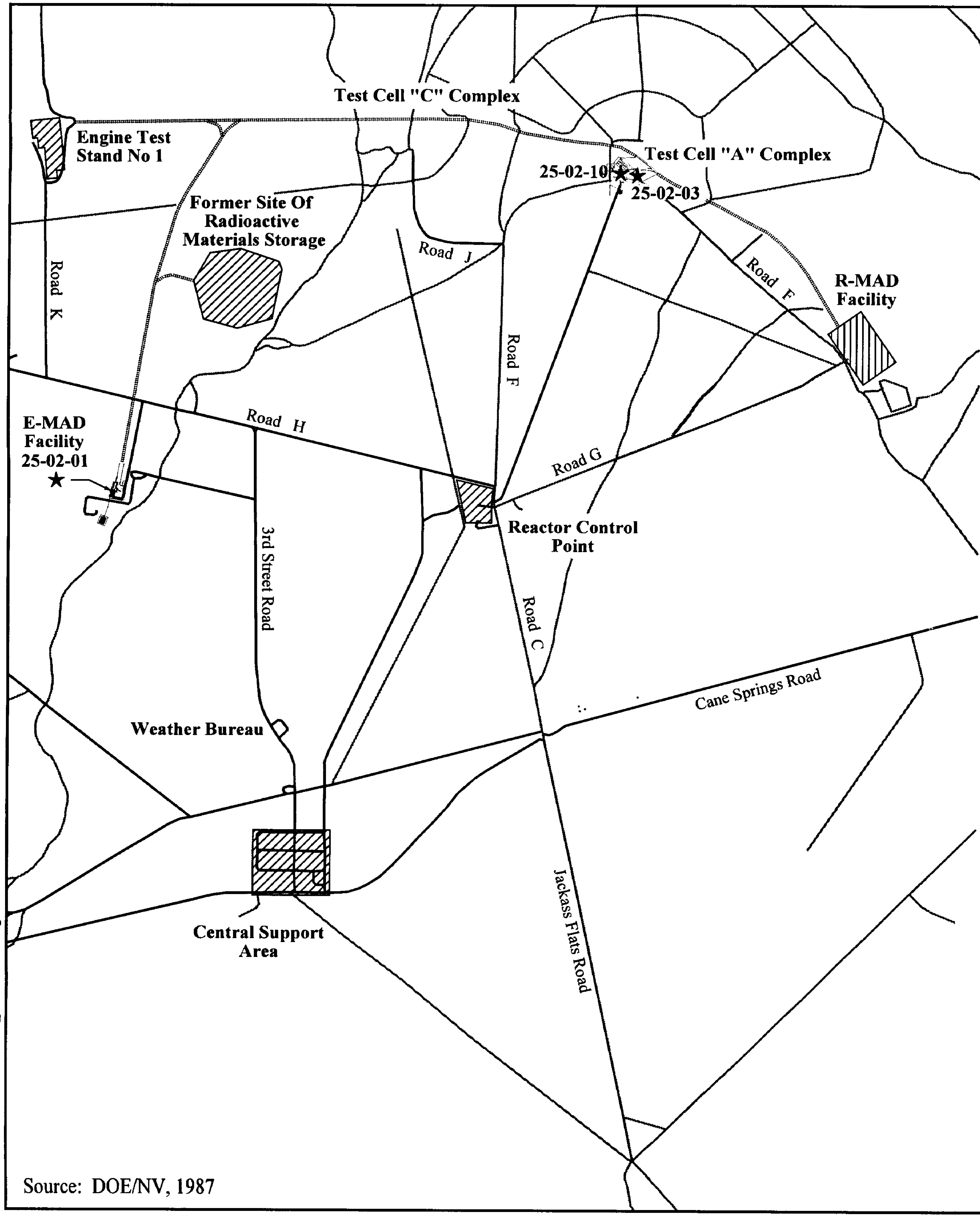


Figure 1-1
Nevada Test Site and Tonopah Test Range



Corrective Action Unit	FFACO Corrective Action Site	CAS Description
135	25-02-01	Underground Storage Tanks
135	25-02-03	Underground Electrical Vault
135	25-02-10	Underground Storage Tank

Explanation

- Various Areas or Compounds
- Railtrack
- Road
- Road
- ★ Corrective Action Site

Note

The size of some of the Areas have been exaggerated for clarity.

Scale

0 1000 2000 Feet

0 1 2 Kilometers

Figure 1-2
CAU 135, Area 25, Underground Storage Tanks
Nevada Test Site

h:\cau_135\0919b12.dgn

06-MAY-1999

Source: AEC, 1962a and b; REECo, 1984a; NERVA/NRDS, 1967

Figure 1-3
General Location Map for CAS 25-02-01,
E-MAD Waste Holdup Tanks
(Map Includes the E-MAD
Radioactive Waste Drain System)
Nye County, Nevada

05-MAY-1999 h:\cau_135\0919b13.dgn

Figure 1-4
CAS 25-02-03
Deluge Valve Pit Location Area and Piping System, Test Cell A
Nye County, Nevada

west of Building 3116 (Pump House) (Figure 1-5). The AST was used for the storage of demineralized water that cooled the reactor carts during tests conducted at TCA.

Both the Deluge Valve Pit (CAS 25-02-03) and the former AST at the TCA Facility (CAS 25-02-10) will be included in the Closure Report for this CAU with no further action as the recommended corrective action. Details for this recommendation are discussed in Section 2.2.2 and Section 2.2.3. The investigation of the vault containing the E-MAD Waste Holdup Tanks, CAS 25-02-01, and sump inside the vault are discussed in this CAIP. The tanks and ancillary piping inside the vault will be removed prior to the investigation. The vault and sump may have been impacted by volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), *Resource Conservation and Recovery Act* (RCRA) metals, total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), and radionuclides (such as cobalt-60, strontium-90, cesium-137, and uranium and plutonium isotopes) during operations at the E-MAD Facility.

1.1 Purpose

This CAIP presents a plan to investigate the nature and extent of the contaminants of potential concern (COPCs) at CAU 135. The purpose of the corrective action investigation described in this CAIP is to:

- Identify the presence and nature of COPCs.
- Determine the location of radiological contamination within the vault and determine the extent of COPCs in the sump area and on the floor.
- Provide sufficient information and data to develop and evaluate appropriate corrective actions for CAS 25-02-01.

This CAIP was developed using the U.S. Environmental Protection Agency's (EPA) Data Quality Objectives (DQOs) (EPA, 1994) process to clearly define the goals for collecting environmental data, to determine data uses, and to design a data collection program that will satisfy these uses. A DQO scoping meeting was held prior to preparation of this plan; a brief summary of the DQOs is presented in Section 3.4. A more detailed summary of the DQO process and results is included in Appendix A.

Figure 1-5
CAS 25-02-10
Former AST at the TCA Facility and Associated Piping, for the Reactor Cooling Water System
Nye County, Nevada

1.2 Scope

The scope of this CAIP is to resolve the problem statement identified in the DQO process (see Appendix A), which states that radioactive and possibly hazardous wastes were released at CAS 25-02-01. Existing data are sufficient to close CAS 25-02-03 and CAS 25-02-10 with no further action. Existing data are insufficient to support selection of a preferred corrective action for CAS 25-02-01. Therefore, the scope of the corrective action investigation includes the following tasks at the E-MAD Waste Holdup Tanks and Vault:

- Tanks, ancillary piping inside the vault, and vault contents will be removed prior to commencement of the investigation to reduce safety hazards for project employees.
- Conduct a radiological survey of the vault interior.
- Visually inspect and define the condition of the sump located in the northwest corner of the vault.
- Collect environmental samples from the sump and floor of the vault if sediment, sludge, or liquid are present.
- Conduct laboratory analysis of environmental samples for COPCs specific to the E-MAD Waste Holdup Tank Vault.

1.3 CAIP Contents

Section 1.0 of this CAIP provides an introduction to this project, including the purpose and scope for this corrective action investigation. The remainder of the document details the investigation strategy and complies with the following required FFACO (1996) elements:

- Management
- Technical aspects
- Quality assurance
- Health and safety
- Public involvement
- Field sampling
- Waste management

The managerial aspects of this project are discussed in the DOE/NV *Project Management Plan* (DOE/NV, 1994) and the site-specific Field Management Plan that will be developed prior to field activities. A facility description is presented in Section 2.0. The technical aspects of this CAIP are contained in Section 3.0 and 4.0 of this document and in the DQO summary presented in Appendix A. Section 4.0 also discusses the field sampling activities and general health and safety concerns. General field and laboratory quality assurance and quality control (QA/QC) issues, including collection of quality control (QC) samples, are presented in the *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 1996b) and Section 4.9 of this CAIP; the methods for field QA/QC are discussed in approved procedures. The generic health and safety aspects of this project are discussed in the *Environmental Restoration Project Health and Safety Plan* (HASP) (DOE/NV, 1998b) and will also be supplemented with a site-specific HASP (SSHASP) written prior to the start of field work. No CAU-specific public involvement activities are planned at this time; however, an overview of public involvement is documented in the "Public Involvement Plan" in Appendix V of the FFACO (1996). Waste management issues are discussed in Section 5.0. The project schedule and records availability information for this CAIP are discussed in Section 6.0, while Section 7.0 provides a list of project references.

2.0 Facility Description

Background information pertaining to the history of the NTS, site-specific history about the three CASs in CAU 135, a geologic summary of Area 25, and an overview of the area's hydrogeology, including depths to groundwater, were obtained from various historical documents, interviews, engineering drawings, and photographs.

2.1 Physical Setting

The three CASs of CAU 135 are located within Area 25, former NRDS, on the NTS (Figure 1-2). Topographically, Area 25 (Jackass Flats) is located in an intermontane valley bordered by highlands on all sides except for a large drainage outlet to the southwest. Elevations range from 1,020 to 1,670 meters (m) (3,400 to 5,600 feet [ft]). (DRI, 1988)

Jackass Flats is a basin formed by structural deformation, mainly faulting of Paleozoic rocks, consisting of carbonate and clastic sediments, approximately 6,700 m (22,000 ft) thick. They are overlain by welded and semi-welded ash flow and ash fall tuffs of Tertiary age, approximately 1,500 m (5,000 ft) thick. Block faulting has displaced both the Paleozoic strata and the Tertiary pyroclastic rocks as much as 600 m (2,000 ft). The Jackass Flats basin is filled by alluvial, colluvial, and volcanic rocks of Cenozoic age. (DRI, 1988; SNPO, 1970)

The alluvium and colluvium are above the saturated zone throughout most of Jackass Flats. Groundwater flow for the region is generally to the south and southwest. Three water supply wells, Wells J-11, J-12, and J-13, are located within the NRDS area. Depths to groundwater at these wells are 317.5 m, 225.7 m, and 283.0 m (1,041 ft, 740 ft, and 928 ft), respectively. The present groundwater is thought to be a result of rainfall in the past, with no significant recharge of groundwater occurring. Surface water flow is ephemeral and is a function of variations in annual climate patterns. The average annual rainfall for Jackass Flats is approximately 10 centimeters (cm) (4 inches [in.]). (DRI, 1988; SNPO, 1970; USGS, 1993)

2.2 Operational History

Although all three of the CASs were originally identified as USTs, none of them meet the regulatory definition of an Underground Storage Tank. In particular, the two E-MAD waste holdup tanks are not technically USTs, and they will be referred to as tanks[1]. Operational histories of the three CASs are described in Sections 2.2.1, 2.2.2, and 2.2.3.

2.2.1 E-MAD Waste Holdup Tanks (CAS 25-02-01)

The E-MAD Waste Holdup Tanks were designed to receive liquid waste from all of the radioactive waste drains at the E-MAD Facility. Process wastewater was occasionally routed to the tanks to dilute highly radioactive contaminated effluent; this process wastewater was not related to activities that involved radiation. Liquids were generated from disassembly and analysis of test units, as well as from the decontamination of personnel and equipment. Over 50 drains in the E-MAD Facility were connected to these tanks Figure 2-1). The liquids were discharged to a radioactive leachfield located to the southwest (CAU 264 - see Figure 1-3) if the radiation levels of the liquids were below disposal standards of the time (AEC, 1968); if radiation levels exceeded these disposal standards, then the liquids were pumped out of the tanks and transported to the Area 5 Liquid Waste Facility. Radiation levels were measured and samples were collected using an automated sampling system. The tanks were typically sampled during operations when liquid levels reached approximately 760 to 1,100 liters (200 to 300 gallons) or after particularly contaminated operations at the E-MAD Facility. No records of this sampling were located. (Garey, 1997; Garey, 1998b, c, and e; Garey, 1999; Westinghouse Electric Corporation, 1978)

The tanks received liquid waste from about 1966, when E-MAD became operational, to about 1987, when E-MAD was abandoned (SNPO, 1970). The tanks were used for the final decontamination activities at E-MAD. Liquids were pumped from the holdup tanks into a Reynolds Electrical & Engineering Company, Inc. (REECo) radiological waste liquid transport tanker for low-level liquid disposal (Westinghouse Electric Corporation, 1987). The outlet valves from the waste holdup tanks to the associated leachfield were shut off, but not capped when the Nuclear Engine Rocket for Vehicular Application (NERVA) program ended in 1973. However, the inlet valve was left open

1. According to 40 *Code of Federal Regulations* (CFR), Section 280.12, “Definitions,” the term underground storage tank does not include storage tanks situated in, upon, or above the surface of the floor (CFR, 1998d).

Source: NERVA/NRDS, 1967; REECo, 1984a

Figure 2-1
Radioactive Waste Drain System at the E-MAD Facility

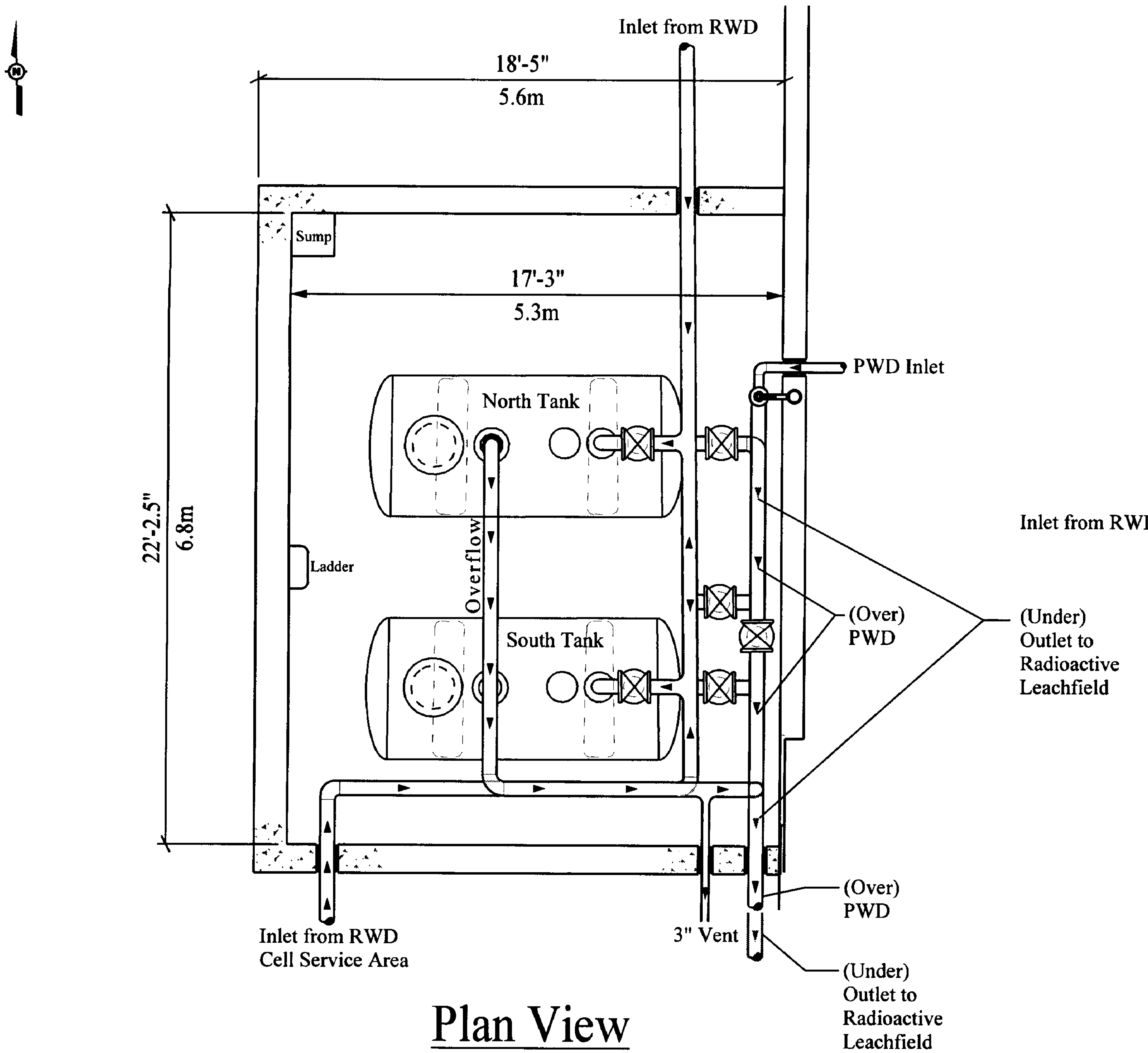
h:\cau_135\0919b21.dgn

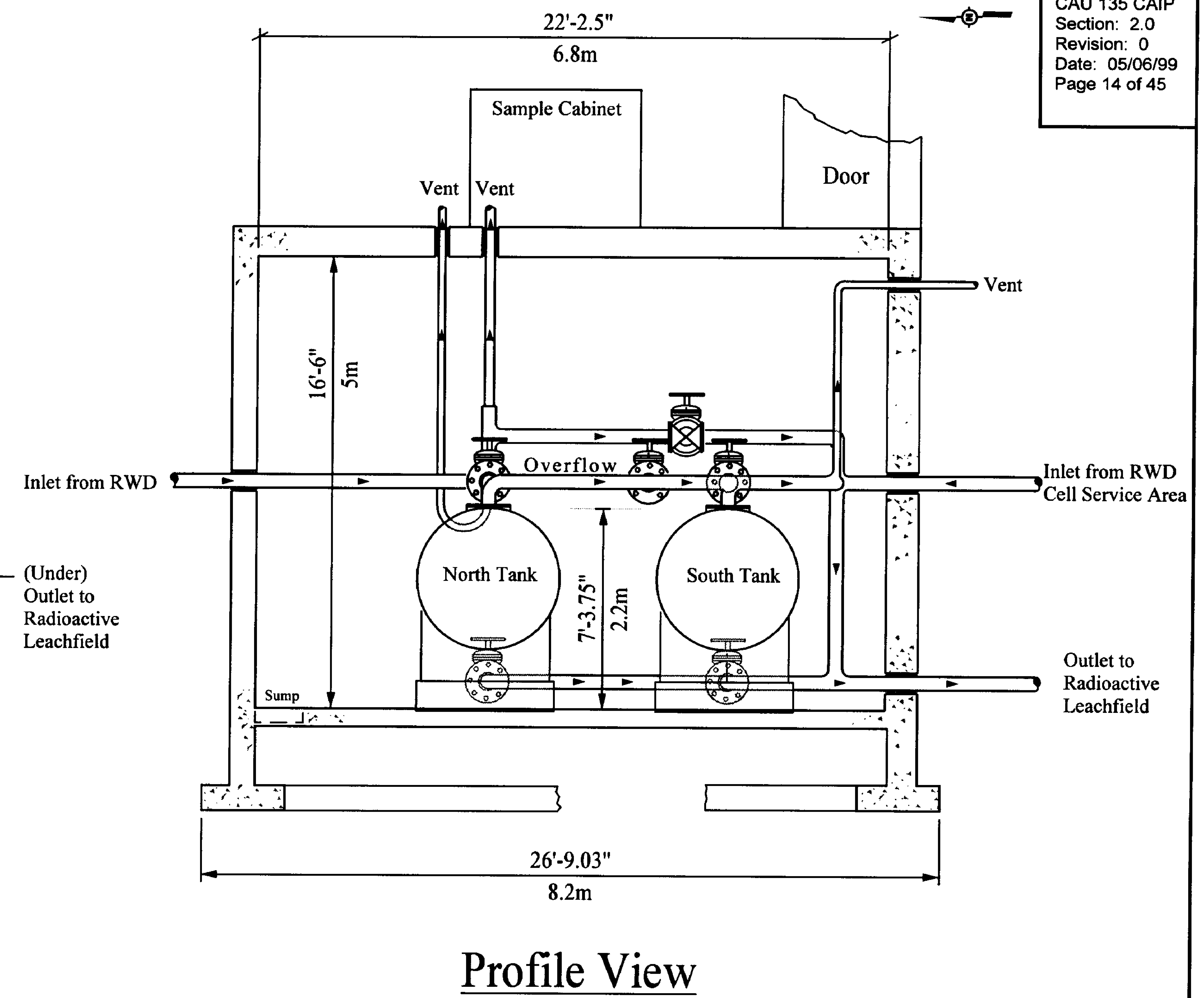
05-MAY-1999

from 1973 to 1987 for various operations that took place at the E-MAD Facility. The inlet valve remains in the open position for emergency purposes. (Garey, 1998e)

The CAS consists of two 1,500-gallon tanks located inside an underground vault (Figure 2-2) covered by a concrete pad. The concrete pad contains three lids that lead into the vault. One lid has been replaced with a thin, aluminum, padlocked trap door. The lids are not sealed and rainwater has entered the vault. There is an illegible faded yellow sign located on the trap door to the vault, probably indicating potential radioactive contamination inside the vault. A sump is located in the low spot or northwest corner of the vault and is an integrated part of the floor. The sump was used as a secondary catchment, or collection pit, for overflows, spills, or leaks. According to engineering drawing 1425-M-21 (AEC, 1962b) and the *E-MAD Facility Equipment Operating Procedure for Radioactive Waste Water System* (Westinghouse Electric Corporation, 1978), the sump has a bottom. In the event of high water levels inside the vault during operations, alarms would have been activated and a portable pump would have been manually lowered into the vault to remove excess water. Field investigations have not been conducted to confirm if the sump has a concrete bottom with no outlet to the underlying soils. The integrity of the vault and sump is unknown. The vault is approximately 5.0 m (16.5 ft) deep, 5.2 m (17 ft) wide, and 6.7 m (22 ft) long. The two tanks inside the vault had the potential to be connected either in series or in parallel by positioning inlet valves to inlet piping. An overflow pipe connects the two tanks to prevent overfilling. Process wastewater can be introduced to either tank to dilute radiologically contaminated water in the tanks or directed into the associated leachfield (CAU 264). All of the process drains were equipped with traps, however, the radiological drains were not. Radiological waste drains were equipped with special covers intended to prevent solid material from entering the piping. The covers had bails for removal by remote handling equipment. (AEC, 1962a; Garey, 1999; IT, 1998; NERVA/NRDS, 1967; Wilczek, 1993)

The north tank was sampled in July 1993 by REECo as part of an UST removal program. The south tank was empty. The sample from the north tank consisted of "sandy dirt with large flakes of rust" (Laub, 1993). The sample was analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals, TCLP VOCs, TCLP SVOCs, pH, and radionuclides (gamma spectrometry only) (see Section 2.5.1 for more details) (Clark, 1993). The vault and tanks were also surveyed for radiation during this effort (see Section 2.5.2 for more details) (Bertrand, 1993). A radiation survey of the vault was also performed by IT Corporation (IT) in 1997 as part of the Decontamination and





Explanation

RWD Radioactive Waste Drain
PWD Process Waste Drain

Scale

0 5 10 feet

0 2 4 meters

Source: AEC, 1962; NERVA/NRDS, 1967; Westinghouse Electric Corporation, 1978

Figure 2-2
Close-Up of the Vault Containing the E-MAD Waste Holdup Tanks Nye County, Nevada

Decommissioning subproject characterization for E-MAD (Building 3900) (see Section 2.5.2 for more details) (DOE/NV, 1998a). Bechtel Nevada (BN) entered the vault on March 22, 1999 to conduct a preliminary assessment of the E-MAD Waste Holdup Tanks and vault, including a limited radiological survey of selected locations inside the vault and a visual confirmation of tank conditions. It was concluded that the tanks did not contain any free-standing liquids (see Section 2.5.2 and Appendix D).

It is unknown if any liquids have entered the tanks since 1993. The possibility of free-standing liquids in the tanks still exists for the following reasons:

- The drains leading to the tanks have not been capped.
- The roof of the E-MAD Building is leaking and there have been small flooding events inside some of the galleries in the E-MAD Building.
- There is an open drain leading from the train decontamination pad (CAU 253) located north of the E-MAD Building to the waste holdup tanks. The drain line was equipped with an isolation valve that had the capability of preventing surface waters from entering the tanks. The former employee interviewed could not recall if the valve had been left in the open position when E-MAD was abandoned (Garey, 1999; NERVA/NRDS, 1967).

2.2.2 Deluge Valve Pit (CAS 25-02-03)

This CAS was originally believed to be an UST and was therefore added to the FFACO (1996). The interior of the vault was inspected by IT field crews in 1993; they identified the CAS as an Underground Electrical Vault and not an UST, since no tanks were in the vault and electrical control boxes were located near the entryway to the vault. Engineering drawings and a site visit in 1998 have revealed that the vault is actually a Deluge Valve Pit. The Dewar Area Deluge Valve Pit (#1) is one of two pits at TCA (see Figure 1-4). The other Deluge Valve Pit (#2) was designed for the Tank Farm Area and was not identified as a CAS in the FFACO. Both pits are part of the same cooling system. (FFACO, 1996; IT, 1993; IT, 1998; REECo, 1984b)

The Deluge Valve Pit is located west of the Dewar Area at the TCA Facility (see Figure 1-4). There are two vaults that are covered by a concrete pad. A 0.6 by 0.8-m (2 by 2.5-ft) wooden lid, which is slightly ajar, covers the entryway to the main valve pit. The main valve pit is approximately 3 by 4 m (10 by 13 ft). A smaller pit located south of the main valve pit measured approximately 0.9 by 1.5 m

(3 by 5 ft). Based on photographic interpretation, both vaults appear to be approximately 1.8 m (6 ft) deep. Two vent pipes protrude from the top of the concrete pad. (IT, 1993 - 1998; IT, 1993; IT, 1998)

The Deluge Valve Pit contains piping and controls related to the water cooling system for the Dewar Area at the TCA Facility. The Dewars contained pressurized gas that needed to be cooled when they were used. The smaller vault contains a flanged manual valve. The pipes in the Deluge Valve Pit received water from a 50,000-gallon elevated water storage tank (see Figure 1-4). The electrical controls in the vault automatically turned on the system. The water was designed to cool the Dewars during testing and acted similar to a sprinkler system. The water was also available for emergency purposes when hydrogen and propane were unloaded from vehicles during delivery to the TCA Facility. Based on engineering drawings and historical documentation, the system did not recirculate the water used for cooling. (REECo, 1984b; Garey, 1998d; SNPO, 1970) Runoff from the Dewar Area was designed to be directed to a culvert located to the south-southeast of the concrete pad (Pan Am, 1965) (Figure 1-4).

The Deluge Valve Pit is currently located in a Radioactive Materials Area (RMA). Based on an “As Built” engineering drawing, it appears that the CAS was included in the RMA because there was an existing security fence containing the Dewar Area (AEC, 1958). A radiological survey of the vault was conducted by BN in January 1999 and the readings were below background (Cowser, 1999) (see Section 2.5.2 for more details about the radiological survey and Appendix D for the survey form).

The CAS should be closed with no further action for the following reasons:

- CAS description was misidentified as an UST in the FFACO (1996).
- The vault’s exterior and interior are not radiologically contaminated.
- There are no other contaminants of potential concern associated with the Deluge Valve Pit.
- Surface runoff from the Dewar Area was directed away from the Deluge Valve Pit.
- A second Deluge Valve Pit at the TCA Facility is not designated as a CAS in the FFACO (1996).

2.2.3 Former AST at TCA (CAS 25-02-10)

This CAS was originally believed to be an UST because there were several pipes extending from the ground in the vicinity of the CAS, potentially indicating the presence of an UST. Also, the circular concrete pad that served as the foundation for the former AST may have resembled the outline of an UST. The CAS was, therefore, added to the FFACO (1996) as an UST. Through historical research and field investigation, it has been confirmed that the CAS was actually a 100,000-gallon steel AST (REECo, 1960). The AST (now CAS 25-01-05) was moved to the Test Cell C (TCC) Facility in 1971 (Garey, 1998a) and is included in CAU 168 in the FFACO (1996). Corrective Action Site 25-02-10 consists of the concrete ringwall and asphalt foundation of the former AST as well as the associated exposed piping near the former location of the AST.

The CAS is located on the west side of the Pump House (Building 3116) at the TCA Facility (REECo, 1984b) (see Figure 1-5). A circular asphalt and concrete foundation remain at the site along with piping that was associated with the AST. No noticeable surface staining was identified during field visits (IT, 1998). The area was cleared of debris and vegetation by BN in August 1998.

The former AST at TCA was used to store demineralized water that cooled the reactor carts during engine tests. Testing at the TCA Facility occurred from about 1957 to 1963. The water was treated with a rust inhibitor and was part of a recirculating system. The type of rust inhibitor used is unknown. The piping that connected the AST to the reactor carts was part of an elaborate piping system. Water held in the AST was supplied by the Control Point main water line and was stored in large quantities in the AST for tests. The pump house next to the former AST was used to pump the water through the cooling system. (NERVA/NRDS, 1965; Smith, 1968; SNPO, 1970)

The TCA Facility was abandoned around 1971. Salvageable equipment was typically relocated to the TCC Facility which was replacing the TCA Facility. During this transition, the 100,000-gallon AST was relocated to the TCC Facility where it was used as part of the Waste Water Hold-Up System. (Garey, 1998a; SNPO, 1972).

It is unlikely that the AST was radiologically contaminated prior to being moved to TCC; however, there is no documentation to confirm this. In January 1999, BN conducted a limited radiological survey of the piping located in the immediate vicinity of the former AST at TCA. Swipe samples revealed no radiological contamination above background in accessible piping (Smith, 1999) (see Section 2.5.2 for more details about the survey and Appendix D for the survey form).

The CAS should be closed with no further action for the following reasons:

- CAS description was misidentified as an UST in the FFACO (1996).
- Piping associated with the former AST is not radiologically contaminated.
- No surface stains have been identified by site visits.
- The pump house (Building 3116) and the piping in the vicinity of CAS 25-02-10 are neither designated as a CAS in the FFACO (1996) nor posted as a radioactive area.

2.3 Waste Inventory

Corrective Action Site 25-02-01 was constructed as part of the radioactive waste drain system for the E-MAD Facility. There were over 50 drains that discharged effluent to the waste holdup tanks from about 1966 to 1987 (Figure 2-1). The tanks were connected to radioactive waste drains, a train decontamination pad, and a metallurgical and chemical trailer. Process wastewater was occasionally routed to the tanks to dilute highly radioactive contaminated waters. Process water drains serviced areas unrelated to radioactive activities (i.e., galleries, offices, boiler room, etc.). Radioactive and possibly hazardous liquids were generated from the decontamination of personnel and equipment at the E-MAD Facility. Operations consisted of disassembling and decontaminating reactors and equipment associated with the nuclear rocket testing and testing equipment using metallurgical processes. The facility was also utilized during the Spent Fuel Demonstration Program and for U.S. Department of Defense special projects. (Garey, 1997; Garey, 1998b and e; NERVA/NRDS, 1967)

Cobalt-60, cesium-137, and uranium isotopes were detected in a sample from one of the waste holdup tanks (see Section 2.5.1 for more details) (Clark, 1993). Samples were also collected from the leachfield associated with the waste holdup tanks (CAU 264, CAS 25-05-06). Potassium-40, cesium-137, radium-226, thorium-228, and thorium-232 were detected; however, isotopes were detected at background concentrations for soil (DOE, 1988b). The volume of water used during the operational period of the facility is unknown, therefore, the amount discharged to the tanks is unknown. The tanks were often pumped during operations; however, records for these events have not been found. The vault served as a catchment for any liquids that may have spilled or leaked. There is also a collection sump in the vault, which served as a secondary catchment for any spilled liquids (Garey, 1998e). A water level alarm was provided for the wastewater sump with signals to annuciator panels in the master control room and RADSAFE office. The sump was required to be pumped if liquids were collected (Westinghouse Electric Corporation, 1978).

2.4 Release Information

The source of potential contamination at the E-MAD Waste Holdup Tanks was discharge of radioactive and/or hazardous constituents in wastewater from the decontamination and decommissioning of reactors, personnel, and trains, as well as from metallurgical testing of equipment at the E-MAD Facility. Under normal conditions the waste liquids were contained at the point of use before entering the waste piping system. Large volumes of waste liquids, such as those associated with area decontamination procedures, were directed to the drains and monitored in the holdup tanks. No information about any specific releases to the waste holdup tanks was found. Releases to the vault interior and sump would have come from tank or piping leaks, or from spillage when the tanks were routinely pumped. No confirmatory information for any such releases exists except for speculation from an interviewed former employee. Liquids from the tanks were sampled during operations using an automated sampling system inside E-MAD when the tanks reached certain liquid levels, or after particularly contaminated operations at the E-MAD Facility. If radiation levels were below disposal limits at the time, the liquids were released to the associated leachfield (CAU 264, CAS 25-05-06). If radiation levels were above disposal limits, the liquids were pumped out and transported to the Area 5 Liquid Waste Facility. Disposal standards were based on the AEC Manual, Chapter 0524 - Annex A, which are the disposal limits for sanitary sewerage systems. (AEC, 1968; Garey, 1997; Garey, 1998b and e; Westinghouse Electric Corporation, 1978 and 1987)

2.5 Investigative Background

Past investigative activities at the E-MAD Waste Holdup Tanks included both tank residue sample collection and radiological surveys. Summaries of these investigations are provided in Sections 2.5.1 and 2.5.2. Radiological surveys of the interior and exterior of the Deluge Valve Pit, CAS 25-02-03, and of the piping in the vicinity of the former AST at TCA, CAS 25-02-10, have been conducted.

2.5.1 Previous Sampling Effort

In 1993, REECo sampled the residue inside the northernmost waste holdup tank at the E-MAD Facility. There was no free standing liquid inside the tank; however, there was some residue that was described as "sandy dirt with large rust flakes" (Laub, 1993). The southernmost tank was void of any residue or liquid. Constituents detected above the instrument detection limits from a sample taken from the northernmost tank are listed in Table 2-1. The sample was analyzed for TCLP VOCs, TCLP SVOCs, TCLP metals, pH, and gamma spectrometry of radionuclides.

Table 2-1
Preliminary Sampling Results CAU 135

CAS No.	REECo Sample Number	Parameter	Result	Units	Comments
25-02-01	ERUST/PH2/EMDN	Barium	0.21	mg/L	100[a]
		Cadmium	0.031	mg/L	1[a]
		Cobalt-60	1.41E-04	µCi/g	b
		Cesium-137	2.18E-02	µCi/g	c
		Uranium-235	2.91E-04	µCi/g	b
		Uranium-238	3.14E-02	µCi/g	c

[a]Regulatory limit for chemical constituents, 40 CFR 261.24 was used for comparison (CFR, 1998a)
[b]Activities were greater than regional background activities from Atlan-Tech (1992)
[c]Activities were greater than regional background activities from McArthur and Miller (1989)

mg/L = Milligram(s) per liter
µCi/g = Microcurie(s) per gram

Barium was detected at 0.21 milligrams per liter (mg/L), which was above the instrument detection limit of 0.0004 mg/L, but below the Regulatory Limit of 100 mg/L (CFR, 1998a). The mercury method blank had a reportable concentration of 0.010 mg/L, which was above the instrument detection limit of 0.00013 mg/L, however, mercury was not detected in the sample. The pH analysis which was performed seven days after sample collection had a reading of 7.32 pH units. Cadmium was detected at 0.031 mg/L, which was above the instrument detection limit of 0.0030 mg/L but below the Regulatory Limit of 1.0 mg/L (CFR, 1998a; Coleman, 1998). Four radionuclides, cesium-137, cobalt-60, uranium-235, and uranium-238, were detected in the sample from the northernmost tank and were above regional background concentrations (McArthur and Miller, 1989; Atlan-Tech, 1992).

2.5.2 Previous Radiological Survey Efforts

A radiological survey was performed inside the vault of the E-MAD Waste Holdup Tanks during the 1993 sampling effort. The 1993 surveys included air sampling, radiation exposure rate measurements, sampling and analysis of removable surface contamination, and surveys of the total surface contamination. Another radiological survey of the vault interior was conducted during 1997 as part of the decontamination and decommissioning of the E-MAD building. In 1997, removable and total surface contamination was analyzed for gross alpha and beta concentrations. (Adams, 1999; Clark, 1993; DOE/NV, 1998a)

The radiation dose rate in the vault and for most areas in the vicinity of the two tanks varied from less than one to two milliRoentgen/hour (mR/hr), which is less than the criteria used to define a radiation area in the *NV/YMP Radiological Control* (RADCON) *Manual* (Gile, 1996). In the 1993 survey, one hot spot reading of 10 mR/hr was found below the middle section of the north tank. Particulate air samples were taken in 1993 and analyzed using gamma spectrometry. Lead-212 was detected in the vault air at a concentration of 4.25E-10 microcuries per milliliter (µCi/mL). The 1993 survey indicated the presence of removable gross beta and gamma contamination on the sump pump, air hoses, sampling scoop, and hatches of the north and south tanks. The sump pump had concentrations of removable and fixed contamination that exceeded the limits established in the RADCON Manual (Gile, 1996) for free unrestricted release of materials to the public. In the 1997 survey, 14 out of 21 measurements of the total gross beta surface contamination exceeded the free unrestricted limits for beta-gamma emitting fission products. Samples taken in 1993 of the sludge/residue inside the northernmost tank yielded concentrations of uranium-235 and uranium-238 of 291 picocuries per gram (pCi/g) and 31,400 pCi/g, respectively. (Adams, 1999; Clark, 1993; DOE/NV, 1998a)

The Deluge Valve Pit was surveyed by BN for radiological contamination on January 20, 1999. An Electra™ hand-held meter was used and no readings above background were noted on the exterior of the vault or access manway. Swipe samples were collected from the interior of the vault (floor, piping, access ladder, and manway). The swipe samples did not indicate any contamination above NTS release limits of 20 disintegrations per minute (dpm) for alpha and 200 dpm for beta. (See Appendix D) (Cowser, 1999)

Two pipes in the immediate vicinity of the former AST at TCA were swiped for radiological contamination on January 11, 1999. Radiological contamination was not detected on swipe samples from these pipes. The four remaining pipes were sealed: three were welded shut and one was bolted. Swipe samples were not taken for the four sealed pipes. (See Appendix D) (McCloskey, 1999; Smith, 1999)

A preliminary evaluation of the E-MAD Waste Holdup Tank vault conditions was conducted on March 22, 1999, by BN. The evaluation included a radiological survey at specific locations in the vault (see Appendix D) and a visual inspection of the tank contents. The field crew noted that there were no free standing liquids inside either of the tanks although the tanks looked damp (Fitzmorris, 1999).

2.5.3 NEPA Requirements

In accordance with the DOE/NV *National Environmental Policy Act* (NEPA) compliance program, a NEPA checklist will be completed prior to commencement of site investigation activities at CAU 135. This checklist compels DOE/NV projects to evaluate their proposed project against a list of several potential environmental impacts which include, but are not limited to, air quality, chemical use, waste generation, noise level, and land use. Completion of the checklist results in a determination of the appropriate level of NEPA documentation by the DOE/NV NEPA Compliance Officer.

General site investigation activities associated with CAU 135 have been identified and documented in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996a).

3.0 Objectives

Objectives addressed in this CAIP are based on qualitative and quantitative statements developed during the DQO process to specify the quality of the data required to support potential courses of action for CAU 135. The DQOs were developed to clearly define the uses for the environmental data and to design a data collection program appropriate to these uses. A conceptual site model was formulated to facilitate the DQO process and to assist with data quality decisions. The DQO process was used to decide that CAS 25-02-03 and CAS 25-02-10 will be closed with no further action.

3.1 Conceptual Site Model

The conceptual site model defines the expected nature and extent of contamination within CAU 135. The conceptual site model for this CAU is based on assumptions formulated from information presented in Section 2.0 and discussed during the DQO process. The model is used to identify appropriate sampling strategy and data collection methods. The conceptual site model for CAS 25-02-01 and assumptions developed in the DQO process are presented in Appendix A and are summarized as follows:

- Radiological and possibly hazardous liquid effluent associated with operations at the E-MAD Facility was released to the waste holdup tanks. Contaminants of potential concern may be located inside the two tanks, on the vault wall surfaces, in the sump, and associated with any ancillary piping.
- Lateral extent of COPCs is limited to the vault interior.
- Vertical extent of COPCs is unknown and release to the underlying soil is contingent upon the sump being contained and the integrity of the vault.
- Depth to groundwater at three nearby wells ranges from approximately 226 to 318 m (740 to 1,041 ft) below ground surface; groundwater impacts are not expected.
- Annual precipitation is approximately 15 cm (6 in.).
- Future use of Area 25 is defined as a research, test, and experiment zone as stated in the Environmental Impact Statement (DOE/NV, 1996a).

- A radiological work permit, bioassay plan, and confined space entry permit will be required for the investigation.
- Potential exposure pathways are ingestion, inhalation, direct exposure, and dermal contact.

3.2 Contaminants of Potential Concern

Based on a combination of process knowledge and preliminary sampling, COPCs were identified for CAS 25-02-01 during the DQO process. The COPCs at the E-MAD Waste Holdup Tank Vault, include Total VOCs, Total SVOCs, PCBs, TPH-diesel range organics, Total RCRA metals, and radionuclides. Radionuclides including mixed fission and activation products (e.g., cobalt-60, strontium-90, and cesium-137), source material (e.g., uranium-235 and uranium-238), and special nuclear material (plutonium-239/240) may be present at CAS 25-02-01. Figure A.3-1 in Appendix A lists the COPCs for CAS 25-02-01 and includes field screening methods and levels and preliminary action levels (PALs). Appendix C identifies the minimum reporting limits, regulatory limits, analytical methods, precision, and accuracy for the analyses.

3.3 Preliminary Action Levels

The following subsections provide the field screening levels and PALs for the CAU. Field screening levels for on-site field screening methods will be used to determine the presence of contamination and guide the investigation.

3.3.1 Field Screening Levels

The following field screening levels will be used for CAS 25-02-01:

- Volatile organic compound headspace screening levels using a photoionization detector (PID) and a water bath (at a temperature of approximately 80-85 degrees Celsius, depending on site weather conditions, for approximately five minutes) are established at 20 parts per million (ppm) or 2.5 times background, whichever is greater. Headspace field screening for VOCs will be performed on all sediment samples taken, if any.
- Radiological contamination (alpha/beta/gamma):
    - For building and equipment structures, Table 2.2 from the *NV/YMP Radiological Control Manual* (Gile, 1996) that establishes the free unrestricted release limits to the public will be used.

- For gross alpha and beta contamination in sediment and sludge material, the field screening level is the mean background activity level in soil plus two times the standard deviation of the mean background activity level (to be determined prior to start of field activities). This level will be monitored during sampling.

- For sediment/sludge material, field screening will be conducted for sample transport purposes (limits are gross alpha/beta <2,000 pCi/g and a dose rate of 0.5 mrem/hour) per package. (DOE, 1988a; CFR, 1998e)

Radiation will be monitored during sampling. Concentrations exceeding field screening levels indicate potential contamination at that sample location. This information will be documented, and the investigation will be continued to delineate the extent of the contamination as established in the DQO process. Additionally, this data will be used to select discretionary laboratory sample locations and/or identify dangerous conditions within the vault.

3.3.2 Chemical Preliminary Action Levels

Off-site laboratory analytical results for the environmental samples will be compared to the following PALs to evaluate the need for possible corrective actions:

- Nevada Division of Environmental Protection Corrective Action Regulations (NAC, 1998b) (for purposes of this CAIP, Region IX Preliminary Remediation Goals (PRGs) for industrial soils are assumed as the PALs [EPA, 1998])

- Total petroleum hydrocarbons concentrations above the TPH limit of 100 ppm per the *Nevada Administrative Code* (NAC) 445A.2272 (NAC, 1998b)

The comparison of laboratory results to preliminary action levels will be discussed in the Corrective Action Decision Document (CADD). Laboratory results above PALs indicate the presence of COPCs at levels that may require corrective action. The evaluation of potential corrective actions and the justification for a preferred action will be included in the CADD based on the results of this field investigation.

3.3.3 Radiological Preliminary Action Levels

There are two different sets of radiological PALs for this CAIP. The first set of PALs are the removable limits for surface radioactivity listed in Table 2-2 of the RADCON Manual (Gile, 1996). This PAL defines the limit for radiological surface contamination and will be used in conjunction with the total surface concentration PALs to determine if the vault walls and floor of the E-MAD Waste Holdup Tanks are contaminated.

The other set of PALs will be used to determine if the concentration of radionuclides in sediment, sludge, or liquid samples exceed the concentrations found in soil samples taken from background locations in the vicinity of CAU 135 and the published concentrations (McArthur and Miller, 1989; Atlan-Tech, 1992). The evaluation of potential corrective action and the justification for a preferred action will be included in the CADD based on the results of this field investigation.

3.4 DQO Process Discussion

Details of the DQO process are presented in Appendix A. The Deluge Valve Pit and the former AST at TCA will not be investigated as part of this CAIP. However, the DQO results indicated the need for biased sediment, sludge, or liquid sampling if possible, and a random radiological survey at the E-MAD Waste Holdup Tank Vault. The COPCs, analytical methods, and reporting limits prescribed through the DQO process are provided in Appendix A and Appendix C. The precision and accuracy requirements are stated in Appendix C.

4.0 Field Investigation

This section of the CAIP contains the sampling approach for investigating CAU 135, Area 25 Underground Storage Tanks. All sampling activities will be conducted in compliance with the Industrial Sites QAPP (DOE/NV, 1996b) and other applicable, approved procedures and instructions. Quality assurance and quality control requirements for field and laboratory environmental sampling are provided in Section 4.9 and in the Industrial Sites QAPP (DOE/NV, 1996b). Data will be collected during field investigations to confirm or refute the conceptual model by assessing the migration of COPCs and determining if COPCs are present in concentrations exceeding the PALs established for the CAU.

No field investigation will be conducted at the Deluge Valve Pit and the former AST at TCA. A recommendation for closure of these CASs with no further action will be made in the Closure Report for this CAU (see Sections 2.2.2 and 2.2.3 for more details).

The field investigation at the E-MAD Waste Holdup Tank Vault will consist of air monitoring, conducting a radiological survey of the vault and vault contents, and sampling any sediment, sludge, or liquid, if sufficient volumes are present. These activities will define the extent of the contamination at the E-MAD Waste Holdup Tank Vault. Field screening will be conducted for VOCs and radioactivity. Environmental samples will be collected from the sump and floor if possible (details provided in Sections 4.4 through 4.7).

Field activities will be performed according to the *Environmental Restoration Project HASP* (DOE/NV, 1998b) and an approved SSHASP. As required by the U.S. Department of Energy (DOE) Integrated Safety Management System (ISMS), these documents outline the requirements for protecting the health and safety of the workers and the public, and procedures for protection of the environment. Safety, health, and protection of the environment will take precedence over expediency and short cuts. The ISMS program requires site personnel to take every reasonable step to reduce or eliminate the possibility of injury, illness, or accidents, and to protect the environment during all project activities. The following will be taken into consideration when evaluating the hazards and associated control procedures for field activities:

- The investigation of the E-MAD Waste Holdup Tanks and Vault will involve a confined space entry into the vault. Confined space entry requirements will be discussed in more detail in the SSHASP for this investigation.
- Potential hazards to site personnel and the public including, but not limited to, radionuclides, chemicals (such as RCRA metals, VOCs, SVOCs, and PCBs), adverse and rapidly changing weather, remote location, motor vehicle, and heavy equipment operation to gain access to the vault interior, and the use of hand tools.
- Proper training of all site personnel to recognize and mitigate the anticipated hazards.
- Work controls to reduce or eliminate the hazards including engineering controls, substitution of less hazardous materials, and personal protective equipment (PPE).
- Occupational exposure monitoring to prevent overexposures to hazards such as radionuclides, chemicals, and physical agents (heat, cold, and high wind).
- Use of the "as low as reasonably achievable" (ALARA) principle when dealing with radiological hazards.
- Emergency and contingency planning and communications to include medical care and evacuation, decontamination and spill control measures, and appropriate notification of project management.

4.1 Field Activities Performed Prior to Investigation

The following activities will be conducted prior to the investigation discussed in this CAIP:

- A preliminary survey of the vault was performed (see Section 2.5.2) including vault lid removal, air monitoring, a radiological survey of selected locations inside the vault (see Appendix D), and a visual inspection of the tank interiors.
- The vault lids will be removed again.
- Air monitoring will be conducted.
- The tanks will be removed from the vault and transported to Area 6 where they will be characterized for disposal.

- The piping inside the vault will be removed. The piping will be stubbed and capped near the vault wall. The inside of the pipes will be swiped for radiological contamination and samples will be collected if there are any free standing liquids in the pipes.

- Process waste drains inside the E-MAD Building will be grouted. The isolation valve from the train decontamination pad (CAU 253) to the radioactive waste drain system for the E-MAD Facility will be closed and welded shut. The isolation valves from the scrubbers of the E-MAD Facility will be closed and welded shut. The drain lines associated with trailers E-26321 and E-26428 will be grouted shut and any exposed piping will be cut flush with ground surface.

4.2 Technical Approach

The following activities will be conducted during the site investigation of the E-MAD Waste Holdup Tank Vault:

- Monitor air quality inside the vault.

- Conduct a radiological survey of the vault interior.

- Visually inspect the sump and integrity of the vault.

- Collect environmental samples from sediment in the sump and on the vault floor if possible.

- Collect one additional environmental sample at depth (approximately 0.3 to 0.6 m [1 to 2 ft] below the vault floor surface) in the sump if it does not have a bottom.

- Field screen sediment samples for VOCs and radioactivity.

- Submit samples for laboratory analysis.

In the following sections, the elements of the field investigation are described in greater detail.

4.3 Vault Air Monitoring

Prior to vault entry, the air quality will be tested for explosivity, VOCs, carbon monoxide, hydrogen sulfide, oxygen level, and radiation using instruments specific for the measured parameter. Continuous air monitoring will be conducted throughout the investigation.

4.4 Radiological Survey

The radiological surveys of the vault walls and floor will be conducted in accordance with Section 5.5 of the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (NRC, 1997). A random-start triangular grid will be established to select sampling locations. The statistical test described in MARSSIM (NRC, 1997) will be used to evaluate the data. A 95 percent confidence level will be used to evaluate Tier I and Tier II error for random sampling. The number and locations of measurement and sampling points will be based on a comparison with the criteria in Table 2-2 of the RADCON Manual (Gile, 1996) and the DQO objectives for precision and representativeness. Systematic measurements, in conjunction with surface scanning, are used to obtain adequate assurance that small areas of elevated radioactivity will be detected and demonstrate whether or not radiological contamination exceeds the release criteria in Table 2-2 of the RADCON Manual. In addition, biased sampling measurement locations and scanning locations may be performed. These locations will be identified from judgement based upon unusual appearance, location relative to contamination areas, or high potential for residual activity. Data points selected based on professional judgement are not included with the data points from the random-start triangular grid for statistical evaluation; instead they are compared individually with the criteria established in Table 2-2 of the RADCON Manual (Gile, 1996). The radiological survey instruments used for the surveys will include an Alpha/Beta scintillator (i.e., Electra™), proportional counters for measuring swipe samples, a Micro-R meter or ion chamber, and a shielded pancake probe, or equivalent/superior instrumentation.

4.5 Visual Inspection of the Vault and Sump Integrity

A visual inspection of the vault will be conducted in concurrence with the radiological survey. Cracks, holes, stains, or other observations will be noted. The sump inside the vault will be inspected for a confining bottom. The presence of sediment, sludge, liquid, stains, or any other notable condition of the sump will be documented.

4.6 Sediment, Sludge, and/or Liquid Sampling

Samples will be collected from biased locations at the E-MAD Waste Holdup Tank Vault as follows:

- One sample from the surface of the sump if any sediment, sludge, or liquid is present.

- One sample from the sump at a depth of approximately 0.3 to 0.6 m (1 to 2 ft), if it is not contained.

- One or more samples from the floor of the vault if sediment, sludge, or liquid exists in sufficient quantities.

If the sump is not contained, and field screening results exceed field screening levels in the sample taken at depth, then NDEP would be notified and the investigation rescoped.

4.7 Field Screening

Field screening for VOCs and radioactivity will be conducted for all samples. Field screening for VOCs will use a headspace method (PID and waterbath). The waterbath will be at a temperature of approximately 80-85 degrees Celsius depending on site weather conditions; the sample will remain in the bath for approximately five minutes. Field screening for radioactivity will include the use of an Alpha/Beta scintillator (i.e., Electra™), swipe survey using a proportional counter, Micro-R meter or ion chamber, shielded pancake probe, or equivalent/superior instrumentation.

4.8 Sampling Criteria

Samples will be submitted to the laboratory for analysis in accordance with Appendix C. Proposed analytical parameters were selected based on process and historical knowledge, sampling data, and discussions during the DQO process. The parameters, methods, and associated QC ranges for precision and accuracy measurements are specified in Appendix C. All laboratory samples will be analyzed for the following constituents:

- Total VOCs
- Total SVOCs
- Total PCBs
- TPH
- Total RCRA metals
- Gamma-emitting radionuclides (such as cobalt-60 and cesium-137) using gamma spectroscopy
- Isotopic uranium and plutonium
- Strontium-90

Samples will be collected with highest priority given to volatile constituents. When volatilization of COPCs is not a concern, the sample will be homogenized and the samples collected with priority given to those with the shortest hold times prior to analysis.

Analytical samples will be submitted to the laboratory in appropriate sample containers. Discretionary sampling points may also be selected for laboratory analysis based on visual examination by the Site Supervisor/Geologist.

Disposable equipment will be used to collect samples. Should decontamination of equipment become necessary, items will be decontaminated in accordance with written and approved procedures consistent with the Environmental Restoration Division (ERD) Procedure ERD-05-701, “Sampling Equipment Decontamination,” Rev. 1 (DOE/NV, 1998d), or as appropriate for the equipment being decontaminated.

Records will be kept of the soil description, field screening measurements and all other relevant data. Approved chain of custody procedures will be followed to assure data defensibility (DOE/NV, 1998c). Project records will be maintained according to the Industrial Sites QAPP (DOE/NV, 1996b) and written and approved procedures, plans, or instructions that meet the requirements of the ERD Standard Operating Procedures.

4.9 Quality Control Samples

Quality control samples will be collected as required by the Industrial Sites QAPP (DOE/NV, 1996b). These samples will include trip blanks, equipment blanks, field blanks, field duplicates, and matrix spike/matrix spike duplicate samples. Except for trip blanks, all QC samples will be analyzed for applicable parameters specified in Appendix A. Trip blanks will only be analyzed for VOCs. The QC samples will be collected at a minimum rate of one QC sample of each matrix type for every 20 environmental samples or fraction of 20 as specified in the QAPP and approved procedures. Additional QC samples may be submitted at the discretion of the Site Supervisor.

5.0 Waste Management

Management of investigation-derived waste (IDW) will be based on regulatory requirements, field observations, process knowledge, and the results of laboratory analysis of CAU 135 investigation samples. Waste Management activities will be performed during the investigation of the E-MAD Waste Holdup Tank Vault. Decontamination activities will be performed according to the approved procedures specified in the field instructions and as appropriate for the COPCs likely to be identified at the CAU.

Disposable sampling equipment, PPE, and rinsate, are considered potentially contaminated waste only by virtue of contact with potentially contaminated media. Therefore, sampling and analysis of the IDW, separate from analyses of site characterization samples, may not be necessary. However, rinsate samples may be taken to support waste management activities. The data generated as a result of site characterization and process knowledge will be used whenever possible to assign the appropriate waste type (i.e., sanitary, hazardous, low-level radioactive waste [LLW], or mixed) to the IDW with the exception noted in Section 5.3.

No process knowledge has been identified thus far indicating that any listed hazardous waste were released or disposed of in CAS 25-02-01. Therefore, if contaminants are identified, they will likely be characteristic rather than listed hazardous wastes.

Sanitary, hazardous, radioactive, and/or mixed waste, if generated, will be managed and disposed of in accordance with DOE Orders, U.S. Department of Transportation (DOT) regulations, RCRA regulations, *Nevada Revised Statutes* (NRS, 1998), and agreements and permits between the DOE and NDEP. Process knowledge indicates that liquid wastes containing potentially radioactive and hazardous materials were discharged to the E-MAD Waste Holdup Tanks. Therefore, when the waste is initially generated, the waste will be managed according to the mixed waste requirements until laboratory analyses are received and a final waste determination is made.

Corrective Action Sites 25-02-03 and 25-02-10 will not be investigated under this CAIP. A recommendation for closure of the CASs with no further action will be made in the Closure Report for this CAU. No waste will be generated from either CAS; waste management strategies provided in this section are not applicable to these CASs.

5.1 Waste Minimization

Corrective action investigation activities have been planned to minimize IDW generation. Rinsate will not likely be generated during site characterization activities. However, if decontamination activities take place, rinsate use will be minimized. Disposable sampling equipment, PPE, and decontamination rinsate, will be segregated to the greatest extent possible to minimize the generation of hazardous, radioactive, and/or mixed waste.

5.2 Potential Waste Streams

Potentially contaminated wastes generated during the investigation activities may include the following:

- Disposable sampling equipment (such as plastic, paper, sample containers, aluminum foil, spoons, scoops, and bowls)
- Personal protective equipment
- Decontamination rinsate

The waste will be managed as three waste streams. Waste will be traceable to its source and the individual samples; this information will be recorded in the Waste Management Logbook.

5.3 Investigation-Derived Waste Management

Management requirements for sanitary, low-level, radioactive, hydrocarbon, hazardous, and mixed waste are discussed further in the following sections. The IDW generated by sampling activities will be managed as potentially mixed waste until laboratory results indicate either the presence or absence of RCRA regulated and radiological constituents. To allow for the segregation of radioactive and nonradioactive waste and materials, radiological swipe surveys may be conducted on reusable sampling equipment, PPE, disposable sampling equipment, and sanitary waste streams exiting from within the controlled area. Removable contamination limits, as defined in Table 2-2 of the RADCON Manual (Gile, 1996), shall be used to determine if the materials are nonradioactive. Once a radiological or nonradiological determination has been made for a particular waste stream, a sanitary or hazardous waste determination will be made. The final disposition of such wastes will be determined by evaluating the analytical results of acquired samples.

5.3.1 Sanitary Waste

Sanitary waste generated outside the controlled area will be contained in plastic bags and will be transported to a solid waste management unit. Sanitary waste generated within the controlled area will be segregated and managed according to Section 5.3.

5.3.2 Low-Level Radioactive Waste

Low-level radioactive waste, if generated, will be managed in accordance with the contractor-specific waste certification program plan, DOE Orders, and the *Nevada Test Site Waste Acceptance Criteria* (NTSWAC) (DOE/NV, 1997). Waste drums containing PPE, disposable sampling equipment, and rinsate shall be staged at a designated Radiological Controlled Area (RCA) pending certification and disposal under NTSWAC requirements (DOE/NV, 1997). If field screening results indicate that activity levels have exceeded RCA values, then the RCA will be upgraded to a Radioactive Materials Area. Waste drums shall be labeled "Radioactive Material Pending Analysis." All drums shall be locked or fitted with tamper-indicating devices (TIDs). Traceability shall be maintained by assigning unique waste tracking numbers to each container and by maintaining records that trace the IDW back to the original sampling locations.

The PPE and disposable sampling equipment shall be placed in clear plastic bags marked with the date and associated sample location. The bags will be tagged with a contractor-specific waste tracking tag and logged in the contractor-specific waste management logbook.

Rinsate generated may be analyzed separately to determine final disposition. If rinsate is categorized as LLW on the basis of drum-specific sampling or other methods, it will have to be solidified prior to NTSWAC certification activities.

5.3.3 Hydrocarbon Waste

The action level for soil contaminated with hydrocarbons is 100 milligrams per kilogram (mg/kg) in the state of Nevada (NAC, 1998b). Soils and associated IDW with TPH levels above 100 mg/kg, characterized as non-RCRA, and non-LLW shall be managed as hydrocarbon waste and shall be disposed of in accordance with all applicable regulations in an appropriate, solid waste management unit.

5.3.4 Hazardous Waste

Suspected hazardous waste will be managed in accordance with RCRA and State of Nevada hazardous waste management regulations, interpreted as follows. Suspected hazardous waste will be placed in 55-gallon drums that meet DOT specifications (49 CFR 172) (CFR, 1998e) and will be locked and fitted with TIDs. The IDW containers will comply with 40 CFR 265.1087 (CFR, 1998c), and drums shall be compatible with the waste in accordance with the requirements of 40 CFR 265.172 (CFR, 1998c). No incompatible wastes are expected to be generated; however, if incompatible waste is encountered in the field, it will be managed in accordance with 40 CFR 265.177 (CFR, 1998c) (i.e., shall not be placed in the same container and shall be separated so that in the event of a spill, leak, or release, incompatible wastes shall not contact one another). Drums shall be handled and inspected in accordance with the requirements of 40 CFR 265.173 and 174, respectively (CFR, 1998c).

Hazardous waste management methods, including the establishment of a Satellite Accumulation Area (SAA) in accordance with 40 CFR 262.34(c) or a 90-day Hazardous Waste Accumulation Area (HWAA) in accordance with 40 CFR 262.34(a), will be employed to temporarily accumulate IDW pending characterization (CFR, 1998b). These methods will be appropriate for the amount of waste being accumulated and in compliance with applicable State of Nevada and federal requirements.

Hazardous waste shall be characterized in accordance with the requirements of 40 CFR 261 (CFR, 1998a). Characterization will be based on laboratory results and process knowledge. Drums containing IDW pending characterization that are managed in a HWAA will be marked with the date of accumulation and the words “Hazardous Waste Pending Analysis” until its regulatory status can be determined through interpretation and evaluation of laboratory results. Drums containing IDW pending characterization that are managed in a SAA will be marked with the words, "Hazardous Waste Pending Analysis." The IDW shall be traceable to its source and the associated samples. Traceability shall be maintained by assigning a unique waste tracking number to each container and maintaining records that trace the IDW back to the samples. After receipt of analytical results and if hazardous waste is identified, the waste will be labeled and marked in accordance with the requirements of 40 CFR 262.31 and 40 CFR 262.32 (CFR, 1998b) and the State of Nevada.

Gamma spectrometry, and alpha spectroscopy for plutonium and uranium, are included in the required site characterization analyses. These analyses are included to determine if the waste will meet the *Nevada Test Site Performance Objectives for Certification of Nonradioactive Hazardous Waste* (BN, 1995). These analyses are included in the event the waste generated during site characterization is determined to be a hazardous waste.

Suspected hazardous waste managed in a HWAA will be accumulated as applicable at or near the site of generation for up to 90 days in accordance with 40 CFR 262.34 (CFR, 1998b). Prior to or on the ninetieth day of accumulation as specified in 40 CFR 262.34 (a) (CFR, 1998b), hazardous waste will be shipped by a licensed/permitted hazardous waste transporter to a permitted treatment, storage, and disposal facility. If hazardous waste must remain on site for longer than 90 days due to unforeseen, temporary, and uncontrollable circumstances, a letter requesting an extension for up to 30 days will be sent to the NDEP in accordance with 40 CFR Part 262.34 (CFR, 1998b). A copy of the uniform hazardous waste manifest shall be provided to the State of Nevada.

5.3.5 Mixed Waste

Mixed waste, if generated, shall be managed in accordance with (40 CFR 262) (CFR, 1998b) and State of Nevada NAC 444 (NAC, 1998a). These regulations and the DOE requirements for radioactive waste are interpreted as follows. Where there is a conflict in regulations or requirements, the most stringent shall apply. For example, the 90-day accumulation time limit and weekly inspections per RCRA regulations will be applied to mixed waste even though it is not required for radioactive waste. Conversely, while RCRA does not require documented traceability, the waste acceptance program for LLW does; therefore, traceability shall be documented.

In general, mixed waste shall be managed in the same manner as hazardous waste, with added mandatory radioactive waste management program requirements. Suspected mixed waste will be managed in accordance with applicable regulations and requirements and will be marked with the words “Hazardous Waste Pending Analysis” pending characterization and confirmation of its regulatory status. However, once the waste determination is made, or the RCRA 90-day time requirement draws to an end, mixed waste shall be transported via a permitted hazardous waste hauler to the NTS transuranic waste storage pad for storage pending treatment or disposal. Mixed waste with hazardous waste constituents below land disposal restrictions may be disposed of at the Area 5 Radioactive Waste Management Site.

Mixed waste not meeting land disposal restrictions will require development of a treatment plan under the requirements of the Mutual Consent Order between DOE and the State of Nevada (NDEP, 1995).

6.0 Duration and Records Availability

6.1 Duration

After the submittal of the CAIP to NDEP (FFACO milestone date of August 2, 1999), the following is a tentative schedule of activities (in calendar days):

- Day 0: Preparation for field work will begin.
- Day 30: The field work, including field screening and sampling, will begin. Samples will be shipped to meet laboratory holding times.
- Day 45: The field work will be completed.
- Day 120: The quality-assured laboratory analytical sample data will be available for review.
- The FFACO date for the CADD is December 31, 1999.

6.2 Records Availability

This document is available in the DOE public reading rooms located in Las Vegas and Carson City, Nevada, or by contacting the DOE Project Manager. The NDEP maintains the official Administrative Record for all activities conducted under the auspices of the FFACO.

7.0 References

AEC, see U.S. Atomic Energy Commission.

Adams, S. IT Corporation. 1999. Memo entitled, "Radiological Surveys for E-MAD UST at CAU 135," 5 January. Las Vegas, NV.

Atlan-Tech. 1992. *Environmental Monitoring Report for the Proposed Ward Valley California LLRW Facility.* Rosewall, GA: Atlan-Tech Inc.

Bechtel Nevada. 1995. *Nevada Test Site Performance Objective for Certification of Nonradioactive Hazardous Waste*, G-E11/96.01, Rev. 0. Las Vegas, NV.

Bertrand, K. Reynolds Electrical & Engineering Company, Inc. 1993. Handwritten notes pertaining to the "Sampling of E-MAD Storage Tanks," 15 July. Las Vegas, NV.

BN, see Bechtel Nevada.

CFR, see *Code of Federal Regulations*.

Clark, G.A. Reynolds Electrical & Engineering Company, Inc. 1993. Memo to S.J. Nacht entitled, "Sample Analytical Results," 1 September. Las Vegas, NV.

Code of Federal Regulations. 1998a. 40 CFR Part 261, "Identification and Listing of Hazardous Wastes." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 1998b. 40 CFR Part 262, "Standards Applicable to Generators of Hazardous Waste." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 1998c. 40 CFR Part 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 1998d. 40 CFR Part 280, "Underground Storage Tanks." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 1998e. 49 CFR Part 172, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements." Washington, DC: U.S. Government Printing Office.

Coleman, L. M. Science Applications International Corporation. 1998. Memo entitled, "Chemical Data Evaluation of Sample ERUST/PH2/EMDN," 23 December. Las Vegas, NV.

Cowser, D.K. Bechtel Nevada. 1999. Letter entitled, "Summary of Radiation Survey Report for Corrective Action Site (CAS) 25-02-03: Area 25 Test Cell A Complex, Nevada Test Site," 25 January. Las Vegas, NV.

Desert Research Institute. 1988. *CERCLA Preliminary Assessment of DOE's Nevada Operations Office, Nuclear Weapons Testing Area*, Vol I. Las Vegas, NV.

DOE, see U.S. Department of Energy.

DOE/NV, see U.S. Department of Energy, Nevada Operations Office.

DRI, see Desert Research Institute.

EPA, see U.S. Environmental Protection Agency.

FFACO, see *Federal Facility Agreement and Consent Order.*

Federal Facility Agreement and Consent Order. 1996. Agreed to by the State of Nevada, the U.S. Department of Energy, and the U.S. Department of Defense.

Fitzmorris, T. Bechtel Nevada. 1999. Record of Telecon with J. Markowsky (SAIC) regarding a preliminary assessment of the E-MAD Waste Holdup Tanks, 19 April. Las Vegas, NV: IT Corporation.

Garey, K. PEER Consultants. 1997. Record of Meeting with A. O'Hagan (IT) regarding waste holdup tanks west of the E-MAD building, 24 February. Las Vegas, NV: IT Corporation.

Garey, K. PEER Consultants. 1998a. Record of Telecon with D. Rainwater (IT) regarding the former AST at TCA, 19 May. Las Vegas, NV: IT Corporation.

Garey, K. PEER Consultants. 1998b. Record of Telecon with M. Truax (IT) regarding the E-MAD Waste Holdup Tanks, 20 August. Las Vegas, NV: IT Corporation.

Garey, K. PEER Consultants. 1998c. Record of Telecon with C. Speer (SAIC) regarding the E-MAD Waste Holdup Tanks, 25 August. Las Vegas, NV: IT Corporation.

Garey, K. PEER Consultants. 1998d. Record of Telecon with D. Rainwater (IT) regarding the Deluge Valve Pit at TCA, 10 December. Las Vegas, NV: IT Corporation.

Garey, K. PEER Consultants. 1998e. Record of Telecon with J. Markowsky (SAIC) regarding the E-MAD Waste Holdup Tanks, 18 December. Las Vegas, NV: IT Corporation.

Garey, K. PEER Consultants. 1999. Record of Telecon with J. Markowsky (SAIC) regarding the E-MAD Waste Holdup Tanks, 29 March. Las Vegas, NV: IT Corporation.

Gile, A.L. 1996. *NV/YMP Radiological Control Manual*, Rev. 2, DOE/NV/11718-079, UC-702. Las Vegas, NV: Bechtel Nevada.

IT, see IT Corporation.

IT Corporation. 1993 - 1998. Digital Photographs of CAS 25-02-01, CAS 25-02-03, and CAS 25-02-10. Las Vegas, NV.

IT Corporation. 1993. Field Form entitled, "ER Sites Inventory Field Data Form," 25 May. Las Vegas, NV.

IT Corporation. 1998. Field Form for CAS 25-02-01 and 25-02-03 entitled, "CAU Phase I Assessment Form," 24 February. Las Vegas, NV.

Laub, M. Bechtel Nevada. 1993. Page from sampling logbook entitled, "A25 E-MAD (2) 1500 gal tanks,"15 July. Las Vegas, NV: IT Corporation.

McArthur, R.D., and F.L. Miller, Jr. 1989. *Off-Site Radiation Exposure Review Project (ORERP), Phase II Soil Program*, DOE/NV/10384-23. Las Vegas, NV: Desert Research Institute.

McCloskey, J. Bechtel Nevada. 1999. Radiation Survey Report for CAU 135, CAS 25-02-10. Las Vegas, NV.

NAC, see *Nevada Administrative Code*.

NDEP, see Nevada Division of Environmental Protection.

NERVA/NRDS, see Nuclear Engine Rocket for Vehicle Application Test Operations, Nuclear Research Development Station.

Nevada Administrative Code. 1998a. NAC 444, "Sanitation." Carson City, NV: Nevada Division of Environmental Protection.

Nevada Administrative Code. 1998b. NAC445A.2272, "Water Controls." Carson City, NV: Nevada Division of Environmental Protection.

Nevada Division of Environmental Protection. 1995. "Mutual Consent Agreement Between the State of Nevada and the Department of Energy for the Storage of Low-Level Land Disposal Restricted Mixed Waste." Transmittal from P. Liebendorfer (NDEP) to D. Elle (DOE/NV), 7 June. Carson City, NV.

Nevada Revised Statutes. 1998. 459.9973, 459.9975, and 459.9977, "Hazardous Materials." Carson City, NV: Nevada Division of Environmental Protection.

NRC, see U.S. Nuclear Regulatory Commission.

NRS, see *Nevada Revised Statutes*.

Nuclear Engine Rocket for Vehicle Application Test Operation, Nuclear Research Development Station. 1965. Engineering drawing entitled, "Test Cell A, Reactor Car, Cooling Water System," drawing number 386D824, 29 April. Mercury, NV: Archives and Records Center.

Nuclear Engine Rocket for Vehicle Application Test Operation, Nuclear Research Development Station. 1967. Engineering drawing entitled, "N.R.D.S. - E-MAD Facility Radioactive Waste Drain System," drawing number E1012975, 5 June. Mercury, NV: Archives and Records Center.

Pan Am, see Pan American Airways.

Pan American Airways. 1965. Engineering drawing entitled, "Concrete Pad Dewar Area," Drawing Number J6-SK-JA-308, 11 June. Mercury, NV: Archives and Records Center.

REECo, see Reynolds Electrical & Engineering Company, Inc.

Reynolds Electrical & Engineering Company, Inc. 1960. Engineering drawing entitled, "3118-Test Area No. 1-Process Piping, Plan of Cooling Tower and Pumping Station Piping," 16 January. Drawing Number RE3118-PP29. Mercury, NV: Archives and Records Center.

Reynolds Electrical & Engineering Company, Inc. 1984a. Engineering drawing entitled, "Existing Water & Sewer Layout, E-MAD Facility Plan," Drawing Number 25-E-MAD-C-1.1, 1 January. "As Built" from 07/28/83. Las Vegas, NV.

Reynolds Electrical & Engineering Company, Inc. 1984b. Engineering drawing entitled, "Existing Water & Sewer Layout, Test Cell 'A', Plan," Drawing Number 25-TC-A-C1, 5 January. Las Vegas, NV.

Smith, J. Bechtel Nevada. 1999. E-mail entitled, "CAU 135 DQO CAS 25-02-01" pertaining to the radiological swipe samples taken on 7 January by J. McCloskey, 12 January. Las Vegas, NV.

Smith, R.E., Los Alamos Scientific Laboratory. 1968. Memo entitled, "Tabulation of LASL Test Plans for Test Cell 'A' and Test Cell 'C'," 16 December. Las Vegas, NV.

SNPO, see Space Nuclear Propulsion Office.

Space Nuclear Propulsion Office. 1970. *NRDS Master Plan 1969-1970, Nuclear Rocket Development Station, Jackass Flats, Nevada*. Las Vegas, NV.

Space Nuclear Propulsion Office. 1972. Engineering drawing entitled, "Test Cell C Waste Water Hold Up System Above Grade Storage Tank," drawing number EDSK-538, 30 June. Mercury, NV: Archives and Records Center.

U.S. Atomic Energy Commission. 1958. Engineering drawing entitled, “Test Area No. 1, Site Plan,” “As Built,” 7 March, Drawing Number 3103-SP12 (PAA-1774). Prepared by Burns and McDonnell Engineering Co. Mercury, NV: Archives and Records Center.

U.S. Atomic Energy Commission. 1962a. Engineering drawing entitled, “NRDS E-MAD Facility Piping Diagram Waste Systems,” Drawing Number 1425-M-2, 3 August. Prepared by Vitro Engineering Company. Mercury, NV: Archives and Records Center.

U.S. Atomic Energy Commission. 1962b. Engineering drawing entitled, “NRDS E-MAD Facility Waste Holdup Tank Pit Plan, Sections and Details,” Drawing Number 1425-M-21, 3 August. Prepared by Vitro Engineering Company. Mercury, NV: Archives and Records Center.

U.S. Atomic Energy Commission. 1968. *Standards for Radiation Protection*, Chapter 0524 in Volume 000, General Administration, Part 0500, Health and Safety, 8 November. Las Vegas, NV: Archives and Records Center.

U.S. Department of Energy. 1988a. *Radioactive Waste Management*, DOE Order 5820.2A. Washington, D.C.

U.S. Department of Energy. 1988b. *Environmental Survey Preliminary Report*, April. Washington, DC: Environment, Safety and Health Office of Environmental Audit.

U.S. Department of Energy, Nevada Operations Office. 1987. *Nevada Test Site - Environmental Compliance Atlas*, 15 June. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1994. *Project Management Plan*, Rev. 0. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1996a. *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada*, DOE/EIS 0243. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1996b. *Industrial Sites Quality Assurance Project Plan*, Nevada Test Site, Nevada, DOE/NV--372, Rev. 1. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1997. *Nevada Test Site Waste Acceptance Criteria*, NVO/NV--325, Rev. 1. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1998a. *Decontamination and Decommissioning Subproject Characterization Report for the E-MAD Decontamination Project*, January, DOE/NV--485. Prepared by IT Corporation. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1998b. *Environmental Restoration Project Health and Safety Plan*, Rev. 3. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1998c. ERD-05-201, "Chain of Custody," Rev. 1. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1998d. ERD-05-701, "Sampling Equipment Decontamination," Rev. 1. Las Vegas, NV.

U.S. Environmental Protection Agency. 1994. *Guidance for the Data Quality Objectives Process*, EPA QA/G-4. Washington, DC.

U.S. Environmental Protection Agency. 1998. Memo from S. J. Smucker regarding Region 9 Preliminary Remediation Goals (PRGs), 1 August. San Francisco, CA.

U.S. Geological Survey. 1993. *Selected Ground-Water Data for Yucca Mountain Region, Southern Nevada and Eastern California, Calendar Year 1993*, Open-File Report 95-158. Las Vegas, NV.

USGS, see U.S. Geological Survey.

U.S. Nuclear Regulatory Commission. 1997. *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, NUREG-1575/EPA 402-R-97-016. Washington, DC.

Westinghouse Electric Corporation. 1978. *E-MAD Facility Equipment Operating Procedure for Radioactive Waste Water System*, 4 December. Document Number WN-F-022. Prepared by the E-MAD staff. Las Vegas, NV: Advanced Energy Systems Division, Nevada Operations.

Westinghouse Electric Corporation. 1987. *E-MAD Facility Deactivation Plan*. Prepared by Ken Garey. Las Vegas, NV: Advanced Energy Systems Division, Nevada Operations.

Wilczek, T.A. 1993. Field Notes on the dimensions of the waste holdup tanks at E-MAD and vault from a sampling effort, 12 May. Las Vegas, NV.

Appendix A

Data Quality Objectives Process

A.1.0 Introduction

A.1.1 Problem Statement

Potentially hazardous and/or radiological constituents may have been released at the three CASs that comprise CAU 135; Area 25 Underground Storage Tanks. The three CASs within CAU 135 are CAS 25-02-01, Underground Storage Tanks; CAS 25-02-03, Underground Electrical Vault; and CAS 25-02-10, Underground Storage Tanks and Vault. Corrective Action Site 25-02-01 will be referred to as the E-MAD Waste Holdup Tanks. Historical documentation has shown that CAS 25-02-03, Underground Electrical Vault, is actually a Deluge Valve Pit at TCA and will be referred to as such in this appendix. Since CAS 25-02-03 is not an UST, the CAS will be closed in the Closure Report for this CAU with no further action required. Corrective Action Site 25-02-10 was an AST that was moved to the TCC Facility in 1971 and will be referred to as the former AST at TCA in this appendix. Since CAS 25-02-10 is not an UST, the CAS will be closed in the Closure Report for this CAU with no further action required. There will be a limited investigation conducted on the piping related to CAS 25-02-10 to determine the presence of any radiological constituents. If there is radiological contamination detected, then the soils and piping will be included in a newly identified CAS or included in the characterization of the Test Cell A Facility decommissioning and decontamination (CAU 115).

Existing information about the nature and extent of contamination for the E-MAD Waste Holdup Tanks is insufficient to evaluate and select preferred corrective actions. This CAS will be investigated based on DQOs developed by representatives of the NDEP and DOE/NV. Corrective Action Site 25-02-01 consists of two tanks, a sump, and ancillary piping contained inside a concrete vault. Conducting a radiological survey and collecting samples of the vault contents will determine if COPCs are present and if concentrations exceed preliminary action levels. Bechtel Nevada will be responsible for removing the tanks and piping in CAS 25-02-01, as well as characterizing the tank contents and transporting and disposing of any waste generated. Data adequate to close the site under NDEP, RCRA, and DOE requirements will be collected.

A.1.2 DQO Kickoff Meeting

Table A.1-1 lists the participants present at the FFACO-required DQO Kickoff Meeting and any subsequent meetings. The goal of the DQO process is to establish the quantity and quality of environmental data required to support corrective action decisions for the CAU. The process ensures that the information collected will provide sufficient and reliable information to identify, evaluate, and technically defend the chosen corrective action. Unless otherwise required by the results of this DQO and stated in the CAIP, this investigation will adhere to the Industrial Sites QAPP (DOE/NV, 1996b).

Table A.1-1
DQO Kickoff Meeting Participants

Participant	Affiliation	Meeting Date
		Kickoff Meeting January 13, 1999
Steve Adams	IT	X
Jodi Markowsky	SAIC	X
Kevin Cabble	DOE/NV	X
Mark DiStefano	IT	X
Bob Bull	SAIC	X
Jeff Smith	BN	X
Dave Madsen	BN	X
Syl Hersh	IT	X
David Friedman	NDEP	X
Mike McKinnon	NDEP	X
Mary Todd	SAIC	X
Debbie Rainwater	IT	X
Jeanne Wightman	Mactec	X
Lydia Coleman	SAIC	X

BN - Bechtel Nevada
DOE/NV - U.S. Department of Energy, Nevada Operations Office
IT - IT Corporation
Mactec - Management Analysis Company Technical
NDEP - Nevada Division of Environmental Protection
SAIC - Science Applications International Corporation

A.2.0 Conceptual Model

Corrective Action Site 25-02-01 is located at the E-MAD Facility and both CAS 25-02-03 and CAS 25-02-10 are located at the TCA Facility. The E-MAD and TCA Facilities were initially designed for operations during the NERVA program. The E-MAD Facility was used to assemble and prepare nuclear engines for testing, refurbish radioactively-hot engines for additional testing, and disassemble and conduct detailed post-mortem inspections of tested rocket engines and components. The TCA Facility was designed for testing nuclear rocket reactors (SNPO, 1970; DOE, 1988a; DRI, 1988). The CASs presented here were used in support of the nuclear rocket testing program that took place from the late 1950s to the late 1980s. Section 2.0 of the CAIP describes the CASs, their operational histories, waste information, release information, and investigative backgrounds.

The conceptual model for the CAU 135 Area 25 Underground Storage Tanks is provided in Table A.2-1.

Table A.2-1
Conceptual Model
(Page 1 of 4)

Conceptual Model Element	Description	Source
Underground Storage Tanks (CAS 25-02-01) (E-MAD Waste Holdup Tanks)	The CAS is located just outside the west gallery door of the E-MAD building (3900) at the E-MAD Facility in Area 25 of the NTS.	IT, 1998a
	Two 1,500-gallon storage tanks are located inside an underground vault and are covered by a concrete pad. The pad contains three lids that lead into the vault. One lid has been replaced with a thin, aluminum, padlocked trap door. A sump is located on the low spot or northwest corner of the vault and makes up part of the floor. It was used as a secondary catchment for overflow or spills.	Process Knowledge, AEC, 1962; IT, 1998b
	The tanks received liquid waste from all of the radioactive drains at E-MAD. Liquids were generated from chemical analysis of test units, as well as from the decontamination of personnel and trains and washdown operations.	Garey, 1997; Garey, 1998a, b, and d
	An automated sampling system inside E-MAD was used to determine radiation levels and collect samples without having to actually access the tanks. The tanks were sampled frequently during operations when liquid levels reached around 760 to 1,100 liters (200 to 300 gallons). If radiation levels were below disposal standards of the time, the liquids were released to the radioactive leachfield located to the southwest (CAS 25-05-06). The tank contents were pumped out and transported to the Area 5 liquid waste facility if radiation levels were too high.	Garey, 1997; Garey, 1998a and d
	The tanks received liquid waste from about 1966 to about 1987. The ancillary piping remains intact. The outgoing valves to the leachfield have been shut off since about 1973; however, they have not been capped. The inlet valves remain in the open position for emergency purposes.	Garey, 1998d
	The tanks were sampled in July 1993 by REECo as part of a UST removal program. The south tank was completely empty and the north tank contained some loose solid material. A sample was taken from the northernmost tank and analyzed. The vault and tanks were also surveyed for radiation. The tanks were surveyed again in February 1997 as part of the decontamination and decommissioning subproject characterization for E-MAD.	Bertrand, 1993; Laub, 1993; IT, 1998a
	Elevated radioactivity was detected inside the vault, on the outside of the tanks, and from a sample collected from the inside of the north tank. Radiological constituents detected include cesium-137, cobalt-60, uranium-235 and uranium-238. The TCLP barium and cadmium were detected but were below regulatory limits. Chemicals released to the tanks during operations at E-MAD may include acids, cleaning solvents, Freon-10, epoxy, and alkali metals.	Coleman, 1998; Garey, 1998d; Clark, 1993
	Bechtel Nevada will investigate and remove the two 1,500-gallon tanks, and the piping inside the vault interior. IT Corporation will investigate the vault, the sump, and piping inside the vault interior. Samples taken from the tank will represent worst case for contamination at this CAS. The results will be used to evaluate waste characterization methods and health and safety issues.	NA

Table A.2-1
Conceptual Model
(Page 2 of 4)

Conceptual Model Element	Description	Source
Underground Electrical Vault (CAS 25-02-03) (Deluge Valve Pit)	The Deluge Valve Pit is located west of the Dewar Area, southwest of Building 3113A at TCA in Area 25 at the NTS.	IT, 1993; REECo, 1991
	There are two vaults that are covered by concrete pads. A 0.6 by 0.8-m (2 by 2.5-ft), slightly open, wooden lid covers the entryway to the main valve pit. The main valve pit is approximately 3 by 4-m (10 by 13-ft) and the small pit located to the south of the main vault is approximately 0.9 by 1.5-m (3 by 5-ft). Both vaults appeared to be approximately 1.8 m (6 ft) deep based on photographs. Two vent pipes protrude from the top of the concrete pad.	IT, 1993 - 1998; IT 1998b
	The CAS was originally called an UST which is why it was added to the FFACO. The interior of the vault was inspected by field crews in 1993; they identified the CAS as an underground electrical vault and not an UST since there weren't any tanks in the vault and there were electrical control boxes near the entryway to the vault. Engineering drawings have revealed that the vault is actually a Deluge Valve Pit. A recent site visit discovered that the vault also contains piping related to the water cooling system for the Dewar Area at TCA. The smaller vault contains a manual flange valve to control water flow.	IT, 1993 - 1998; IT, 1993; REECo, 1984
	The Deluge Valve Pit for the Dewar Area received water from a 50,000-gallon elevated water storage tank. It was designed to cool the Dewars during testing, and was used for emergency purposes when hydrogen and propane were unloaded from vehicles during delivery to the TCA Facility. The system appears to be unidirectional.	Process Knowledge; REECo, 1984; Garey, 1998c; Little, 1971; SNPO, 1970
	A radiological survey was conducted in June 1998 for the Dewar Area at TCA. The Deluge Valve Pit is enclosed within the fenced area of the Dewar Area. Maximum results for the entire Dewar Area included 29,700 dpm field beta, 67 dpm final beta, 700 microRoentgen per hour (μR/hr), and 14,000 counts per minute Fidler.	Junio, 1998
	Another radiological survey was conducted in August 1998 of the exterior of the deluge valve pit. The readings were taken at the cover handle and inside the valve house. Readings from the survey were 200 and 220 μR/hr. Entry was not attempted due to the confined space access.	IT, 1998c
	This CAS will be closed in the Closure Report for this CAU and will require no further action. Sufficient information exists to prove that the CAS is not an UST.	NA

Table A.2-1
Conceptual Model
(Page 3 of 4)

Conceptual Model Element	Description	Source
Underground Storage Tank (CAS 25-02-10) (former AST at TCA)	The CAS is located on the west side of the Pump House (Building 3116) in the TCA Facility in Area 25 at the NTS.	REECo, 1984
	Through historical research and field investigation, it has been confirmed that the UST described in the FFACO has been improperly identified and is actually a 100,000-gallon steel AST. The AST was moved to TCC around 1971. This AST is CAU 168, CAS 25-01-05 in the FFACO.	Garey, 1998a; REECo, 1960; SNPO, 1970
	A circular asphalt foundation remains at the site as well as piping that may have been associated with the AST. A concrete vault is located north of the foundation and a concrete pad with an electrical outlet appears to have been related to the AST. In February 1998, the area was covered with cable and piping debris as well as overgrown vegetation. Recent IT field visits have indicated that the debris and vegetation have been cleared.	IT, 1998b
	The TCA AST was used for the storage of demineralized water that cooled the reactor carts during engine tests that were conducted from about 1957 to about 1963. The water was treated with a rust inhibitor and was part of a recirculated system.	NRDS, 1965; Smith, 1968: SNPO, 1970
	Sometime around 1971, the 100,000-gallon storage tank was relocated to the TCC Facility. The water storage tank was utilized at the TCC Facility as part of the Waste Water Holdup System.	Garey, 1998d; SNPO, 1972
	Sufficient information exists to prove that the CAS is not an UST. There will be a limited investigation conducted including a radiological survey of the piping located in the vicinity of the CAS. If the piping is contaminated, then a new CAS will be created, or included in the decommissioning and decontamination CAU for the Test Cell A Facility. If the piping is not contaminated, the CAS will be closed in the Closure Report for this CAU and will require no further action.	NA

Table A.2-1
Conceptual Model
(Page 4 of 4)

Conceptual Model Element	Description	Source
Lateral extent of potential contaminants	The E-MAD Waste Holdup Tanks are located in an underground vault. There does not appear to be any concern for lateral contamination. The investigation of this CAU will consist of the contents of the vault interior for health and safety and waste characterization concerns. The vault investigation will be used as a baseline for the worst case contamination areas in the event of future E-MAD tenants. The vault itself and related piping in the E-MAD Building will be included in the decommissioning and decontamination CAU for the E-MAD Facility.	IT, 1998b
Vertical extent of potential contaminants	If the sump inside the vault for the E-MAD Waste Holdup Tanks is not contained, there may be a potential for vertical migration of contaminants. Vertical extent of potential contaminations is unknown. Rescoping of the investigation may be necessary if the sump is not contained and field screening results exceed field screening levels underneath the surface of the sump.	NA
Depth to Groundwater	Groundwater impacts are not anticipated. All three CASs are near Well J-11 located at approximately 5,286 m (18,000 ft) south of the Test Cell A facility and approximately 2,800 m (9,100 ft) southeast of the E-MAD Building. The depth to groundwater at this well is 317 m (1,040 ft) below ground surface.	USGS, 1993
System dynamics	Annual precipitation is approximately 15 cm (6 in.).	DOE/NV, 1997
	The E-MAD waste holdup tanks are currently abandoned and not operational. The outlet valves from the tanks have been shut off but not capped. The inlet valves have been left open for emergency purposes. Any waters generated from the E-MAD Facility since 1987 could have potentially to have entered into the tanks.	Garey, 1997; Garey, 1998e
	The lids that lead to the vault are not sealed and rainwater has leaked into the vault.	IT, 1993 - 1998
	Some radiological constituents have short half-lives, i.e. Cobalt-60, and may have gone through several half-lives since they entered the tanks.	NA
Physical and practical constraints	Nearby utilities as well as the E-MAD Building are found in the vicinity. Corrective Action Site 25-02-01 is located inside the E-MAD Facility fence and a key is necessary for entry. The vault will be opened by BN prior to the investigation by IT. Confined space entry is required at this site. Adverse weather conditions may affect the site.	IT, 1998b
Future Use	Future use for E-MAD may include industrial, educational tours, research, and support sites. The vault and piping outside the vault will be left intact and may also be useful for future E-MAD occupants.	DOE/NV, 1996a
Potential exposures	Potential for exposure is mainly to field personnel and workers performing investigations at these sites. Exposure pathways include ingestion, inhalation, dermal contact, and direct exposure. Groundwater pathways are not considered at this CAU.	DOE/NV, 1988

NA = Not applicable

A.3.0 Potential Contaminants

Section 3.0 of the CAIP provides additional information on the COPCs for the Area 25 Underground Storage Tank CASs, including PALs and QA/QC requirements. The E-MAD Waste Holdup Tanks will be the only CAS investigated in this CAU.

The COPCs for the E-MAD Waste Holdup Tanks are as follows:

- Table A.3-1 identifies the COPCs for CAS 25-02-01.
- Table C.1-1 shows the laboratory chemical and radiochemistry analytical requirements.

Table A.3-1
CAU 135 Contaminants of Potential Concern
(Underground Storage Tanks [E-MAD Waste Holdup Tanks], CAS 25-02-01)[c]

Potential Contaminants	Comments	Field Screening Method	Field Screening Level	Conduct Analytical?	Preliminary Action Level
Volatile Organic Compounds	There may have been unknown discharges to the tanks from metallurgical processes.	Headspace using a PID/waterbath	20 ppm or 2.5X background (use greater value)	Yes[c]	PRGs[a] NAC 445A[b]
Semivolatile Organic Compounds	There may have been unknown discharges to the tanks from metallurgical processes.	NA	NA	Yes[c]	PRGs[a] NAC 445A[b]
Total RCRA Metals	Barium, and cadmium were detected below regulatory levels in a preliminary sample.	NA	NA	Yes[c]	PRGs[a] NAC 445A[b]
Total Petroleum Hydrocarbons	There may have been unknown discharges to the tanks associated with the decontamination of trains.	NA	NA	Yes[c]	100 ppm NAC 445A[b]
Total PCBs	There may have been unknown discharges to the tanks.	NA	NA	Yes[c]	PRGs[a] NAC 445A[b]
Radionuclides[c]	cobalt-60, cesium-137, uranium-235, and uranium-238 were detected in a preliminary sample.	Electra™ Alpha/Beta scintillator; sodium iodide detector or equivalent; swipe survey using a gas proportional counter; Micro-R; shielded pancake probe	<u>For building and equipment surfaces</u> - Table 2.2 from the RADCON Manual[d]; gross alpha and beta surface activities for fixed and removable. <u>For soil/sludge</u> - (1) mean background plus two standard deviations; (2) requirements per sample shipment are gross alpha/beta <2,000 pCi/g and 0.5 mrem/hr following DOE Order 5820.2A[e] and DOT regulations, 49 CFR 173[f]	Yes[c]	<u>For Building and equipment surfaces</u> - Table 2.2 from the RADCON Manual[d]; wipes with elevated gross alpha or beta activity will be submitted for radioanalysis. <u>For soil/sludge</u> - Maximum concentrations in samples taken from undisturbed background locations in the vicinity of CAU 135[g,h]

[a]EPA *Region IX Preliminary Remediation Goals* (PRGs) (EPA, 1998)
[b]*Nevada Administrative Code* (NAC, 1998)
[c]See Table C.1-1 for specific analyses
[d]*NV/YMP Radiological Control Manual* (Gile, 1996)
[e]U.S. Department of Energy (DOE, 1988b)
[f]*Code of Federal Regulations*, 49 CFR Part 173, Subpart I, Class 7 for radioactive materials (CFR, 1998)
[g]McArthur and Miller (1989)
[h] Atlan-Tech (1992)

NA = Not applicable

A.4.0 Decisions and Inputs

A.4.1 Decisions

Decisions to be resolved by the investigation include:

- Determine if COPCs are present at the site.
- Determine if COPC concentrations exceed field screening levels.
- Determine if COPC concentrations exceed PALs.
- Determine the nature and extent of contamination with enough certainty to develop and evaluate a range of potential corrective actions, including closure in place and clean closure.

A.4.2 Inputs and Strategy

Inputs to the decisions include those elements of information used to support the decisions in addressing the identified problem. A list of information inputs, existing data, identified data gaps, and brief strategies are discussed in Table A.4-1. A more detailed discussion of investigation strategies is found in Section A.5.0.

Table A.4-1
Decisions, Inputs, and General Strategies
(Page 1 of 3)

Decision	Input	Existing Data	Data Gap	Strategy
Are COPCs present above PALs at site?	Potential contaminant identification	Process knowledge of potential discharges; previous sampling effort (Clark, 1993; Bertrand, 1993; IT, 1998c)	Exact COPCs	Collect laboratory samples; analyze for COPCs.
	Potential contaminant concentration	Preliminary sampling data available (Clark, 1993; Bertrand, 1993; IT, 1998c)	COPC concentrations; do concentrations exceed PALs?	Collect radiological swipe samples at random and biased locations inside the vault interior. Collect field screening and laboratory samples from the sump and floor; compare results to field screening levels and PALs.
	Potential contaminant distribution	Contamination appears to be contained within the components of the vault and the vault itself. The exception to this is the sump. It is unknown at this time if the bottom of the sump is contained.	Exact vertical extent of the sump; sump construction and condition	Visual inspection; determine if sump is contained; collect sample from contents of sump; if sump not contained collect a subsurface sample if possible; if field screening levels exceed PALs in the sample taken from subsurface sample in the sump, rescope.

Table A.4-1
Decisions, Inputs, and General Strategies
(Page 2 of 3)

Decision	Input	Existing Data	Data Gap	Strategy
Are potential contaminants migrating?	Meteorologic data	Sufficient information should be available	None	No site-specific meteorological data collection will be collected; general weather conditions and wind speed and direction are noted on daily field notes
	Geologic/hydrologic data	General geologic/hydrologic characteristics of site; specific geologic conditions of nearby sites; site is located inside a vault, if sump is contained, the threat of contaminant migration is negligible	No specific geologic or hydrologic sample data will be collected for this site. Assume mainly near-surface investigation.	NA
	Radioactive decay	Radionuclides expected in CAS 25-02-01	Presence, types, and extent of radionuclides at CAS 25-02-01.	Field screen for gamma-ray and alpha/beta radiation; collect samples for laboratory analysis; compare results to field screening levels and/or PALs

Table A.4-1
Decisions, Inputs, and General Strategies
(Page 3 of 3)

Decision	Input	Existing Data	Data Gap	Strategy
Data sufficient to support closure options?	No further action	Historical evidence shows that COPCs were not released to the environment at CAS 25-02-03, Deluge Valve Pit at TCA; historical evidence shows that COPCs may have been released at site 25-02-10 in the form of rust inhibitors, former AST at TCA; both CASs are not USTs which was the original FFACO identification; no further action may apply at CAS 25-02-03 and CAS 25-02-10	NA for CASs 25-02-03 and 25-02-10	Include CAS 25-02-01 and CAS 25-02-10 in the Closure Report for this CAU.
	Closure in place	Potential for PCBs, VOCs, SVOCs, TPH, RCRA metals, and radionuclides at CAS 25-02-01, E-MAD Waste Holdup Tanks	Presence of regulated COPCs; concentrations above PALs	Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/Closure Report; otherwise prepare CADD.
	Clean closure by contaminant removal	Potential for PCBs, VOCs, SVOCs, TPH, RCRA metals, and radionuclides at CAS 25-02-01, E-MAD Waste Holdup Tanks	Presence, concentration, and extent of COPCs; volume of contaminated material above PALs	Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/Closure Report; otherwise prepare CADD.

NA = Not applicable

A.5.0 Investigation Strategy

Samples collected from CAS 25-02-01 will be analyzed according to the appropriate COPC table as provided in Section A.3.0 and Table C.1-1.

A.5.1 CAS 25-02-01 Underground Storage Tanks (E-MAD Waste Holdup Tanks)

Investigate the E-MAD Waste Holdup Tanks using the following approach:

- The vault will be opened by BN prior to the investigation. The two tanks and ancillary piping inside the vault will also be removed by BN prior to vault entry. The piping will be stubbed at the vault wall and capped.
- Conduct an air monitoring survey of the vault using confined space entry requirements which will be specified in the SSHASP.
- Enter the vault via ladders wearing proper PPE.
- Conduct a radiological survey of the stubbed piping in the vault interior and survey vault interior using an HNu™ PID, an alpha/beta scintillator, Micro-R meter, swipes (monitor with sodium iodide or zinc sulfide), shielded pancake probe, or other appropriate equipment.
- Collect a sample from the vault floor if possible.
- Field screen floor samples for VOCs (using headspace method) and for radioactivity (using Electra™ alpha/beta scintillator, a sodium iodide detector, or equivalent).
- Visually inspect the sump in the vault. If the sump is contained, and soil/sludge is present, collect a surface sample. If the sump is not contained collect a surface sample (0 to 0.3 m [0 to 1 ft]) using a scoop and near-surface sample (0.3 to 0.6 m [1 to 2 ft]) using a hand trowel.
- Field screen sump samples for VOCs (using headspace method) and for radioactivity (using Electra™ alpha/beta scintillator, a sodium iodide detector, or equivalent).

- Submit samples for laboratory analysis for PCBs, VOCs, SVOCs, TPH, gamma spectrometry (includes cobalt-60 and cesium-137), isotopic uranium, isotopic plutonium, Total RCRA metals, and Strontium-90.

- Collect and submit QA/QC samples for all components sampled as prescribed in the QAPP (no trip blanks unless VOC samples collected).

A.5.2 CAS 25-02-03 Underground Electrical Vault (Deluge Valve Pit)

No investigation will be conducted for this CAS. No further action is required and is the recommended corrective action that will be included in the Closure Report for this CAU.

A.5.3 CAS 25-02-10 Underground Storage Tank (former AST at TCA)

No investigation will be conducted for this CAS. There will be a limited radiological swipe survey investigation conducted for nearby piping and asphalt foundation. If there is contamination, then the nearby piping and soils will either be included in a newly identified CAS or included in the decommissioning and decontamination CAU for the Test Cell A Facility (CAU 115).

A.6.0 Decision Rules

The following decision rules are applicable to CAS 25-02-01 and will be used to guide the investigation and subsequent data evaluation.

- If, in the course of the investigation, either of the following occur, the investigation will be halted and rescoped as necessary:
  - The conceptual model fails to such a degree that rescoping is required
  - Sufficient data are collected to support evaluation of corrective actions
- If laboratory results indicate the presence of COPCs above PALs, then a CADD will be prepared.
- If no COPCs are identified above PALs, then a CADD/Closure Report will be prepared according to the outline agreed upon by NDEP and DOE/NV. This type of CADD incorporates the elements of the regular CADD and the corrective action plan and serves as the closure report for the site.

Figure A.6-1 provides additional decision points and rules specific to CAS 25-02-01.

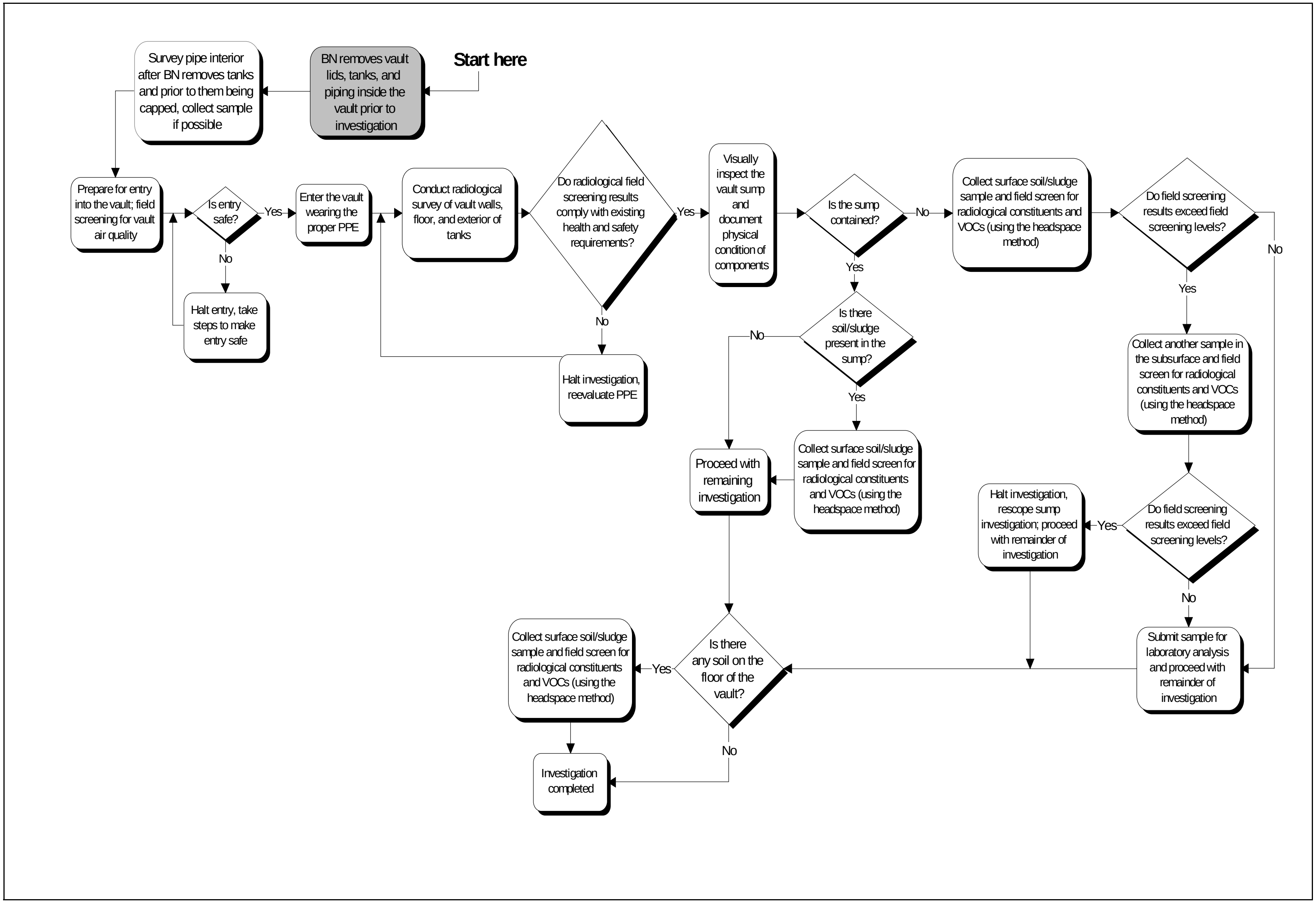


Figure A.6-1
CAS-Specific Decision Points and Rules for E-MAD Waste Holdup Tanks

A.7.0 Decision Error

Random and biased sampling of the total and removable radioactive contamination will be taken on the vault floor, walls, and sump. If particulates, sludge, or liquids are present in the sump or on the vault floor they will be sampled. Exposure rates will be measured near the tanks at random locations in the vault, and from all samples that will be shipped to an analytical laboratory. This will ensure that the extent of the contamination has been adequately located and identified. Sampling locations will be identified in the field investigation plan for this CAU.

Subsurface samples will be taken in the sump if it is not contained, if there is soil present, and if the field screening levels exceed PALs. If field screening levels were exceeded in the subsurface sample then the investigation will be halted and rescoping the investigation will be necessary.

A.8.0 References

AEC, see U.S. Atomic Energy Commission.

Bertrand, K. Reynolds Electrical & Engineering Company, Inc. 1993. Handwritten notes pertaining to the "Sampling of E-MAD Storage Tanks," 15 July. Las Vegas, NV.

CFR, see *Code of Federal Regulations*.

Clark, G.A. Reynolds Electrical & Engineering Company, Inc. 1993. Memo to S.J. Nacht entitled, "Sample Analytical Results," 01 September. Las Vegas, NV.

Code of Federal Regulations. 1998. 49 CFR Part 173, Subpart I, "Class 7 (Radioactive Materials)." Washington, DC: U.S. Government Printing Office.

Coleman, L. Science Applications International Corporation. 1998. Memo to J. Markowsky (SAIC) entitled, "Chemical Data Evaluation of Sample ERUST/PH2/EMDN," 23 December. Las Vegas, NV: IT.

Desert Research Institute. 1988. *CERCLA Preliminary Assessment of DOE's Nevada Operations Office, Nuclear Weapons Testing Area*, Vol I. Las Vegas, NV.

DOE, see U.S. Department of Energy.

DOE/NV, see U.S. Department of Energy, Nevada Operations Office.

DRI, see Desert Research Institute.

EPA, see U.S. Environmental Protection Agency.

Garey, K. Peer Consultants. 1997. Record of Meeting with A. O'Hagan (IT) regarding waste holdup tanks west of the E-MAD building, 24 February. Las Vegas, NV: IT.

Garey, K. Peer Consultants. 1998a. Record of Telecon with D. Rainwater (IT) regarding the former AST at TCA, 19 May. Las Vegas, NV: IT.

Garey, K. Peer Consultants. 1998b. Record of Telecon with M. Truax (IT) regarding the E-MAD waste holdup tanks, 20 August. Las Vegas, NV: IT.

Garey, K. Peer Consultants. 1998c. Record of Telecon with C. Speer (SAIC) regarding the E-MAD waste holdup tanks, 25 August. Las Vegas, NV: IT.

Garey, K. Peer Consultants. 1998d. Record of Telecon with D. Rainwater (IT) regarding the Deluge Valve Pit at TCA, 10 December. Las Vegas, NV: IT.

Garey, K. Peer Consultants. 1998e. Record of Telecon with J. Markowsky (SAIC) regarding the E-MAD waste holdup tanks, 18 December. Las Vegas, NV: IT.

Gile, A.L. 1996. *NV/YMP Radiological Control Manual*, DOE/NV/11718-079, UC-702, Rev. 2. Las Vegas, NV: Bechtel Nevada.

IT, see IT Corporation.

IT Corporation. 1993 - 1998. Digital Photographs of CAS 25-02-01, CAS 25-02-03, and CAS 25-02-10. Las Vegas, NV.

IT Corporation. 1993. Field Form entitled, "ER Sites Inventory Field Data Form," 25 May. Las Vegas, NV.

IT Corporation. 1998a. *Decontamination and Decommissioning Subproject Characterization Report for the E-MAD Decontamination Project*, January, DOE/NV--485. Las Vegas, NV.

IT Corporation. 1998b. Field Form for CAS 25-02-01 and 25-02-03 entitled, "CAU Phase I Assessment Form," 24 February. Las Vegas, NV.

IT Corporation. 1998c. Radiological Survey Form for CAS 25-02-03, 19 August. Las Vegas, NV.

Junio, S. Bechtel Nevada. 1998. Record of Telecon with G. Evenson (SAIC) regarding a radiological survey of the Dewar area at TCA, 27 July. Las Vegas, NV.

Laub, M. Bechtel Nevada. 1993. Page from sampling logbook entitled, "A25 E-MAD (2) 1500 gal tanks," 15 July. Las Vegas, NV: IT.

Little, L.E. Nuclear Rocket Test Operations. 1971. Letter from L.E. Little to Distribution entitled, "Transmittal of NRTO-G-0241-Test Cell 'A' Deluge Systems Checkout," 22 September. Las Vegas, NV.

NAC, see *Nevada Administrative Code*.

NRDS, see Nuclear Rocket Development Station.

Nevada Administrative Code. 1998. NAC445A.345 - 445A.22755, "Corrective Action Regulations." Carson City, NV: Nevada Division of Environmental Protection.

Nuclear Rocket Development Station. 1965. Engineering Drawing entitled, "Test Cell A Reactor Car Cooling Water System," 29 April, Drawing Number 386D824. Las Vegas, NV.

REECo, see Reynolds Electrical & Engineering Company, Inc.

Reynolds Electrical & Engineering Company, Inc. 1960. Engineering drawing entitled, "3118-Test Area No. 1-Process Piping, Plan of Cooling Tower and Pumping Station Piping," 16 January, Drawing Number RE3118-PP29. Las Vegas, NV.

Reynolds Electrical & Engineering Company, Inc. 1984. Engineering drawing entitled, "Existing Water & Sewer Layout, Test Cell 'A', Plan," Drawing Number 25-TC-A-C1, 05 January. Las Vegas, NV.

Reynolds Electrical & Engineering Company, Inc. 1991. *Inventory of Inactive and Abandoned Facilities and Waste Sites*, April, DOE/NV/10630-18, Vol. 5 of 5. Las Vegas, NV.

Smith, R.E. Los Alamos Scientific Laboratory. 1968. Memo entitled, "Tabulation of LASL Test Plans for Test Cell A and Test Cell C," 16 December. Las Vegas, NV.

SNPO, see Space Nuclear Propulsion Office.

Space Nuclear Propulsion Office. 1970. *NRDS Master Plan 1969-1970, Nuclear Rocket Development Station, Jackass Flats, Nevada*. Las Vegas, NV.

Space Nuclear Propulsion Office. 1972. Engineering Drawing entitled, "Test Cell C Waste Water Holdup System, Above Grade Storage Tank," 30 June, Drawing Number EDSL-0538. Las Vegas, NV.

U.S. Atomic Energy Commission. 1962. Engineering Drawing entitled, "NRDS E-MAD Facility Piping Diagram Waste Systems," Drawing Number 1425-M-2, 03 August. Prepared by Vitro Engineering Company. Mercury, NV: Archives and Records Center.

U.S. Department of Energy. 1988a. *Environmental Survey Preliminary Report*, April. Washington, DC: Environment, Safety and Health Office of Environmental Audit.

U.S. Department of Energy. 1988b. *Radioactive Waste Management*, DOE Order 5820.2A. Washington, DC.

U.S. Department of Energy, Nevada Operations Office. 1988. *Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada,* DOE/RW-0199, Vols. I-IX. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1996a. *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada,* DOE/EIS-0243. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1996b. *Industrial Sites Quality Assurance Project Plan*, DOE/NV--372, Rev 1. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1997. *Nevada Test Site Annual Site Environmental Report for Calendar Year 1996*, DOE/NV/11718-137. Las Vegas, NV: Bechtel Nevada.

U.S. Environmental Protection Agency. 1998. Memo from S.J. Smucker regarding *Region 9 Preliminary Remediation Goals (PRGs)*, 1 August. San Francisco, CA.

USGS, see U.S. Geological Survey.

U.S. Geological Survey. 1993. *Selected Ground-Water Data for Yucca Mountain Region, Southern Nevada and Eastern California, Calendar Year 1993*, Open-File Report 95-158.

Appendix B

Project Organization

B.1.0 Project Organization

The DOE/NV Project Manager is Janet Appenzeller-Wing and she can be reached at (702) 295-0461.

The names of the project Health and Safety Officer and the Quality Assurance Officer can be found in the appropriate DOE/NV plan. However, personnel are subject to change, and it is suggested that the DOE/NV Project Manager be contacted for further information. The Task Manager will be identified in the FFACO Biweekly Activity Report prior to the start of field activities.

Appendix C

Laboratory Chemical, Toxicity Leaching Procedure, and Radiochemistry Analytical Requirements for Industrial Sites

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and Radiochemistry Analytical Requirements for Industrial Sites
(Page 1 of 5)

Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD)[a]	Percent Recovery (%R)[b]
ORGANICS						
Total Volatile Organic Compounds (VOCs)	Water	8260B[c]	Analyte-specific estimated quantitation limits[d]	Not Applicable (NA)	14[e]	61-145[e]
	Soil				24[e]	59-172[e]
Toxicity Characteristic Leaching Procedure (TCLP) VOCs						
Benzene	Aqueous	1311/8260B[c]	0.050 mg/L[d]	0.5 mg/L[d]	14[e]	61-145[e]
Carbon Tetrachloride			0.050 mg/L[d]	0.5 mg/L[d]		
Chlorobenzene			0.050 mg/L[d]	100 mg/L[d]		
Chloroform			0.050 mg/L[d]	6 mg/L[d]		
1,2-Dichloroethane			0.050 mg/L[d]	0.5 mg/L[d]		
1,1-Dichloroethene			0.050 mg/L[d]	0.7 mg/L[d]		
Methyl Ethyl Ketone			0.050 mg/L[d]	200 mg/L[d]		
Tetrachloroethene			0.050 mg/L[d]	0.7 mg/L[d]		
Trichloroethene			0.050 mg/L[d]	0.5 mg/L[d]		
Vinyl Chloride			0.050 mg/L[d]	0.2 mg/L[d]		
Total Semivolatile Organic Compounds (SVOCs)	Water	8270C[c]	Analyte-specific estimated quantitation limits[d]	NA	50[e]	9-127[e]
	Soil				50[e]	11-142[e]
TCLP SVOCs						
o-Cresol	Aqueous	1311/8270C[c]	0.10 mg/L[d]	200 mg/L[d]	50[e]	9-127[e]
m-Cresol			0.10 mg/L[d]	200 mg/L[d]		
p-Cresol			0.10 mg/L[d]	200 mg/L[d]		
Cresol (total)			0.30 mg/L[d]	200 mg/L[d]		
1,4-Dichloro-benzene			0.10 mg/L[d]	7.5 mg/L[d]		
2,4-Dinitrotoluene			0.10 mg/L[d]	0.13 mg/L[d]		

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and Radiochemistry Analytical Requirements for Industrial Sites
(Page 2 of 5)

Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD)[a]	Percent Recovery (%R)[b]
Hexachloro-benzene	Aqueous	1311/8270C[c]	0.10 mg/L[d]	0.13 mg/L[d]	50[e]	9-127[e]
Hexachloro-butadiene			0.10 mg/L[d]	0.5 mg/L[d]		
Hexachloro-ethane			0.10 mg/L[d]	3 mg/L[d]		
Nitrobenzene			0.10 mg/L[d]	2 mg/L[d]		
Pentachloro-phenol			0.50 mg/L[d]	100 mg/L[d]		
Pyridine			0.10 mg/L[d]	5 mg/L[d]		
2,4,5-Trichloro-phenol			0.10 mg/L[d]	400 mg/L[d]		
2,4,6-Trichloro-phenol			0.10 mg/L[d]	2 mg/L[d]		
Total Pesticides	Water	8081A[c]	Analyte-specific (CRQL)[e]	NA	27[e]	38-131[e]
	Soil				50[e]	23-139[e]
TCLP Pesticides						
Chlordane	Aqueous	1311/8081A[c]	0.0005 mg/L[e]	0.03 mg/L[d]	27[e]	38-131[e]
Endrin			0.001 mg/L[e]	0.02 mg/L[d]		
Heptachlor			0.0005 mg/L[e]	0.008 mg/L[d]		
Heptachlor Epoxide			0.0005 mg/L[e]	0.008 mg/L[d]		
gamma-BHC (Lindane)			0.0005 mg/L[e]	0.4 mg/L[d]		
Methoxychlor			0.005 mg/L[e]	10 mg/L[d]		
Toxaphene			0.05 mg/L[e]	0.5 mg/L[d]		
Polychlorinated Biphenyls (PCBs)	Water	8082[c]	Analyte-specific contract required quantitation limits (CRQL)[e]	NA	Lab-specific[f]	Lab-specific[f]
	Soil					
Total Herbicides	Water	8151A[c]	1.3 µg/L[c]	NA	Lab-specific[f]	Lab-specific[f]
	Soil		66 µg/kg[c]			
TCLP Herbicides						
2,4-D	Aqueous	1311/8151A[c]	0.002 mg/L[d]	10 mg/L[d]	Lab-specific[f]	Lab-specific[f]
2,4,5-TP			0.00075 mg/L[d]	1 mg/L[d]		

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and Radiochemistry Analytical Requirements for Industrial Sites
(Page 3 of 5)

Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD)[a]	Percent Recovery (%R)[b]
Total Petroleum Hydrocarbons (TPH)	Water Gasoline	8015B modified[c]	0.1 mg/L[g]	NA	Lab-specific[f]	Lab-specific[f]
	Soil Gasoline		0.5 mg/kg[g]			
	Water Diesel		0.5 mg/L[g]			
	Soil Diesel		25 mg/kg[g]			
Explosives	Water	8330[c]	14 µg/L[c]	NA	Lab-specific[f]	Lab-specific[f]
	Soil		2.2 mg/kg[c]			
Polychlorinated Dioxins and Furans	Water	8280A/8290[c]	0.05 µg/L[c]	NA	Lab-specific[f]	Lab-specific[f]
	Soil		5 µg/kg[c]			
INORGANICS						
Total *Resource Conservation and Recovery Act* (RCRA) Metals						
Arsenic	Water	6010B/7470A[c]	10 µg/L[g,h]	NA	20[h]	75-125[h]
	Soil	6010B/7471A[c]	1 mg/kg[g,h]			
Barium	Water	6010B/7470A[c]	200 µg/L[g,h]			
	Soil	6010B/7471A[c]	20 mg/kg[g,h]			
Cadmium	Water	6010B/7470A[c]	5 µg/L[g,h]			
	Soil	6010B/7471A[c]	0.5 mg/kg[g,h]			
Chromium	Water	6010B/7470A[c]	10 µg/L[g,h]			
	Soil	6010B/7471A[c]	1 mg/kg[g,h]			
Lead	Water	6010B/7470A[c]	3 µg/L[g,h]			
	Soil	6010B/7471A[c]	0.3 mg/kg[g,h]			
Mercury	Water	6010B/7470A[c]	0.2 µg/L[g,h]			
	Soil	6010B/7471A[c]	0.1 mg/kg[g,h]			
Selenium	Water	6010B/7470A[c]	5 µg/L[g,h]			
	Soil	6010B/7471A[c]	0.5 mg/kg[g,h]			
Silver	Water	6010B/7470A[c]	10 µg/L[g,h]			
	Soil	6010B/7471A[c]	1 mg/kg[g,h]			

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and Radiochemistry Analytical Requirements for Industrial Sites
(Page 4 of 5)

Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD)[a]	Percent Recovery (%R)[b]
TCLP RCRA Metals						
Arsenic	Aqueous	1311/6010B[c] 1311/7470A[c]	0.10 mg/L[g,h]	5 mg/L[d]	20[h]	75-125[hh]
Barium			2 mg/L[g,h]	100 mg/L[d]		
Cadmium			0.05 mg/L[g,h]	1 mg/L[d]		
Chromium			0.10 mg/L[g,h]	5 mg/L[d]		
Lead			0.03 mg/L[g,h]	5 mg/L[d]		
Mercury			0.002 mg/L[g,h]	0.2 mg/L[d]		
Selenium			0.05 mg/L[g,h]	1 mg/L[d]		
Silver			0.10 mg/L[g,h]	5 mg/L[d]		
Cyanide	Water	9010B[c]	0.01 mg/L[h]	NA	20[h]	75-125[h]
	Soil		1.0 mg/kg[h]			
Sulfide	Water	9030B/9034[c]	0.4 mg/L[c]	NA	Lab-specific[f]	Lab-specific[f]
	Soil or Sediment		10 mg/kg[g]			
pH/Corrosivity	Water	9040B[c]	NA	pH >2[i]	Lab-specific[f]	Lab-specific[f]
	Soil	9045C[c]		pH<12.5[i]		
Ignitability	Water	1010[c]	NA	Flash Point <140° F[d]	NA	NA
	Soil	1030[c]		Burn Rate[c] >2.2 mm/sec nonmetals; >0.17 mm/sec metals		
RADIOCHEMISTRY						
Gamma-emitting Radionuclides[j]	Water	EPA 901.1[k]	Isotope-specific[m]	NA	20	Tracer Yield 30-105 Laboratory Control Sample Yield 80-120
	Soil	HASL 300[l]			35	
Isotopic Plutonium[j]	Water	NAS-NS-3058[n,o]	2 pCi/L	NA	20	
	Soil		0.1 pCi/g Pu-238[p] 0.4 pCi/g Pu-239/240[p]		35	
Isotopic Uranium[j]	Water	NAS-NS-3050[q,r]	2 pCi/L	NA	20	
	Soil		1 pCi/g		35	
Strontium - 90[j]	Water	SM 7500-Sr[s]	8 pCi/L[t]	NA	20	
	Soil	Martin 79[u]	1 pCi/g[v]		35	

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and Radiochemistry Analytical Requirements for Industrial Sites
(Page 5 of 5)

[a]RPD is used to Calculate Precision
Precision is estimated from the relative percent difference of the concentrations measured for the matrix spike and matrix spike duplicate analyses of unspiked field samples, or field duplicates of unspiked samples. It is calculated by:
RPD = 100 x $\{(|C_1-C_2|)/[(C_1+C_2)/2]\}$, where C_1 = Concentration of the analyte in the first sample aliquot, C_2 = Concentration of the analyte in the second sample aliquot.

[b]%R is used to Calculate Accuracy
Accuracy is assessed from the recovery of analytes spiked into a blank or sample matrix of interest, or from the recovery of surrogate compounds spiked into each sample. The recovery of each spiked analyte is calculated by: %R = 100 x (C_s-C_u/C_n), where C_s = Concentration of the analyte in the spiked sample, C_u = Concentration of the analyte in the unspiked sample, C_n = Concentration increase that should result from spiking the sample

[c]U.S. Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste, 3rd Edition, Parts 1-4, SW-846 (EPA, 1996)

[d]Estimated Quantitation Limit as given in SW-846 (EPA, 1996)

[e]EPA Contract Laboratory Program Statement of Work for Organic Analysis (EPA, 1988b; 1990; 1991; and 1994b)

[f] In-House Generated RPD and %R Performance Criteria
It is necessary for laboratories to develop in-house performance criteria and compare them to those in the methods. The laboratory begins by analyzing 15-20 samples of each matrix and calculating the mean %R for each analyte. The standard deviation (SD) of each %R is then calculated, and the warning and control limits for each analyte are established at ± 2 SD and ± 3 SD from the mean, respectively. If the warning limit is exceeded during the analysis of any sample delivery group (SDG), the laboratory institutes corrective action to bring the analytical system back into control. If the control limit is exceeded, the sample results for that SDG are considered unacceptable. These limits are reviewed after every 20-30 field samples of the same matrix and are updated at least semiannually. The laboratory tracks trends in both performance and control limits by the use of control charts. The laboratory's compliance with these requirements is confirmed as part of an annual laboratory audit. Similar procedures are followed in order to generate acceptance criteria for precision measurements.

[g]*Industrial Sites Quality Assurance Project Plan* (DOE/NV, 1996)

[h]EPA Contract Laboratory Program Statement of Work for Inorganic Analysis (EPA, 1988a; 1993; and 1994a)

[i]RCRA Regulations and Keyword Index, 1998 Edition

[j]Isotopic minimum detectable concentrations are defined during the DQO process and specified in the CAIP as applicable

[k]*Prescribed Procedures for Measurements of Radioactivity in Drinking Water* (EPA, 1980) or equivalent method

[l]*Environmental Measurements Laboratory Procedures Manual* (DOE, 1992) or equivalent method

[m]Isotope-Specific Minimum Reporting Limit to be specified in CAIP

[n]The Radiochemistry of Plutonium (Coleman, 1965) or equivalent method

[o]*Separation and Preconcentration of Actinides from Acidic Media by Extraction Chromatography* (Horwitz, 1993) or equivalent method

[p]The Nevada Test Site Performance Objective Criteria requirement for certifying that hazardous waste has no added radioactivity requires that the total plutonium (the sum of the Pu-238, 239, 240 concentrations) not exceed 0.5 pCi/g (BN, 1995)

[q]The Radiochemistry of Uranium (Grindler, 1962) or equivalent method

[r]*Separation and Preconcentration of Uranium from Acidic Media by Extraction Chromatography* (Horwitz, 1992) or equivalent method

[s]Standard Methods for the Examination of Water and Waste Water (APHA, 1992) or equivalent method

[t] 40 CFR 141.16, Table A, "Average Annual Concentrations Assumed to Produce a Total Body or Organ Dose of 4.0 mrem/yr" (CFR, 1976)

[u] Determination of Strontium-89 and -90 in soil with Total Sample Decomposition (Analytical Chemistry, 1979) or equivalent method

[v] The 1.0 pCi/g concentration is approximately twice the concentration of fallout Sr-90 in background surface soils reported in the "Environmental Monitoring Report for the Proposed Ward Valley California Low-Level Radioactive Waste Facility" (Atlan-Tech, 1992)

Definitions:
µg/kg = Microgram(s) per kilogram
mg/kg = Milligram(s) per kilogram
pCi/L = Picocurie(s) per liter
mg/L = Milligram(s) per liter
pCi/g = Picocurie(s) per gram
µg/L = Microgram(s) per liter

C.1.0 References

APHA, see American Public Health Association.

American Public Health Association. 1992. *Standard Methods for the Examination of Water and Waste Water,* 18th Edition. Washington, DC.

Analytical Chemistry. 1979. *Determination of Strontium-89 and -90 in Soil with Total Sample Decomposition*, Martin 79. October.

Atlan-Tech. 1992. *Environmental Monitoring Report for the Proposed Ward Valley California Low-Level Radioactive Waste Facility.* Roswell, GA.

Bechtel Nevada. 1995. *Nevada Test Site Performance Objective for Certification of Nonradioactive Hazardous Waste*, Rev. 0. Las Vegas, NV.

Code of Federal Regulations. 1976. 40 CFR 141.16, Table A, "Average Annual Concentrations Assumed to Produce a Total Body or Organ Dose of 4 mrem/yr." Washington, DC: U.S. Government Printing Office.

Coleman, G.H. 1965. *The Radiochemistry of Plutonium*, NAS-NS-3058. Washington, DC: National Academy of Sciences.

Grindler, J.E. 1962. *The Radiochemistry of Uranium*, NAS-NS-3050. Washington, DC: National Academy of Science.

Horwitz. 1993. "Separation and Preconcentration of Actinides from Acidic Media by Extraction Chromatography." In *Analyticda Chimica Acta.*

Horwitz. 1992. "Separation and Preconcentration of Uranium from Acidic Media by Extraction Chromatography." In *Analyticda Chimica Acta.*

RCRA Regulations and Keyword Index. 1998. ISSN 1074-1364. New York, NY: Elsevier Science, Inc.

U.S. Department of Energy. 1992. *Environmental Measurements Laboratory Procedures Manual*, HASL-300, 27th Edition, Vol. 1. New York, NY.

U.S. Department of Energy, Nevada Operations Office. 1996. *Industrial Sites Quality Assurance Project Plan, Nevada Test Site, Nevada*, DOE/NV--372. Las Vegas, NV.

U.S. Environmental Protection Agency. 1996. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd Edition (which includes updates to 1986, 1992, and 1994 revisions), CD-ROM. Washington, DC.

U.S. Environmental Protection Agency. 1994a. *Contract Laboratory Program Statement of Work for Inorganic Analysis*, ILMO 4.0. Washington, DC.

U.S. Environmental Protection Agency. 1994b. *Contract Laboratory Program Statement of Work for Organic Analysis*, OLMO 3.1. Washington, DC.

U.S. Environmental Protection Agency. 1993. *Contract Laboratory Program Statement of Work for Inorganic Analysis*, ILMO 3.0. Washington, DC.

U.S. Environmental Protection Agency. 1991. *Contract Laboratory Program Statement of Work for Organic Analysis*, OLMO 1.8. Washington, DC.

U.S. Environmental Protection Agency. 1990. *Contract Laboratory Program Statement of Work for Organic Analysis*, 3/90. Washington, DC.

U.S. Environmental Protection Agency. 1988a. *Contract Laboratory Program Statement of Work for Inorganic Analysis, ILMO 3.0.* Washington, DC.

U.S. Environmental Protection Agency. 1988b. *Contract Laboratory Program Statement of Work for Organic Analysis*, 2/88. Washington, DC.

U.S. Environmental Protection Agency. 1980. *Prescribed Procedures for Measurements of Radioactivity in Drinking Water*, EPA-600/4-79-020. Washington, DC.

Appendix D

Radiological Survey Information

Radiation Survey Report for CAS 25-02-10 - 01/07/99, 2 pages (McCloskey, 1999)

E-mail regarding radiological survey performed at CAS 25-02-10 - 01/12/99, 1 page (Smith, 1999)

Memo from D. Cowser regarding a radiation survey performed at CAS 25-02-03 - 01/25/99, 1 page (Cowser, 1999)

Radiation Survey Report pertaining to radiation survey performed at CAS 25-02-03 - 01/20/99, 1 page (Colglazier, 1999)

Radiation Survey Report pertaining to a radiation survey of the vault interior at CAS 25-02-01 - 03/22/99, 1 page (McCloskey, 1999)

Bechtel Nevada

RADIATION SURVEY REPORT

Number A 09011 Page 1 of 1

RCT(S): McCloskey

SIGNATURE: [signature] DATE: 7-7-99

HEALTH PHYSICIST: O'Keefe

SUPERVISOR: Junio

EVENT/RWP NO.: NA

PROJECT/WORK ORDER: N/A

COUNTING EQUIPMENT USED IN COLUMN 1+2
INSTRUMENT: Tennelec NUMBER: 181856
ALPHA EFFICIENCY: 29.5% BETA EFFICIENCY: 42.5%
MDA: 9 dpm MDA: 20 dpm
CONVERSION FACTOR: 3.39 CONVERSION FACTOR: 2.36
COUNT TIME: 1 min

COUNTING EQUIPMENT USED IN COLUMN ~~2+4~~ 3+4
INSTRUMENT: Electra NUMBER: 1143
ALPHA EFFICIENCY / BETA EFFICIENCY / MDA / CONVERSION FACTOR / COUNT TIME: N/A

INSTRUMENT USED IN COLUMN — INSTRUMENT — NUMBER: N/A
INSTRUMENT USED IN COLUMN — INSTRUMENT — NUMBER: N/A
INSTRUMENT USED IN COLUMN — INSTRUMENT — NUMBER: N/A

ALL READINGS MEET UNRESTRICTED RELEASE LIMITS? ☒ YES ☐ NO

PURPOSE: Survey of pipes vicinity of CAU 135

TIME	DESCRIPTION OF SURVEY	No. of Points	COLUMN 1 α☒ β☐ γ☐ OTHER; UNIT dpm/100cm²; FIXED + REMOVE ☐ SWIPE ☒ N/A ☐	COLUMN 2 α☐ β☒ γ☐ OTHER; UNIT dpm/100cm²; FIXED + REMOVE ☐ SWIPE ☒ N/A ☐	COLUMN 3 α☒ β☐ γ☐ OTHER; UNIT dpm/100cm²; FIXED + REMOVE ☒ SWIPE ☐ N/A ☐	COLUMN 4 α☐ β☒ γ☐ OTHER; UNIT dpm/100cm²; FIXED + REMOVE ☒ SWIPE ☐ N/A ☐	COLUMN 5 α☐ β☐ γ☐ OTHER; UNIT; FIXED + REMOVE ☐ SWIPE ☐ N/A ☐
1430	BACKGROUND (Gross)	N/A	0	270	0	749	
1413	Pipes @ CAU 135	4	3.38	8.85	Ø	Ø	

WGT ITEM

COMMENTS:

FOLLOW UP REQUIRED? YES ☐ NO ☒

ALL READINGS ARE NOT ABOVE BACKGROUND UNLESS NOTED

DISTRIBUTION: Original - HPD Records Center M/S 450

THU JAN 7.1999
GROUP A A 23 SAMPLES

SN	TIME	COUNTS A	COUNTS B	CPM A	CPM B	A/0000.296	B/0000.418	HR:MIN:SEC
1	1.00	0	1	0.00	-2.30	0.00	-5.50	16:10:10
2	1.00	1	5	1.00	1.70	3.38	4.07	16:11:24
3	1.00	0	7	0.00	3.70	0.00	8.85	16:12:37
4	1.00	0	7	0.00	3.70	0.00	8.85	16:13:51

#	IDENTIFICATION	TIME	PST A	PST B	BKG A	BKG B	Ka	Kb
A	A 23 SAMPLES	1.00	9999999	9999999	0.00	3.30	0.296	0.418
B	A 23 SAMPLES	1.00	9999999	9999999	0.00	3.30	0.296	0.418
~~C~~	~~CHI-SQUARE~~	~~1.00~~	~~9999999~~	~~9999999~~	~~0.00~~	~~0.30~~	~~0.000~~	~~0.000~~
D	A 23 SAMPLES	1.00	999999	9999999	0.00	3.30	0.296	0.418
E	EFFICIENCY	10.00	9999999	9999999	0.00	0.00	0.000	0.000

Markowsky, Jodi

From: Jeff Smith [SMITHJL@bnsmtp.nv.doe.gov]
Sent: Tuesday, January 12, 1999 5:00 PM
To: BONNJF@bnsmtp.nv.doe.gov; COWSERDK@bnsmtp.nv.doe.gov; NACHTSJ@bnsmtp.nv.doe.gov; JMarkow_it@nv.doe.gov
Subject: CAU 135 DQO CAS 25-02-01

Jodie,

As you requested here is a brief summary of the information my RCT Jim McCloskey developed last Thursday afternoon (1/7/99):

In the area of the old above ground storage tank CAS 25-02-01 there are six cut-off pipes. Two of the pipes do not appear to associated with the AST (the piping is thin walled and the access was not sealed). Swipe samples were collected from these two pipes and no radiologic contamination was detected from these swipes.

The four remaining pipe openings were sealed (3 were welded shut and one was a bolted flange). Further investigation of these pipes would require additional planning and potentially a RWP and Hot Work Permit.

That is all of the information that we could obtain on short notice.

Jeff

Bechtel Nevada

Mailing address: P.O. Box 98521
Las Vegas, NV 89193-8521

Express mail only: 2621 Losee Road
North Las Vegas, NV 89030-4129

1300-DC-99-0045

January 25, 1999

J. L. Appenzeller-Wing, Project Manager
Environmental Restoration Division
DOE Nevada Operations Office
Post Office Box 98518
Las Vegas, NV 89193-8518

Subject: Contract No. DE-AC08-96NV11718
SUMMARY OF RADIATION SURVEY REPORT FOR CORRECTIVE ACTION SITE (CAS) 25-02-03: AREA 25 TEST CELL A COMPLEX, NEVADA TEST SITE
Project No. 04028

As requested by the Department of Energy in the Data Quality Objectives meeting on January 13, 1999, a radiological survey was completed at an underground vault located at Test Cell A. The vault is identified in the Federal Facility Agreement and Consent Order as CAS 25-02-03 and is part of Corrective Action Unit 135.

The radiological survey was completed on January 20 by using an Electra hand-held meter and collecting swipe samples. The Electra did not detect readings above background levels on the exterior vault surface or access manway. Swipe samples were collected from the interior vault flooring, piping, access ladder, and manway. The swipe sample results did not indicate elevated readings and were below the Nevada Test Site release limits of 20 disintegrations per minute (dpm) for alpha and 200 dpm for beta. The Radiation Survey Report is enclosed

Please contact Jeff Smith at 295-7775 if you should have any questions.

for D. K. Cowser, Program Manager
Environmental Restoration

JFB:cab
Subject Code: ENV 38

Enclosure: as stated

cc w/enc.
Correspondence Control, NLV008
EM Correspondence, NLV080
K. J. Cabble, DOE/NV, 505
A. M. Heidema, BN, NLV102
J. M. Markowski, IT, 439
S. J. Nacht, BN, NTS306
J. L. Smith, BN, NTS306

Bechtel Nevada

RADIATION SURVEY REPORT

Number A 03042 Page 1 of 1

RCT(S): Colglazier
SIGNATURE: [signature]
DATE: 1-20-99
HEALTH PHYSICIST: O Keefe
SUPERVISOR: Juno
EVENT/ RWP NO:
PROJECT / WORK ORDER: Test Cell A

COUNTING EQUIPMENT USED IN COLUMN 1-2		COUNTING EQUIPMENT USED IN COLUMN	
INSTRUMENT: Tennelec	NUMBER: 181556	INSTRUMENT: N/A	NUMBER:
ALPHA	BETA	ALPHA	BETA
EFFICIENCY: 7.8	EFFICIENCY: 41.8	EFFICIENCY:	EFFICIENCY:
MDA: 9	MDA: 21	MDA:	MDA:
CONVERSION FACTOR: —	CONVERSION FACTOR: —	CONVERSION FACTOR:	CONVERSION FACTOR:
COUNT TIME:	1 min	COUNT TIME:	

INSTRUMENT USED IN COLUMN: N/A (all instrument blocks marked N/A)

ALL READINGS MEET UNRESTRICTED RELEASE LIMITS? ☐ YES ☒ NO

PURPOSE: Contamination Survey of Vault at Test cell A

	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
	α☒ β☐ γ☐ OTHER	α☐ β☒ γ☐ OTHER	α☐ β☐ γ☐ OTHER	α☐ β☐ γ☐ OTHER	α☐ β☐ γ☐ OTHER
UNIT	dpm/100cm²	dpm/100cm²			
FIXED + REMOVE	☐	☐	☐	☐	☐
SWIPE	☒	☒	☐	☐	☐
N/A	☐	☐	☐	☐	☐

TIME	DESCRIPTION OF SURVEY	No. of Points	Column 1	Column 2	Column 3	Column 4	Column 5
N/A	**BACKGROUND** (Gross)	N/A	0.0	7.6			
1502	Vault	16	0.1	18.7			

N/A

COMMENTS: A [illegible] Survey was performed Around the Entry way using Electra #1143. All readings were background or Less α + β. Background = 1100 dpm α + β

FOLLOW UP REQUIRED? YES ☐ NO ☒

ALL READINGS ARE NET ABOVE BACKGROUND UNLESS NOTED

DISTRIBUTION: Original - HPD Records Center M/S 450
Copy - HPD CP6 672 File, M/S 450
Copy - Requesters Copy

Bechtel Nevada

RADIATION SURVEY REPORT

Number A 14644 Page 1 of 1

RCT(S): McCloskey

SIGNATURE: [signature] DATE: 3-22-99

HEALTH PHYSICIST: LYONS SUPERVISOR: JUNIO

EVENT/ RWP NO: BN 99065 PROJECT / WORK ORDER: CAU 135

COUNTING EQUIPMENT USED IN COLUMN 1+2		COUNTING EQUIPMENT USED IN COLUMN 3+4		INSTRUMENT USED IN COLUMN 5	INSTRUMENT USED IN COLUMN	INSTRUMENT USED IN COLUMN
INSTRUMENT: TENNELEC	NUMBER: 181F56	INSTRUMENT: ELECTRA	NUMBER: 1652	INSTRUMENT: BICRON NUMBER: 787	INSTRUMENT NUMBER: N/A	INSTRUMENT NUMBER: N/A
ALPHA	BETA	ALPHA	BETA	INSTRUMENT USED IN COLUMN: N/A	INSTRUMENT USED IN COLUMN	INSTRUMENT USED IN COLUMN
EFFICIENCY 29.7%	EFFICIENCY 43.1%	EFFICIENCY	EFFICIENCY	INSTRUMENT NUMBER	INSTRUMENT NUMBER	INSTRUMENT NUMBER
MDA 9 dpm	MDA 18 dpm	MDA N/A	MDA			
CONVERSION FACTOR 3.37	CONVERSION FACTOR 2.32	CONVERSION FACTOR	CONVERSION FACTOR			
COUNT TIME 1 MIN		COUNT TIME				

ALL READINGS MEET UNRESTRICTED RELEASE LIMITS? ☐ YES ☒ NO

PURPOSE: PERFOM PRE-WORK SURVEY INSIDE VAULT @ EMAD CAU-135

TIME	DESCRIPTION OF SURVEY	No. of Points	COLUMN 1 α☒ β☐ γ☐ OTHER; UNIT dpm/100 cm²; SWIPE ☒	COLUMN 2 α☐ β☒ γ☐ OTHER; UNIT dpm/100 cm²; SWIPE ☒	COLUMN 3 α☒ β☐ γ☐ OTHER; UNIT dpm/100 cm²; FIXED + REMOVE ☒	COLUMN 4 α☐ β☒ γ☐ OTHER; UNIT dpm/100 cm²; FIXED + REMOVE ☒	COLUMN 5 α☐ β☐ γ☒ OTHER; UNIT µrem; N/A ☒
1230	BACKGROUND (Gross)	N/A	0.0	4.9	0.0	5456	30
1614	SUMP PUMP	6	50.51	626.22	1800	18.5K	N/A
1618	SUMP BOTTOM	4	13.47	48.49	— 1	— 1	N/A
1635	NORTH TANK	14	13.47	64.73	0.0	516K	200
1648	SOUTH TANK	11	6.73	55.45	0.0	56K	800
1703	VAULT FLOOR	13	6.73	64.73	— 1	— 1	N/A
1712	MISC EQUIP: CAMERA, ELECTRA, LADDER, ROPE ETC.	8	6.73	9.05	0.0	0.0	N/A
1245	VAULT ER	N/A	N/A	N/A	N/A	N/A	100
	LAST ITEM						

COMMENTS: NOTE #1 - NO CONTACT READING BASED ON ELEVATED READINGS FROM TANKS ACCURACY OF CONTACT WOULD BE QUESTIONABLE

FOLLOW UP REQUIRED? YES ☒ NO ☐

ALL READINGS ARE NET ABOVE BACKGROUND UNLESS NOTED

DISTRIBUTION: Original - HPD Records Center M/S 450
Copy - HPD CP6-672 File, M/S 450
Copy - Requesters Copy

Appendix E

NDEP Document Review Sheet

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number: Draft Corrective Action Investigation Plan for Corrective Action Unit 135: Area 25 Underground Storage Tanks, Nevada test Site, Nevada	2. Document Date: February 1999
3. Revision Number: 0	4. Originator/Organization: IT Corporation
5. Responsible DOE/NV ERP Subproject Mgr.: Janet Appenzeller-Wing	6. Date Comments Due: March 25, 1999
7. Review Criteria:	
8. Reviewer/Organization/Phone No.: David P. Friedman, NDEP, 486-2850	9. Reviewer's Signature:

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
1. Executive Summary, Pg. ES-1, Line 16.		"*...No structures or media related to the sites are specified in the Federal Facilities Agreement and Consent Order...*" This statement is confusing and could potentially be misleading. The Deluge Valve Pit, as part of the cooling system for the dewars, is related to operation of the Test Cell A (TCA) facility. The TCA facility has structures listed in the FFACO. The former above ground storage tank, CAS 25-02-10, was moved to Test Cell C (TCC) and is now identified in the FFACO Appendix II as CAS 25-01-05 in CAU 168. NDEP recommends the sentence be deleted from the text.	The sentence was modified as follows: "Furthermore, there are no structures or media related to the sites (i.e. nearby exposed piping, the Pump House [Building 3116], Deluge Valve Pit #2) specified in the *Federal Facility Agreement and Consent Order*."	In Part
2. Executive Summary, Pg. ES-1, Line 21 .		"*...and tanks and ancillary piping removed...*" Clarify that only ancillary piping <u>exposed in the vault</u> will be removed.	Change made.	Yes
3. Executive Summary, Pg. ES-2, Line 4.		"*...no investigation will be conducted at these sites...*" Clarify that <u>no further</u> investigation will be required at these sites. Some investigation has already been performed including research of site processes and radiological swipe samples.	Change Made	Yes
4. Executive Summary, Pg. ES-2, Bullets Describing Conceptual Site Model.		NDEP believes a bullet identifying the E-MAD waste hold-up tanks and vault piping as potential sources of contaminants of potential concern (COPC) is valuable in this section, as the CAIP includes the removal of these facilities as a task in this investigation (see next comment).	The second bullet of the Conceptual Site Model was modified by adding the following sentence: "Contaminants of potential concern may be located inside the two tanks, on the vault wall surfaces, in the sump, and associated with any ancillary piping related to the tanks."	Yes

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
5. Executive Summary, Pg. ES-2, Bullets Describing Technical Approach.		NDEP believes a bullet citing the removal of the E-MAD waste hold-up tanks and vault piping is appropriate for completeness.	The following bullet was added to the beginning of the technical approach bullet list: “Tanks, ancillary piping inside the vault, and vault contents will be removed prior to the commencement of the investigation to reduce safety hazards for project employees.”	Yes
6. Section 1.2 Page 8, Scope		The CAIP work plan includes the radiological survey of the E-MAD holding tanks and vault piping exterior, the sampling of any liquids in the tanks (if present), and the removal of the tanks and piping from the site. NDEP believes a bullet should be added in this section citing these proposed tasks.	As stated in comment #5, a bullet was added to Section 1.2 reflecting the activities performed prior to the investigation. The tanks will be removed by Bechtel Nevada (BN) and characterized for disposal. A preliminary investigation of the vault and tanks performed by BN on 03/22/99, included a radiological survey of selected locations inside the vault and visual confirmation that the tanks do not contain liquids. A description of these activities was added to Section 2.5.2 of this CAIP and the radiological survey form was added as Appendix D.	Yes

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
7. Section 2.2.1, Page 11, Waste Holdup Tanks.		NDEP needs to know the planned disposition of the E-MAD waste drainage system not identified in the FFACO. This includes all parts of the drainage system outside of the waste holdup tanks and the radioactive leachfield (CAU 264 CAS 25-05-06). NDEP has identified six components of the waste drainage system not addressed by CAU 135 or CAU 264. The six components are as follows: the drain line from the E-MAD train decontamination pad (CAU 253 CAS 25-07-06) to Building 3900; the drain line from radioactive stack #1 and scrubber to Building 3900; the drain lines associated with trailers E-26321 and E-26428 to Building 3900; the drain line from radioactive stack #2 and scrubber to the waste holdup tank vault; Building 3900 interior drainage lines; and the 8" vitrified clay pipe and distribution box from the waste holdup tanks vault to the radioactive leachfield.	The Decontamination and Decommissioning (D&D) of the E-MAD Building (CAU 114) was removed from the FFACO list of sites because it is considered operational. The six components of the waste drainage system listed in the comment will be addressed as follows: **1)** Drain lines from the train decontamination pad (CAU 253, CAS 25-07-06) will be addressed with that CAU or will be addressed in the eventual D&D of the E-MAD Building (CAU 114). These pipes run from the pad to the connection with the radioactive drain system. The drain line contains an isolation valve that will be closed and welded shut by BN. This activity was added to Section 4.1. **2 and 4)** Based on a comment from BN, the scrubber is not radioactive and only contains radiation detectors. The word "radioactive" was deleted from Figures 1-3 and 2-1. The pipelines to the scrubbers have isolation valves and will be closed and welded shut by BN. This activity was added to Section 4.1. The actual pipe will be addressed in the eventual D&D of the E-MAD Buildng (CAU 114). **3)** The drain lines associated with trailers E-26321 and E-26428 will be grouted shut by BN. This activity was added to Section 4.1. Any exposed piping for the trailrs will be cut at ground surface by BN. The remainng piping will be addressed in the eventual D&D of the E-MAD Building (CAU 114). **5)** The interior drains inside Building 3900 will be addressed in the eventual D&D of the E-MAD Building (CAU 114). The process waste drains inside the E-MAD Building will be grouted shut by BN. This activity was added to Section 4.1. **6)** The clay pipeline and distribution box extending from the outside of the vault (CAS 25-02-01) to the radioactive leachfield (CAU 264, CAS 25-05-06) will be addressed during the investigation of the radioactive leachfield.	In Part

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
7. Section 2.2.1, Page 11, Waste Holdup Tanks (continued).			**** The components addressed above that will be addressed in CAU 114 were added to the D&D agenda per DOE Order 430.1A - Life Cycle Asset Management.**	
8. Section 2.2.2, Page 13, Deluge Valve Pit.		NDEP needs to know the planned disposition of the remaining portions of the dewar cooling system. NDEP has identified the following four components of the dewar cooling system not addressed by CAU 135: 50,000-gallon water storage tank; deluge valve pit #2; 10" main potable water line; and 6" branch potable water line to Dewar A and Dewar B.	The four components of the dewar cooling system identified in the comment will be addressed under the D&D project for CAU 115 (Test Cell A). Related equipment for the Test Cell A Facility was included in CAU 115 per DOE Order 430.1A - Life Cycle Asset Management.	No changes made to document
9. Section 2.2.2, Page 15, Line 15.		"*...a manual flange valve...*" More accurately, this is a <u>flanged</u> manual valve; i.e., a flanged gate valve, flanged butterfly valve, flanged swing-check valve, etc.	Change made	Yes
10. Section 2.2.3, Page 16, Line 4.		Include the new CAS number as 25-01-05 in CAU 168. NDEP also believes this section should clearly state that it is concrete ringwall and asphalt pavement foundation and the associated piping exposed at the ground surface of the former AST that are being closed as part of CAU 135, CAS 25-02-10. As stated in the CAIP, there is a complex system of underground piping that delivered coolant to the reactor carts associated with the former AST and this piping has not been identified in the FFACO. NDEP needs to know the planned disposition of the piping and associated appurtenances of the reactor cart cooling system. More detailed research of the reactor cart coolant system and its operational process may be required to establish if any piping or related components are potentially contaminated.	The CAS number was added to sentence. The following sentence was added to the first paragraph of Section 2.2.3: "Corrective Action Site 25-02-10 consists of the concrete ringwall and asphalt foundation of the former AST as well as the associated exposed piping near the former location of the AST." The piping and appurtenances of the reactor cart cooling system will be addressed in the D&D of the Test Cell A Facility (CAU 115). All related equipment at the Test Cell A Facility will be addressed in CAU 115 per DOE Order 430.1A - Life Cycle Asset Management.	Yes
11. Section 3.1, Page 22, Bullets Describing Conceptual Site Model.		As stated previous, NDEP believes a bullet identifying E-MAD waste hold-up tanks and vault piping as potential sources of contaminants of potential concern (COPC) is pertinent to the conceptual site model.	The second bullet was modified the same as the bullet in comment response for Comment #4.	Yes
12. Section 3.3.1, Page 23, 1st Bullet.		State the temperature of the constant temperature water bath to be used.	Change made.	Yes

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
13. Section 4.1, Page 27, Field Activities Performed Prior to Investigation.		It is NDEP's understanding that the waste hold-up tanks exterior and vault piping surfaces will be surveyed for radiological contamination. It is appropriate this task be identified in this section.	BN performed a preliminary vault survey that consisted of a radiological survey of selected locations and a visual inspection of the tank interiors. Information on these activities was added to Section 2.5.2. A copy of the radiological survey form is included as an appendix to the CAIP. A statement was added to Section 4.1 reflecting this activity.	Yes
14. Section 4.4, Page 28, Radiological Survey.		The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) has not yet been agreed to by NDEP for use at the NTS. NDEP can not concur with this method until DOE establishes how MARSSIM integrates with other DOE radiological survey protocols.	The MARSSIM method was jointly accepted by DOE, EPA, DOD, and NRC as voluntary guidance for random sampling of large surface areas (i.e. floors, walls, surface soil at landfills). We have chosen MARSSIM for this investigation because it specifies a logical method for conducting a vault survey.	No changes made to document
15. Section 4.7, Page 30, Field Screening.		Describe the field screening method to be used for VOCs in more detail. Define if the screening samples are to be collected in air-tight containers and how long they are to be kept in the water bath. Also, define the temperature of the water bath and clearly state that these field screening samples will be collected as "splits" of the laboratory VOC samples. NDEP wants it clearly understood that the laboratory VOC samples will be collected in approved-glassware (preferably laboratory-supplied) and will be preserved at 4°C immediately after collection until analysis.	All activities conducted during this investigation will be performed according to ITLV procedures (i.e. sampling, sample maintenance, sample packaging and sample transport). NDEP has a controlled copy of these procedures at their office.	No changes made to document
16. Section 4.8, Page 30, Sampling Criteria.		It is stated in the CAIP that previous sampling efforts identified cobalt-60 and cesium-137 as COPCs in the holding tanks. Additionally, section 3.2 (page 23) identifies strontium-90 as a COPC and states that strontium-90 extraction will be an analysis performed. Verify that these COPCs will be properly analyzed for in the listed analytical constituents.	Strontium-90 was added as a bullet to the list of constituents in Section 4.8. Gamma spectroscopy will be used to identify gamma emitting radionuclides such as cobalt-60 and cesium-137. Strontium-90 is a beta emitter and requires a special analysis; this has been clarified in Sections 3.2 and 4.8.	Yes

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
17. Section 5.3.4, Page 35, Line15.		"*...containing IDW pending characterization will be marked...*" Add the Date of Accumulation to the required drum labeling.	The third sentence of paragraph 3 in Section 5.3.4 was modified as follows: "Drums containing IDW pending characterization which are managed in a HWAA will be marked with the date of accumulation and the words..." "Drums containing IDW pending characterization that are managed in a SAA will be marked with the words..." If the waste management for each waste stream is less than one-55 gallon drum or less than one quart of acute hazardous waste, then a Satellite Accumulation Area will be established and the date of accumulation is not necessary.	Yes
18. Appendix A, Section A.5.1, Page A-15, 1st Bullet.		*"...The two tanks and ancillary piping inside the vault will also be removed by BN prior to vault entry..."* Add that if liquid is discovered in the tanks, this liquid will be sampled and the tank and piping exterior will be surveyed for radiological contamination.	Liquids were not discovered in the tanks when BN went into the vault on 03/22/99. A discussion of this survey was added to Section 2.5.2.	In part
19. Appendix A, Section A.5.1, Page A-15, 9th Bullet.		*"...isotopic plutonium, and TCLP RCRA metals..."* Samples are to be submitted for Total RCRA metals and add analyses for strontium-90, cobalt-60, and cesium-137.	Change made.	Yes

[a] Comment Types: M = Mandatory, S = Suggested.

Return Document Review Sheets to DOE/NV Environmental Restoration Division, Attn: QAC, M/S 505.

Distribution

*Provide copy in distribution of Rev. 0 and subsequent revisions if applicable. Copies of only the NDEP-approved document will be distributed to others.

Paul J. Liebendorfer State of Nevada Bureau of Federal Facilities Division of Environmental Protection 333 W. Nye Lane, Room 138 Carson City, NV 89706-0851	2 (Controlled)*
Michael McKinnon State of Nevada Bureau of Federal Facilities Division of Environmental Protection 555 E. Washington, Suite 4300 Las Vegas, NV 89101	1 (Controlled)*
Sabrina Lawrence Environmental Restoration Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Controlled)*
Janet Appenzeller-Wing Environmental Restoration Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)*
Kevin Cabble Environmental Restoration Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)*
Steve Nacht Bechtel Nevada P.O. Box 98521, M/S NTS306 Las Vegas, NV 89193-8521	1 (Uncontrolled)*

Jeff Smith Bechtel Nevada P.O. Box 98521, M/S NTS306 Las Vegas, NV 89193-8521	1 (Uncontrolled)*
IT Corporation Central Files P.O. Box 93838 Las Vegas, NV 89193	1 (Uncontrolled)*
Jodi Markowsky SAIC P.O. Box 93838 Las Vegas, NV 89193	1 (Controlled)*
Mary Todd SAIC P.O. Box 93838 Las Vegas, NV 89193	1 (Uncontrolled)*
Technical Information Resource Center DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)
U.S. Department of Energy Office of Scientific and Technical Information P.O. Box 62 Oak Ridge, TN 37831	1 (Uncontrolled, electronic copy)
Manager Southern Nevada FFACO Public Reading Room P.O. Box 98521, M/S NLV040 Las Vegas, NV 89193-8521	1 (Controlled) 1 (Uncontrolled)
Manager Northern Nevada FFACO Public Reading Room c/o Rosa Silver IT Corporation P.O. Box 93838 Las Vegas, NV 89193	1 (Uncontrolled)

FFACO Public Reading Room Coordinator Rosa Silver IT Corporation P.O. Box 93838 Las Vegas, NV 89193	1 (Controlled)