Nevada
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DOE/NV-498
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Corrective Action Investigation
Plan for Corrective Action
Unit 342: Area 23 Mercury
Fire Training Pit
Nevada Test Site, Nevada

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March 1998

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**CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 342:
AREA 23 MERCURY FIRE TRAINING PIT
NEVADA TEST SITE, NEVADA**

DOE Nevada Operations Office
Las Vegas, Nevada

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**CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 342:
AREA 23 MERCURY FIRE TRAINING PIT
NEVADA TEST SITE, NEVADA**

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List of Acronyms and Abbreviations

AST	Aboveground storage tank
bgs	Below ground surface
BN	Bechtel Nevada
BTEX	Benzene
CADD	Corrective Action Decision Document
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
CFR	<i>Code of Federal Regulations</i>
COPC	Contaminants 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
DQO	Data quality objective(s)
EPA	U.S. Environmental Protection Agency
EQL	Estimated quantitation limit
FFACO	<i>Federal Facility Agreement and Consent Order</i>
ft	Foot (feet)
ft ³	Cubic foot (feet)
FTP	Fire Training Pit
gal	Gallon(s)
HASP	Health and Safety Plan
IDW	Investigation-derived waste
IT	IT Corporation
km	Kilometer(s)
L	Liter(s)

List of Acronyms and Abbreviations (Continued)

m	Meter(s)
m ³	Cubic meter(s)
mi	Mile(s)
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per liter
NAC	<i>Nevada Administrative Code</i>
NDEP	Nevada Department of Environmental Protection
NTS	Nevada Test Site
NTSWAC	Nevada Test Site Waste Acceptance Criteria
PCB	Polychlorinated biphenyls
POC	Performance Objective Criteria
PPE	Personal protective equipment
ppm	Parts per million
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	Quality control
RCRA	<i>Resource Conservation and Recovery Act</i>
SAIC	Science Applications International Corporation
SVOC	Semivolatile organic compound(s)
TCA	1,1,1-trichloroethane
TPH	Total petroleum hydrocarbon
VOC	Volatile organic compound(s)
µg/L	Microgram(s) per liter
UTM	Universal Transverse Mercator

Executive Summary

The Corrective Action Investigation Plan for Corrective Action Unit 342, Area 23 Mercury Fire Training Pit, 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 342 consists of a single Corrective Action Site, 23-56-01.

The Fire Training Pit was used from the early 1960s until the early 1990s for fire suppression training exercises. Fires were ignited using off-specification or rust-contaminated fuels; various fire-suppressant chemicals were used to extinguish the fires. The contaminants of potential concern consist mainly of hydrocarbons and possibly other volatile organic compounds, semivolatile organic compounds, metals, and polychlorinated biphenyls. In addition to regular training exercises, special burns were occasionally conducted to test cables or other materials. These special burns may have resulted in the release of other contaminants such as dioxins and furans.

Based on site history collected to support the Data Quality Objectives process, a conceptual site model for the Corrective Action Unit was developed as follows:

- Contaminants of potential concern are confined within the boundary of the study area as shown on Figure 1-2 of the Corrective Action Investigation Plan.
- Infiltration at the burn pit and the aboveground storage tanks was mainly vertical with minimal subsurface lateral spread.
- Infiltration in other areas of the site is limited vertically to near surface.
- Surficial areal extent of contaminants of potential concern is unknown within the study area because of insufficient documentation of burn locations and cleanup activities and because of potential redistribution associated with grading in the area.
- The total volume of hydrocarbon liquid discharged to the Fire Training Pit is unknown, but at least 136,000 liter (36,000 gallons) are estimated to have been used in training activities at the site. Unknown amounts of water and other fire suppressants were likely released at the Fire Training Pit.

- Groundwater impact is unlikely because depth to groundwater is extensive (greater than 240 meters [800 feet]), and the environmental conditions at the site (i.e., arid climate, high evapotranspiration rate, low permeabilities) are not conducive to downward migration.

A more detailed conceptual model is presented in Section 3.0 of the 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:

- A preliminary assessment of contaminant of potential concern distribution using a passive soil gas survey
- A surface and near-surface soil investigation using hand tools or hydraulic samplers
- A subsurface soil investigation using borings

Field-screening methods will be used to detect preliminary concentrations of volatile organics, radioactivity (not expected in this area), and total petroleum hydrocarbons. Samples will be collected for laboratory analysis and verification at each site. Additional sampling and analytical details are presented in Section 4.0 of the Corrective Action Investigation Plan. Details of the waste management strategy for the Corrective Action Unit are included in Section 5.0 of the 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. The 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 342, the Area 23 Mercury Fire Training Pit (FTP), which is located in Area 23 at the Nevada Test Site (NTS). The NTS is approximately 88 kilometers (km) (55 miles [mi]) northwest of Las Vegas, Nevada (Figure 1-1 and Figure 1-2). Corrective Action Unit 342 is comprised of CAS 23-56-01.

The FTP is an area approximately 100 meters (m) by 140 m (350 feet [ft] by 450 ft) located west of the town of Mercury, Nevada, which was used between approximately 1965 and 1990 to train fire-fighting personnel (REECo, 1991; Jacobson, 1991). The surface and subsurface soils in the FTP have likely been impacted by hydrocarbons and other contaminants of potential concern (COPC) associated with burn activities and training exercises in the area.

1.1 Purpose

This CAIP presents a plan to investigate the nature and extent of COPCs at the FTP. The purpose of the corrective action investigation described in this CAIP is to:

- Identify the presence and nature of COPCs at the FTP.
- Determine the vertical and lateral extent of COPCs at the CAS.

Figure 1-1
Nevada Test Site

Explanation

- Study area boundary
- Waste Management Area (proposed)

SCALE

Note: Surface features removed in March 1998

Figure 1-2
CAU 342, Area 23, Mercury Fire Training Pit

- Provide sufficient information and data to develop and evaluate appropriate corrective actions for the CAU.

This CAIP was developed using the U.S. Environmental Protection Agency (EPA) Data Quality Objectives (DQOs) (EPA, 1994) seven-step process to clearly define the goals for collecting and using environmental data and to design a data collection program that will satisfy these goals and 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. The DQOs are included in Appendix A.

1.2 Scope

The scope of this CAIP is to resolve the problem statement identified in the DQO process (see Appendix A) which is that significant volumes and concentrations of hydrocarbons, paints, and possibly other chemicals may have been released at the FTP and that existing data are insufficient to support selection of a corrective action for the CAU. Therefore, the scope of the corrective action investigation at the FTP includes the following elements to answer the problem statement:

- Conducting a passive soil gas survey to help identify areas of potential subsurface contamination
- Drilling boreholes using a suitable drilling method capable of reaching the expected vertical extent of COPCs, of penetrating potential subsurface geologic anomalies (e.g., caliche or gravel), and of providing suitable core for sample collection and logging of subsurface conditions
- Conducting continuous field screening to direct drilling and sampling activities and provide an initial assessment of subsurface impact
- Collecting surface and near-surface soil samples for laboratory analysis of environmental and geotechnical parameters
- Logging core to assess soil characteristics

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 FFACO (1996) requires that CAIPs address the following 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, 1994b), in the site-specific Field Management Plan (to be developed prior to field activities), and in Appendix B. The technical aspects of this CAIP are contained in Sections 3.0 and 4.0 of this document and in the DQO summary presented in Appendix A. General field and laboratory quality assurance and quality control (QA/QC) issues, including collection of QC samples, are presented in the *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 1996c); the methods for field QA/QC are discussed in approved procedures. The health and safety aspects of this project are documented in the *Environmental Restoration Project Health and Safety Plan* (HASP) (DOE/NV, 1996a) and will be supplemented with a site-specific HASP 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). Field sampling activities are discussed in Section 4.0 of this CAIP; 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, and Section 7.0 provides a list of project references.

2.0 Facility Description

2.1 Physical Setting

The FTP is located in Area 23 of the Nevada Test Site in Nye County, Nevada, west of the town of Mercury and just off the Mercury bypass highway. The site is approximately 146 m by 110 m (480 ft by 360 ft) and is partially fenced. The site is bounded on the east and west by washes and on the north and south by desert.

The FTP is located on an alluvial fan that slopes southwest from Red Mountain (carbonate rock) toward Mercury Valley. The elevation at the site is approximately 1,140 m (3,740 ft) above sea level (USGS, 1983a; USGS, 1983b). The depth to water below ground surface (bgs) is approximately 355 m (1165 ft) as measured in Well SM-23-1, the nearest well located approximately 1.6 km (1 mi) from the site.

The near-surface alluvium in Area 23 is composed of silty sands containing abundant gravel and cobbles. Some boulders, up to 1 m (3 ft) in diameter, have been noted (DOE/NV, 1997a).

Localized caliche development may be present in the near surface and is observed in the boreholes drilled to install neutron access tubes for monitoring moisture conditions at CAU 112, the Area 23 Hazardous Waste Trenches (REECo, 1993a; REECo, 1993b; DOE/NV, 1997b). These trenches are located approximately 0.8 km (0.5 mi) west-southwest of the FTP.

2.2 Operational History

The FTP was used for fire suppression training from the early 1960s until operations ended at the facility in 1992. The exact date of the initial FTP use is uncertain; however, interviews with site personnel suggested the initial start sometime between 1963 and 1965 (REECo, 1991; Jacobson, 1991). The FTP was used only occasionally from 1988 until 1992 and is currently inactive.

Fire training events were conducted on a monthly, and sometimes weekly, basis. Typical burn fuels included off-specification or rust and/or water-contaminated gasoline, diesel, and aviation fuel (JP-4). Paint from the paint shop was also burned at the site. In addition to regular fire

training exercises, special burn events were conducted as follows (REECo, 1991; Jacobson, 1991):

- In 1984, four tires were burned on two different occasions.
- In January, 1989, Los Alamos National Laboratory staff conducted a test burn of a 30-m by 40-m (100-ft by 130-ft) polyvinylchloride pond liner. The exact location of this burn event is unknown.
- Six cubic meters (m^3) (200 cubic feet [ft^3]) of Type "A," material (burnable material such as wood, paper, or cloth) was possibly burned at the FTP. No records were found indicating the exact materials or the date of the event.
- Lawrence Livermore Laboratory conducted a test burn of copper cable to determine the effects of fire on the cable insulation. Approximately 25 pieces of 3.7-m to 4.3-m (12-ft to 14-ft) long cable were burned.

The site was also used for training first responders in handling vehicle accidents and extraction equipment (such as the "jaws of life") was used on old cars and trucks.

2.3 Waste Inventory

Approximately 570 liters (L) (150 gallons [gal]) of fuel were used for each training event. In 1982, an air permit was issued for the burn activities. Based on records since the issuance of the permit, an estimated 38,600 L (10,200 gal) of fuel were burned at the FTP from 1982 to 1991 (REECo, 1991; Jacobson, 1991). Applying a similar rate of fuel consumption to the period prior to the permit (1963 to 1981), a total of approximately 136,000 L (36,000 gal) of fuel may have been used at the FTP. Because only part of the fuel was consumed during the burn, these fuels pooled on the ground surrounding the burn pit and eventually volatilized to the air or soaked into the soils.

Approximately 19 L to 38 L (5 gal to 10 gal) of paint were burned monthly at the FTP until sometime in the 1970s. Metals may have been associated with paints of this era.

Other burned materials included a polyvinyl chloride liner, tires, and laminating adhesive which may have released dioxins and furans during combustion. Some release of fluids associated with a bus and old cars and trucks may have occurred; however, the types and volumes are uncertain.

2.4 Release Information

The source of potential contamination at the FTP is hydrocarbons and other chemicals used in the fire training exercises. These chemicals were released directly to the soils at the FTP or to structures, such as the burn pit aboveground storage tank (AST) or wooden sheds, and subsequently released to the soils through spilling or incomplete burns. Other COPCs, such as dioxins and furans, would have been released through the actual burn process to the soils in the vicinity of the burn activities. The COPCs may have been redistributed across the surface of the FTP through regrading activities and potential cleanup activities. Subsurface COPCs would be a result of direct release of hydrocarbon fuels to the soil and subsequent vertical migration through natural processes or the application of water used during fire fighting exercises.

2.5 Investigative Background

Results from previous sampling events and a passive soil gas survey are discussed in the following subsections along with interim actions conducted at the FTP.

2.5.1 Previous Sampling Events

In 1996, Bechtel Nevada (BN) sampled the residual liquids in the storage ASTs (Schlick, 1997). In January of 1998, BN sampled the telephone poles and residual material in the burn pit AST. Constituents identified from the analysis of these samples are presented in Table 2-1.

Table 2-1
Constituents Identified in the AST Residual Fluids and the Telephone Poles

Volatile Organic Compounds	Semivolatile Organic Compounds	Total Petroleum Hydrocarbons	Total Metals
toluene ethyl benzene xylene acetone 2-butanone benzene 1,4-dichlorobenzene	2-methylnapthalene napthalene phenanthrene bis (2-ethylhexyl Phthalate)	gasoline diesel oil	lead cadmium

2.5.2 Passive Soil Gas Survey

Passive soil gas sampling was performed in December 1997 and January 1998 by IT Corporation to better define the geometry and extent of soil contamination. Sixty samplers were installed in holes from 0 m to 1 m (0 to 3 ft) below ground surface, as shown in Figure 2-1, on December 22 and 23, 1997. The samplers were collected on January 6, 1998. The samplers were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and TPH.

Data generated by the survey are qualitative only and, therefore, are only used for screening purposes. The results cannot be used to determine the concentrations of the compounds present in the soil. Results of the survey indicate the presence of total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, VOCs, and SVOCs at the site. The data were used to create plots of the compounds identified. These plots indicate the presence of several distinct plumes at the site.

One plume consisting of TPH and BTEX compounds is centered on the burn pit, as indicated in Figure 2-2. Additionally, trichloroethylene was identified in a pattern roughly matching that of the TPH and BTEX compounds. A second plume consisting of chlorinated hydrocarbons including 1,1,1-trichloroethane (TCA), 1,2-dichloroethane, chloroform, and 1,1-dichloroethene, appears to be centered approximately 38 m (125 ft) north east of the burn pit. A possible third plume consisting of TPH was identified along the western boundary of the study area (Figure 2-2). The data were not sufficient to indicate the center location of this plume.

The results of this study were used to guide the selection of borehole locations. Proposed borehole locations are shown in relation to the plumes in Figure 2-2 and will be discussed in greater detail in Section 4.0.

2.5.3 Interim Actions

Bechtel Nevada conducted interim actions at the FTP in 1997 and 1998 to remove surface structures prior to investigation activities. As stated in Section 2.5.1, the liquids in the ASTs were sampled; the tanks were steam-cleaned and removed for salvage or disposal. The telephone poles were sampled and removed for disposal. A bus, wooden sheds, and other debris were removed for salvage or disposal, as applicable.

Explanation

- Study area boundary
- - - Waste Management Area (proposed)
- 58 Planned passive soil gas monitor location

SCALE

Note: Surface features removed in March 1998

Figure 2-1
Passive Soil Gas Sample Locations

Explanation

- Shaded contours represent TCA plume (darker shading equals greater concentration)
- Contour lines represent total petroleum hydrocarbons (lines bound increasing concentrations)
- 22 Passive soil gas monitor location
- Proposed soil boring location
- ▲ Proposed step-out soil boring location

SCALE

Figure 2-2
Passive Soil Gas Plume Map with Proposed Soil Boring Locations

2.5.4 National Environmental Policy Act (NEPA) Requirements

Site investigation activities associated with CAU 342 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, 1996b).

3.0 Objectives

The DQOs are qualitative and quantitative statements that specify the quality of the data required to support potential courses of action for the FTP. The DQOs were developed to clearly define the purposes for which environmental data will be used and to design a data collection program that will satisfy these purposes. One element of the DQO process is the formulation of a site conceptual model.

3.1 Conceptual Site Model

The conceptual site model for the FTP developed in the DQO process is presented in Appendix A and is summarized as follows:

- COPCs are confined within the boundary of the study area as shown on Figure 1-2.
- Infiltration of COPCs from the burn pit is limited to a maximum depth of 45 m (150 ft) with the majority of the highest concentrations located in the upper soil zones.
- Infiltration of COPCs near the ASTs is limited to a maximum depth of 15 m (50 ft) because of lower assumed release volumes.
- Infiltration was mainly vertical with minimal lateral spread.
- Infiltration in other areas of the study area is limited vertically to near surface (see Table 3-1).
- The surficial areal extent of COPCs within the study area is unknown because of insufficient documentation of burn locations and cleanup activities and because of potential redistribution associated with grading in the area.
- The total volume of hydrocarbon liquid discharged to the FTP is unknown, but at least 136,000 L (36,000 gal) are estimated to have been used in training activities at the site. Unknown amounts of water and other fire suppressants were likely released at the FTP.
- Groundwater impact is unlikely because depth to groundwater is extensive (greater than 240 m [800 ft]), and the environmental conditions at the site (i.e., arid climate, low permeabilities) are not conducive to downward migration.

Table 3-1
Site Elements, Descriptions, Activities, and COPCs for the FTP
 (Page 1 of 3)

Site Element	Site Description	Site Activities	COPCs	Extent of COPCs
AST area	The site consists of two fueling cars and two ASTs with associated hoses for transferring fuels to the burn pit; there is staining in AST area and from the ASTs to burn pit; hydrocarbon odor is present.	The ASTs were used to store off-specification fuels for burn events associated with training; the nearby area was used for staging 55-gal drums prior to use of ASTs in 1982.	TPH VOCs SVOCs Metals	Potential surface contamination is evidenced by soil staining; potential deeper contamination is due to volume of liquids associated with tanks and potential spills in the area.
Burn area near bus	A large burn area is evident from historical photos; however, the stained area is no longer evident and may have been removed or covered over. No records indicate either action.	Area appears to have been the site of considerable burning as evidenced by charred debris; possibly is the site of burned wooden structures for fire suppression training; there is no indication of amount of fuels used.	TPH VOCs SVOCs Metals	The extent is uncertain; if sufficient fuels were used, there may be deeper potential for COPCs; surface and near-surface COPCs may have been addressed by removal or may have been distributed over a greater area through site grading and covering with clean fill.
Burn pit	This is a stained area with a charred AST resting within a slight surface depression; significant staining and hydrocarbon odor are present.	The pit was used to burn materials for fire training activities; the tank was used for containing and burning fuels, paints, etc.	TPH VOCs SVOCs Metals	Potential surface contamination is evidenced by soil staining; potential deeper contamination is due to release of significant volume of liquids associated with training exercises and the pooling of hydrocarbons at site associated with incomplete burn of fuels from training activities.

Table 3-1
Site Elements, Descriptions, Activities, and COPCs for the FTP
(Page 2 of 3)

Site Element	Site Description	Site Activities	COPCs	Extent of COPCs
Bus	The bus is overturned and there is no evidence of burning; bus brought to the FTP from the Burma Road Training Area.	The bus was brought to the FTP in late 1980s or early 1990s and was used for non-burn related training.	TPH VOCs Metals (All COPCs associated with liquids from hydraulic and engine components of the bus or from the bus batteries)	COPCs are limited to surface soils because of limited quantities of liquids; there is no driving force for deeper COPCs.
Cable racks	The cable racks are a series of fence-posts with U-shaped hangers and evidence of burning(s); burned cable pieces remain on the racks and the ground nearby.	The racks were used to test fire ratings for cables	TPH VOC SVOCs Metals Dioxin Furans PCBs	COPCs are thought to be limited to surface and near-surface based on limited number of cable burns; however, the method of ignition of the cables and amount of liquid fuels potentially used are unknown; if significant amounts of liquid fuels were used, COPCs may have been carried deeper into the subsurface.
Pallets and wood debris	The partially burned wooden pallets and other wooden debris are a recent addition to FTP; there is evidence of burning.	The pallets and wood debris were presumably used in fire-suppression training	TPH VOCs SVOCs Metals	COPCs are limited to surface and near-surface based on the partial charring of the pallets and limited evidence of soil staining.
Sheds	Two charred sheds approximately 5 ft by 10 ft, show evidence of burning; however, the buildings are still mainly intact.	The sheds were presumably used in fire-suppression training	TPH VOCs SVOCs Metals	The amount of fuel used (if any) to start fires at the shed is unknown; however, the extent is likely limited to the surface and near-surface.

Table 3-1
Site Elements, Descriptions, Activities, and COPCs for the FTP
 (Page 3 of 3)

Site Element	Site Description	Site Activities	COPCs	Extent of COPCs
Stained soil areas	There are several distinct stained areas; others may be present, but may be covered or redistributed through site grading. The stained areas are light to pale brown and dark brown to black in color with slight diesel/oil odor.	The stained soil areas are the result of spills and incomplete burns associated with training activities	TPH VOCs SVOCs Metals Dioxin Furans PCBs	The potential exists for deeper contamination because of the volume of fuels used at the site.
Telephone poles	The large pile of telephone poles appears to be very old and unusable; the origin is uncertain. There is some indication on one pole of wood preservative treatment; many are cut short and/or are splintered and decaying. A 55-gal drum is visible among the poles.	The poles have no identified purpose at the FTP; there is no evidence of burning	Metals SVOCs	COPCs are limited to surface and near-surface; no driving force exists other than natural precipitation events.
Tire burn area	Two partially burned tires are located northeast of the bus.	The tires may have been burned as part of training activities.	Dioxins Furans Metals, particularly arsenic and zinc PCBs	COPCs are limited to surface and near-surface; no driving force exists other than natural precipitation events. The area is limited to 4 tires based on process knowledge

AST - Aboveground storage tanks
 VOC - Volatile organic compound(s)
 SVOC - Semivolatile organic compound(s)
 FTP - Fire training pit
 PCB - Polychlorinated biphenyls

- Based on the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996b) and the *Record of Decision: Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996e), the future land use of the FTP area ranges from support for short-term testing and experimentation to development of a solar energy power-generation station and light industry and commercial manufacturing.

3.2 Contaminants of Potential Concern

The COPCs for the FTP vary from area to area within the CAU based on the activities conducted there. Table 3-1 describes each area within the CAU, the activities contributing to the release of COPCs to the environment, and the expected or associated COPCs for that area.

3.3 Preliminary Action Levels

Preliminary action levels for both on-site field screening methods and off-site analytical methods will be used to determine the presence of contamination. The following action levels will be used for on-site field screening:

- Volatile organic compound headspace screening levels at 20 parts per million (ppm) or 2.5 times background, whichever is greater
- Total petroleum hydrocarbon field-screening results greater than 100 ppm
- Radiation (beta/gamma) screening above two times the established daily background

Concentrations exceeding field-screening preliminary action levels indicate contamination at that sample location. This information will be documented, and the investigation will continue to delineate the extent of the contamination. Field-screening results above preliminary action levels may also be used to select discretionary laboratory sample locations.

Off-site laboratory analytical results will be compared to the following preliminary action levels to evaluate the need for possible corrective actions:

- NDEP Corrective Action Regulations (NAC, 1996a)
- TPH concentrations above the TPH limit of 100 ppm per the *Nevada Administrative Code* (NAC) 445A.2272 (NAC, 1996a)

- Background concentrations of radioactive material or concentrations above those listed in the *Offsite Radiation Exposure Review Project, Phase II Soils Programs* report (McArthur and Miller, 1989)

The comparison of laboratory results to preliminary action levels will be discussed in the Corrective Action Decision Document (CADD). Laboratory results above preliminary action levels 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 presented 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 DQO results for the FTP indicated the need for both biased and random sampling to account for data gaps in the history and process knowledge of the site. Due to the potential for subsurface migration of COPCs, an investigation consisting of both surface and subsurface sampling was identified. The COPCs, analytical methods, and reporting limits prescribed through the DQO process are provided in Table 3-2.

The precision and accuracy requirements are those stated in the latest revision of the individual EPA SW-846 methods (EPA, 1996). Representativeness for the investigation and resulting data will be evaluated by confirming or refuting of the conceptual model.

Table 3-2
Laboratory Analytical Requirements

Analyte	Medium ^a	Analytical Method	Minimum Reporting Limit ^b	Precision (RPD)	Accuracy (%R)
Total VOCs	Water	8260 ^c	Analyte-specific estimated quantitation limits ^d	14	60 - 132
	Soil			24	59 - 172
Total SVOCs	Water	8270 ^c	Analyte-specific estimated quantitation limits ^d	50	5 - 230
	Soil			50	11 - 142
Total RCRA Metals					
Arsenic	Water	6010/7470 ^c	10 µg/L	20	75 - 125
Barium			200 µg/L		
Cadmium			5 µg/L		
Chromium			10 µg/L		
Lead			3 µg/L		
Mercury			0.2 µg/L		
Selenium			5 µg/L		
Silver			10µg/L		
Total RCRA Metals					
Arsenic	Soil	6010/7470 ^c	1 mg/kg	20	75 - 125
Barium			20 mg/kg		
Cadmium			0.5 mg/kg		
Chromium			1 mg/kg		
Lead			0.3 mg/kg		
Mercury			0.1 mg/kg		
Selenium			0.5 mg/kg		
Silver			1 mg/kg		
TPH	Water (gasoline)	8015 modified ^c	1 mg/L	20	25 - 145
	Water (diesel)		1 mg/L	20	25 - 145
	Soil (gasoline)		1 mg/kg	30	30 - 130
	Soil (diesel)		30 mg/kg	30	30 - 130
PCBs	Water	8080 ^c	Analyte specific estimated quantitation limit	30	8 - 160
	Soil			50	8 - 139
Polychlorinated Dioxins and Furans	Water	8290 ^c	1 µg/L	25	35 - 140
	Soil		1 µg/kg	25	35 - 140
Gamma-Emitting Radionuclides*	Water	EPA 901.1 ^f	20 pCi/L	20	80 - 120
	Soil	HASL 300, 4.5.2.3 ^f	0.2 pCi/g	20	80 - 120

*QC (water) samples are included in table

^bIndustrial Sites Quality Assurance Project Plan (DOE/NV, 1996c)

^cEPA Test Methods for Evaluating Solid Waste, 3rd Edition, Parts 1-4, SW-846 (EPA, 1996)

^dEstimated Quantitation Limit (EQL) as given in Method SW-846, U.S. EPA (EPA, 1996)

^ePrescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA, 1980)

^fEnvironmental Measurements Laboratory Procedures Manual, HASL-300, U.S. Department of Energy (DOE, 1992)

mg/kg - milligrams per kilogram

pCi/L - picocuries per liter

mg/L - milligrams per liter

pCi/g - picocuries per gram

µg/L - micrograms per liter

%R - percent recovery

RCRA - Resource Conservation and Recovery Act

RPD - relative percent difference

*Gamma Spectroscopy analysis will only be performed if field-screening levels indicated the presence of gamma-emitting radionuclides at levels greater than two times background.

4.0 Field Investigation

4.1 Technical Approach

The investigation for CAU 342 will consist of the following activities:

- Collecting a series of biased and random surface and near-surface samples to investigate the presence and extent of COPCs in the surface soils at the FTP
- Drilling a minimum of one borehole to investigate the presence and extent of subsurface COPCs at the burn pit.
- Drilling a minimum of one borehole at the center of the chlorinated hydrocarbon plume identified through the passive soil gas survey (Figure 2-1).
- Drilling a minimum of one borehole to investigate the presence and extent of COPCs at the historical burn area to the northwest.
- Drilling step-out borings at each of the three boring locations as needed to evaluate the lateral and vertical extent of COPCs

Field screening and environmental sampling will be conducted during the investigation, and the results will be used during the corrective action decision process. In the following sections, the elements of the field investigation are described in greater detail.

4.2 Surface and Near-Surface Sampling

Surface and near-surface samples will be collected from the FTP at both random and biased locations as shown on Figure 4-1. Biased samples will be collected at each of the potentially contaminated site elements and at noticeably stained soil locations. These samples will be analyzed for the parameters identified in Table 3-1 for the specific site. Random samples will be collected from the center of each grid cell as shown in Figure 4-1. The sample locations will be tracked by the grid cell alphanumeric x-y coordinates as shown in Figure 4-1. The random samples will be analyzed for the full suite of analytes listed in Table 3-2 with the exception of dioxans and furans. These will only be analyzed for at the locations designated in Table 3-2 and at ten percent of the random locations. If a random sample location coincides with a biased sample location, only one sample will be collected at that location and analyzed for the full suite

Explanation	
	Study area boundary
	Waste Management Area (proposed)
	Biased locations

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Note: Random samples at grid cell centers
 Surface features removed in March 1998

Figure 4-1
Proposed Surface and Near-Surface Soil Sampling Locations

of COPCs. Both surface and near-surface samples will be collected at each biased and random location. Surface samples will be collected from approximately 0 m to 0.15 m (0 ft to 0.5 ft); near-surface samples will be collected from approximately 0.6 m to 1.3 m (2 ft to 4 ft). Sample intervals may change depending on the nature of the soil at the surface location. Hand tools or hydraulic samplers (such as the Geoprobe) will be used to collect the surface and near-surface samples.

Surface samples will be field-screened for radiological contamination. Because the samples will be submitted for laboratory analysis, field screening for VOCs and TPH will not be conducted. Twenty-five percent of the samples will be analyzed using gamma spectroscopy as confirmatory sampling even though the FTP is not in known radiological area and radiological contamination is not expected.

4.3 Subsurface Sampling

Potential soil boings will be located as shown on Figure 2-1. Borings will be advanced in 1.5-m (5-ft) intervals starting from ground surface and will be continued until two consecutive, 1.5-m (5-ft) interval, non-detect field-screening readings are obtained for VOCs, TPH, and radionuclides (if above 15 m [50 ft] bgs). If two consecutive, 1.5-m (5-ft) interval, non-detect field screening readings are not obtained above a depth of 15 m (50 ft) bgs, field-screening will then be increased to 3-m (10-ft) intervals below 15 m (50 ft) bgs, and drilling will continue until two consecutive, non-detect field-screening readings are obtained. The drilling rig will be capable of drilling at least 45 m (150 ft). If COPCs are encountered at the maximum attainable depth of the drilling rig, the investigation will be suspended, and NDEP will be notified at that time.

If COPCs above the field-screening preliminary action levels (Section 3.3) are identified during advancement of the initial borings, then step-out borings will be advanced to evaluate the extent of lateral and vertical contaminant migration as shown on Figure 2-1. The location and depth of the proposed step-out borings will be adjusted based on the initial boring screening results. Based on field screening results, additional step-outs (beyond the initial ones) may also be needed to delineate the plume boundaries. At a minimum, step-out borings will be advanced to match

depths of detectable concentrations (based on field screening readings above preliminary action levels) found in the initial (adjacent) borings.

Sonic drilling or another appropriate drilling method will be used to advance the boreholes. This drilling method will meet the following requirements:

- Permit drilling to the expected vertical limit of COPCs (45 m [150 ft])
- Limit the volume of investigation-derived waste (IDW)
- Provide a vertical profile of the subsurface materials via collection of continuous core
- Provide high quality, relatively undisturbed samples
- Allow reasonable drill rates and penetration of most types of materials that may be encountered subsurface (e.g., caliche)

4.3.1 Field Screening

The field-screening methods include headspace testing for VOCs using either a flame ionization detector or a photoionization detector, TPH screening using Hanby field testing kits (manufactured by Hanby Environmental Laboratory Procedures, Inc.), and radiological screening for alpha and beta/gamma emitters using an Electra instrument. This field-screening data will serve three purposes. First, the data will provide continuous, semiquantitative measurement of the subsurface environmental impact (provided sufficient material is available to conduct the tests) for site characterization. Second, the data will provide a mechanism for guiding the subsurface investigation deeper, if necessary. Third, the data will assist with the selection of samples submitted for laboratory analysis.

Field screening tests will be performed for all borings at 1.5-m (5-ft) intervals to approximately 15.2 m (50 ft) bgs. If drilling should need to continue past 15.2 m (50 ft) bgs, field screening will continue in 3.0-m (10-ft) intervals to total depth.

4.3.2 Sampling Criteria

Soil samples will be collected for laboratory analysis based on visual observations (e.g., areas of visible staining) and/or the results of field screening. In step-out borings (if performed), samples

will be collected for laboratory analysis from the highest field-screening interval and the lowest vertical, non-detect interval. If field screening does not detect any contamination in the step-out borings, a sample from the lowest interval will be submitted for confirmation of the non-detect field screening readings.

Proposed analytical parameters were selected based on process knowledge and requirements specified by the NDEP for waste characterization. The parameters, methods, and associated Quality Control (QC) ranges for precision and accuracy measurements are specified in Table 3-2. All laboratory samples from the proposed borings and step-outs, if required, will be analyzed for the following constituent lists:

- Total VOCs
- Total SVOCs
- Total *Resource Conservation and Recovery Act* (RCRA) metals
- TPH, gasoline, diesel, and oil fractions
- Polychlorinated biphenyls (PCBs)

Twenty-five percent of the samples will be submitted for gamma spectroscopy.

Soil samples will also be collected for evaluation of geotechnical parameters with regard to future corrective action strategies. The geotechnical analysis will be performed by an off-site, fixed-based laboratory for the parameters listed in Table 4-1. Analytical parameters and methods are presented in Table 3-2.

Soil samples will be collected from the bottom 0.6 m (2 ft) of each sample interval within the core barrel sampler. In general, the following sequence of sample collection will be used: the first two portions of the core will be retained for total VOCs and TPH-gasoline analysis, respectively. The next portion will be retained for VOC and TPH field screening. The fourth portion will be retained for total SVOCs, PCBs, TPH-diesel, and RCRA metals analyses. The fifth portion will be analyzed for gamma-emitting radionuclides, if necessary. The remaining core will be used for analysis of geotechnical parameters. Analytical samples will be submitted to the laboratory in brass sleeves and/or appropriate sample containers. The entire core will be field-screened for alpha and beta/gamma radiological contamination during sample aliquot collection.

Discretionary sampling points may also be selected for laboratory analysis based on a visual

Table 4-1
Geotechnical Analyses

Analysis	Method
Initial moisture content	ASTM ^a D 2216
Dry bulk density	EM ^b -1110-2-1906
Calculated porosity	EM-1110-2-1906
Saturated/unsaturated hydraulic conductivity	ASTM D 5084
Particle-size distribution	ASTM D 422
Water-release (moisture retention) curve	ASTM D 3152
Microbial activity	Laboratory specific

^aASTM, 1996

^bUSACE, 1970

examination by the site supervisor/geologist. Selection criteria for discretionary samples could include:

- Moist or discolored zones
- Significant changes in soil grain size
- Increases in odor

All equipment that contacts the soil will be decontaminated in accordance with contractor's written and approved procedures consistent with the DOE/NV Environmental Restoration Division Procedure ERD-05-701, "Sampling Equipment Decontamination," Rev. 0 (DOE/NV, 1994c), or as appropriate for special equipment being decontaminated (i.e., steam-cleaning core barrels).

Clean core barrels shall be used for each sampling event. This will minimize the potential for cross-contamination between sample locations. All samples collected for laboratory analysis will be aliquots of fresh media (rather than reusing the sample media used for screening). Records will be kept of the soil description, field screening measurements, and all other relevant data. All pertinent and required sampling information (i.e., date, time, sample interval) will be documented in accordance with the Industrial Sites QAPP (DOE/NV, 1996c). Approved Chain of Custody procedures (DOE/NV, 1994a) will be followed to ensure the defensibility of the data.

5.0 Waste Management

Management of IDW will be based on regulatory requirements, field screening and observations, and the results of laboratory analysis of the FTP study area samples. Administrative controls (decontamination procedures and the characterization strategy) will minimize waste generated during the investigation.

Solid materials other than soil wastes are hazardous or radioactive waste only by virtue of contact with contaminated media. The same is true of decontamination rinsate. Therefore, sampling and analysis of the IDW (other than soil from the borings), separate from site characterization analyses, will not be required. The data generated as a result of site characterization will be used to assign the appropriate waste type (i.e., ordinary, hydrocarbon, hazardous) to the IDW. Based on process knowledge and the previous sampling results, radioactive and mixed wastes are not anticipated at this site. The action levels for IDW contaminants are presented in Table 5-1.

Solid (sanitary), hydrocarbon, or hazardous waste, if generated, will be managed and disposed of in accordance with applicable U.S. Department of Energy (DOE) Orders, U.S. Department of Transportation (DOT) requirements, RCRA regulations, agreements and permits between DOE and NDEP, and site-specific requirements. Decontamination activities will be performed according to approved procedures (e.g., DOE/NV, 1994c).

5.1 Waste Minimization

Corrective action investigation activities have been planned to minimize the amount of IDW generated. Borehole or soil waste that does not require management as radioactive or RCRA-regulated waste will be disposed of as ordinary waste. Other waste, such as disposable sampling and personal protective equipment (PPE), will be segregated to the greatest extent possible to avoid generation of hazardous, radioactive, or mixed waste. Hazardous materials will be controlled, minimizing generation of hazardous or mixed waste.

**Table 5-1
 Action Levels for Investigation-Derived Contaminants**

Parameter	Action Level	Source	Comments
TPH ^a	100 mg/kg ^b	NAC ^c 459.9973	Regulated by the NDEP ^d
TCLP or Total VOCs ^e , SVOCs ^f , and RCRA ^g metals	Table 1 of 40 CFR 261.24	40 CFR ^h 261 ⁱ	-----
Total Polychlorinated Biphenyls (PCBs)	50 ppm	40 CFR 761.1(b) ^j NAC 444.940 to 444.9555 ^k	NDEP requires manifesting as hazardous waste for shipping and disposal purposes
Radiological	Isotope-specific	NTS POC ^j	-----

^aTotal Petroleum Hydrocarbons

^bMilligram(s) per kilogram

^cNevada Administrative Code (NAC), 1996b

^dNevada Division of Environmental Protection

^eVolatile Organic Compound(s)

^fSemivolatile Organic Compound(s)

^gResource Conservation and Recovery Act

^hCode of Federal Regulationsⁱ (CFR, 1996a)

ⁱNevada Test Site Performance Objective Criteria (POC) for Certification of Nonradioactive Hazardous Waste (BN, 1995)

^jCode of Federal Regulations (CFR, 1996c)

^kNevada Administrative Code (NAC, 1990)

5.2 Potential Waste Streams

Process knowledge indicates that hydrocarbon waste and potentially other COPCs were released to the FTP. Radioactive or mixed wastes are not anticipated at this site. There is a potential that hydrocarbon, hazardous, and/or ordinary wastes will be generated during the field investigation activities. In addition, the reagents used in the TPH field-screening methods will produce small quantities of hazardous wastes.

5.3 Investigation-Derived Waste Management

Wastes generated during the investigation activities may include, but are not limited to, the following:

- Decontamination rinsate
- Contaminated disposable or reusable sampling equipment (such as plastic, paper, sample containers, aluminum foil, or hand augers)
- Personal protective equipment

- Soil, spent solvent, and rinsate contaminated by TPH field-screening activities
- PPE from TPH field-screening activities
- Potentially contaminated core material

For administrative purposes, the waste will be managed in at least three waste streams: soil, contaminated solid trash, and liquid wastes such as decontamination rinsate. Each waste stream will be segregated, and additional segregation may occur within each waste stream. For example, the soil waste and decontamination rinsate will be segregated.

Drill cuttings will be containerized in 55-gallon drums and managed as described in the following sections. Excess soil associated with surface and near-surface sampling will be minimized; any excess soil will be returned to the sample location and will be addressed through the CADD and corrective action process.

5.3.1 Sanitary Waste Management

Sanitary waste will be contained in plastic bags, dumpsters, or drums and transported to an NTS-managed or approved off-site sanitary waste landfill. Soils that are not regulated and meet the acceptance criteria for the NTS or approved off-site sanitary landfills will also be disposed of as sanitary waste.

5.3.2 Low-Level Waste Management

Radiological COPCs are not anticipated at the FTP. Radiological controls will not be instituted unless field-screening or laboratory analytical results exceed two times background level (see Sections 3.2 and 3.3). Low-level waste, if generated, will be managed in accordance with DOE Orders and the requirements of the Nevada Test Site Waste Acceptance Criteria (NTSWAC) (DOE/NV, 1996d). Investigation-derived waste such as PPE will be placed in plastic bags marked with the date and associated borehole and/or sample number. The bags will be placed in drums that meet DOT specifications as defined in CFR Title 49 Part 172 (CFR, 1997a) which will be properly labeled and locked or fitted with tamper-indicating devices. The drums will be staged at a designated Radioactive Materials Area pending disposal under NTSWAC requirements (DOE/NV, 1996d).

Low-level waste will be characterized in accordance with the requirements of the NTSWAC and the contractor-specific waste certification program plan and implementing procedures.

Characterization will be based on laboratory results, field screening, process knowledge, or a combination thereof.

5.3.3 Hazardous Waste Management

Suspected hazardous wastes will be managed in accordance with RCRA and State of Nevada hazardous waste management regulations, interpreted as follows. Suspected hazardous wastes will be placed in drums that meet DOT specifications as defined in 49 CFR 172 (CFR, 1997a) which will be locked or fitted with tamper-indicating devices. The containers shall be compatible with the waste in accordance with the requirements of 40 CFR 265.172 (CFR, 1996b).

Containers shall be handled and inspected in accordance with the requirements of 40 CFR 265.173 and 174, respectively (CFR, 1996b). Based on process knowledge, incompatible wastes shall be managed in accordance with 40 CFR 265.177 (CFR, 1996b) (i.e., shall not be placed in the same container), and they shall be separated so that in the event of a spill, leak, or release, incompatible wastes shall not contact one another. Wastes shall be containerized in a manner to comply with Subpart CC of 40 CFR 265 (CFR, 1996b).

Hazardous wastes shall be characterized in accordance with the requirements of 40 CFR 261 (CFR, 1996a). Characterization will be based on laboratory results, field-screening results, and process knowledge. Waste pending characterization will be marked with "Hazardous Waste Awaiting Analysis" until its regulatory status can be determined through evaluation of laboratory results. The determination of whether the waste is characteristic or listed will be based on 40 CFR 261, "Identification and Listing of Hazardous Wastes" (CFR, 1996a). Waste shall be traceable to its source and/or samples considered analogous to the waste (such as waste drill core associated with a sample). Traceability shall be maintained by numbering containers and keeping appropriate records that trace waste to samples, areas, or products. Process knowledge may be used to assist in making final hazardous waste determination. After receipt of analytical results, hazardous wastes, if identified, will be labeled and marked in accordance with the requirements of 40 CFR 262.32 (CFR, 1997b) and State of Nevada requirements such as writing the EPA Waste Code on the hazardous waste label.

Suspected hazardous wastes will be accumulated at the site of generation for less than 90 days in accordance with 40 CFR 262.34 (CFR, 1997b). Prior to 90 days after the accumulation start date as specified in 40 CFR 262.34(a) (CFR, 1997b) or generation of wastes in excess of quantity limits specified in 40 CFR 262.34(c)(1) (CFR, 1997b), the waste will be shipped to a permitted hazardous waste treatment, storage, or 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 262.11(b) (CFR, 1997b). The waste will be shipped by an appropriately licensed and permitted hazardous waste hauler. A Uniform Hazardous Waste Manifest shall be completed prior to shipping hazardous waste in accordance with the requirements of 40 CFR 262.20-23 (CFR, 1997b). A copy of the manifest shall be provided to the State of Nevada in accordance with state regulatory requirements.

5.3.4 Hydrocarbon Waste Management

Hydrocarbon waste such as contaminated soil containing more than 100 ppm TPH will be properly containerized in bags or drums and will be transported to an appropriately permitted hydrocarbon waste management facility after the waste is fully characterized. Hydrocarbon waste which has come in contact or has had the potential to contact radiologically contaminated media (e.g., cuttings) is to be considered radiological waste and managed in accordance with the handling procedures for low-level radiological waste (see Section 5.3.2).

5.3.5 Mixed Waste Management

Mixed waste, if generated, shall be managed in accordance with RCRA (40 CFR 262) (CFR, 1997b) and State of Nevada (NAC, 1990) regulations as well as DOE requirements for radioactive waste, 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 low-level radioactive waste does; therefore, traceability shall be documented as described in Section 5.5. 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 "Awaiting Analysis" stickers pending characterization and confirmation of its regulatory status. However, mixed waste shall be transported 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 NTS Area 5 Radioactive Waste Management Site. Mixed waste not meeting land disposal restrictions will remain in Area 5 and 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 June 1, 1998), the following is a tentative schedule of activities (in calendar days):

- Day 0: Preparation for field work will begin.
- Day 60: The field work, including field screening and sampling, will begin.
- Day 110: The field work will be completed, and samples will be shipped to the laboratory for analysis.
- Day 185: The quality-assured laboratory analytical sample data will be available for review.
- The FFACO date for the CADD is March 31, 1999.

The following information will be reported in the CADD:

- Introduction, including purpose, scope, and a discussion about the need for further action
- The results of the corrective action investigation
- A corrective measures study, including initial screening of alternatives, evaluation of alternatives, and comparison of alternatives
- The recommended alternative

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.

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U.S. Department of Energy, Nevada Operations Office. 1997b. *Corrective Action Investigation Plan for Corrective Action Unit No. 423: Building 03-60 Underground Discharge Point, Tonopah Test Range, Nevada*, DOE/NV-487, Rev. 0. Las Vegas, NV: Environmental Restoration Division.

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- USGS, see U.S. Geological Survey.

Appendix A

Data Quality Objectives Process

A.1.0 Introduction

The Data Quality Objectives (DQO) process for the Area 23 Mercury Fire Training Pit (FTP), Corrective Action Unit (CAU) 342, was conducted to aid in the preparation of the Corrective Action Investigation Plan (CAIP). A series of meetings was held between the U.S. Department of Energy, Nevada Operations Office (DOE/NV); the State of Nevada Department of Environmental Protection (NDEP); and contractor personnel. An information and kickoff DQO meeting was held on August 26, 1997, to distribute site background and contamination information and to discuss and plan the elements of the CAU investigation. A site tour was conducted by the DQO participants on October 14, 1997. Table A.1-1 lists the DQO process participants and their roles. The DQO followed the U.S. Environmental Protection Agency's (EPA) *Guidance for the Data Quality Objectives Process* (EPA, 1994).

**Table A.1-1
Data Quality Objectives Process Participants and Roles**

Participant	Participant Role		
	Scoping Team Member	Core Decision Team Member	Primary Decision Maker
Janet Appenzeller-Wing, DOE/NV	X		X
Clayton Barrow, DOE/NV	X	X	X
Harry van Drielen, NDEP	X		
Dean Miereau, NDEP	X		
Kenneth Beach, IT ^a	X		
Robert Boehlecke, SAIC ^b	X		
Betty Bordelois, SAIC	X	X	
Syl Hersch, IT	X		
Mary Todd, SAIC	X	X	
Steve Mergenmeier, IT	X		
Jerry Bonn, BN	X	X	
Steve Nacht, BN	X		

^aIT Corporation

^bScience Applications International Corporation

The goal of the DQO process is to establish the quantity and quality of environmental data needed to support a decision on closure of the CAU. The process is intended to ensure that the information collected will provide sufficient and reliable information to identify, evaluate, and technically defend a corrective action.

The DQOs for site investigations were also developed to adhere to the precision, accuracy, representativeness, comparability, and completeness parameters, as discussed in the *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 1996b). The results of the DQO process, as provided in this summary, are the foundation of the CAIP.

The FTP is located at the Nevada Test Site (NTS) in Nye County, Nevada west of the town of Mercury, Nevada (see Figure 1-1 in the CAIP). The site is approximately 146 meters (m) by 110 m (480 feet [ft] by 360 ft) and is partially fenced (see Figure 1-2 in the CAIP). The site is bounded on the east by the Mercury bypass highway, on the west by a wash, and on the north and south by desert.

The CAU contains a single Corrective Action Site (CAS), 23-56-01. Within the CAU, discrete areas of potential contamination include the following (see Figure 1-2 in the CAIP):

- Burn pit
- Above-ground storage tanks (AST)
- Overturned bus
- Telephone poles
- Two partially-burned, wooden 2.4-m (8-ft) square structures
- Area containing burned tires
- Areas of stained soils
- Burn area to the northwest of the current bus location
- Cable burn area

The equipment and debris will be removed and properly disposed by Bechtel Nevada (BN) prior to investigation of the site per the approved *Housekeeping Category CAU Work Plan* (DOE/NV, 1996a).

Table 3-1 in the CAIP lists associated activities and possible contaminants of potential concern (COPCs) that may have been released as a result for fire training activities for each of these areas at the FTP.

A.2.0 Conceptual Model

A.2.1 Contaminants of Potential Concern

The COPCs vary by area within the FTP as described in Table 3-1 of the CAIP. This table also includes the rationale for these COPCs based on activities at the FTP. The following is the "full suite" list of possible COPCs for the FTP and the corresponding analytical method to be used for laboratory analysis:

- Total volatile organic compounds (VOCs) - EPA Method 8260 (EPA, 1996)
- Total semivolatile organic compounds (SVOCs) - EPA Method 8270 (EPA, 1996)
- Total RCRA metals - EPA Method 6010/7470 (EPA, 1996)
- TPH, gasoline, diesel, and oil fractions - EPA Method 8015 modified (EPA, 1996)
- PCBs - EPA Method 8080 (EPA, 1996)
- Dioxins and furans - EPA Method 8290 (EPA, 1996)
- Gamma spectroscopy - HASL-300 (DOE, 1992)

A.2.2 Conceptual Site Model

The conceptual site model for the FTP defines the expected nature and extent of contamination based on existing information as presented in the previous sections. The conceptual site model is the basis for identifying appropriate sampling strategy and data collection methods. The conceptual model is as follows:

- COPCs are confined within the boundary of the CAS.
- Infiltration of COPCs from the burn pit is limited to a maximum depth of 45 m (150 ft) with the majority of the highest concentrations located in the upper soil zones. Infiltration was mainly vertical with minimal lateral spread.
- Infiltration of COPCs near the ASTs is limited to a maximum depth of 15 m (50 ft) because of lower assumed release volumes.
- Infiltration in other areas of the CAS is limited vertically to near surface.

- Areal extent of COPCs is unknown within the FTP area because of insufficient documentation of burn locations and cleanup activities and because of potential redistribution associated with grading in the area.

A.2.3 Problem Statement

Significant volumes and concentrations of hydrocarbons, paints, and possibly other chemicals may have been released at the FTP as a result of required fire training exercises. These releases may have resulted in concentrations in surface and subsurface soils that exceed acceptable regulatory and risk-based levels; however, insufficient data exist to support a closure decision. The remainder of the DQO describes the decisions, inputs, decision rules, and decision errors identified to address this problem and the basis for designing a field investigation to resolve the problem statement and support evaluation of corrective actions at the site.

A.3.0 Decisions and Inputs

A.3.1 Decisions

Decisions to be resolved by the investigation are:

- Decide if COPCs are present at the FTP.
- Decide if COPC concentrations exceed regulatory standards.
- Decide if COPCs may pose an impact to groundwater.
- Decide if data are sufficient to support evaluation and selection of one of the following closure options at the site:
 - No further action
 - Closure in place
 - Clean closure through removal of contaminants

A.3.2 Inputs

Inputs to the decisions include those elements of information used to support the decisions in addressing the identified problem. Inputs are identified and discussed in Table A.3-1.

Because different activities took place at several locations within the FTP area, the list of analytes varies with location. The analytes identified in Table 3-1 of the CAIP will mainly be investigated at the individual site elements. However, because of limited process knowledge, random full suite analysis will be conducted for surface samples throughout the area as listed in Section 4.2 of the CAIP. Table 3-1 of the CAIP lists the analytes by site element for the FTP.

In addition to chemical analysis for COPCs, samples will be collected for geotechnical/hydrologic and other parameters as follows:

- Initial moisture content
- Dry bulk density
- Calculated porosity
- Saturated/unsaturated hydraulic conductivity

- Particle size distribution
- Moisture retention characteristics
- Microbial activity

Section 3.3 of the CAIP lists the field screening levels and the preliminary action levels for each of the anticipated COPCs or COPC groups. These levels will be used to correlate field data and laboratory results to identify concentrations exceeding action levels.

**Table A.3-1
Inputs and Input Sources**

Inputs	Source of Information
COPC Identification	Analyze soils by field screening and laboratory methods for COPCs as listed in Table 3-1 of the CAIP.
Action Level Exceedence	Compare detectable analytes to established regulatory limits as prescribed in Section 3.3 of the CAIP.
COPC Distribution	Collect random and biased samples from the surface and near-surface; collect biased subsurface samples; determine soil physical characteristics as described in Section A.3.2.
Risk Evaluation	Collect data of sufficient quantity and quality to support a risk evaluation and establishment of risk-based action levels based on Nevada Administrative Code 445A (NAC, 1996) and other risk assessment guidance.
Waste Management	Collect data to support waste management and disposal according to applicable standards as listed in Section 5.0 of the CAIP.
Potential Corrective Actions	Collect data of sufficient quantity and quality to support evaluation and justification of a preferred corrective action(s) at the site.

A.4.0 Study Boundaries

A.4.1 Geographical Boundaries

Geographical boundaries and the site study area are shown on Figure 1-2 of the CAIP. The study area boundary includes the following discreet activity areas associated with the investigation:

- Waste management area
- Decontamination areas for personnel and equipment
- Sample handling area
- Vehicle staging area
- Field-screening area

These activity areas will be contained within the footprint of the CAU and will be delineated in the field instructions prior to field work. The results of the passive soil gas survey or other preliminary assessment activities may be used to locate these areas appropriately.

A.4.2 Temporal Boundaries

Temporal boundaries for the FTP include the natural degradation of the organic compounds and the TPH. The concentrations of these COPCs are assumed to decrease over time. No additional COPCs are assumed at the site because operations have been halted, and access to the site is controlled by DOE/NV. Migration of COPCs is assumed to be limited because of the arid climate, the high evapotranspiration rate, low soil permeabilities, and the cessation of liquid release at the site associated with operations. The distribution of COPCs at the site is considered static.

A.4.3 Constraints on Data Collection

The investigation sampling activities are currently scheduled to be conducted early in 1998. Constraints on this schedule and the actual sampling activities include the following:

- Approval of the CAIP: this serves as the starting point for data collection activities, including preparation of site-specific health and safety plans and field instructions.
- Environmental concerns: evaluations for the presence of threatened and endangered species and cultural resources will be required prior to investigation activities.
- Radiological concerns: the current assumption is that no man-made radiological constituents are present at the site. Information contrary to this assumption would require reevaluation of the sampling strategy. An exception is the pile of telephone poles. Information collected during the preparation of the CAIP indicated some potential for radiological contamination of these poles; however, a survey conducted by Radiological Control of BN found no indication of radiological constituents. Samples will be collected and analyzed by BN prior to removal of the poles. Adjustments to the sampling plan may be necessary based on the results of that sampling.
- Heavy equipment and resource availability: the investigation will require procurement of a drilling subcontractor and coordination with other site activities to ensure availability of equipment and resources.
- Inclement weather: data will not be collected during periods of inclement weather that may impact health and safety, as detailed in the site-specific health and safety plan, or that may impact data quality.

A.5.0 Decision Rules

The decision rules are summary statements that specify the way data will be used to make the decisions. Data collected from the FTP field investigation will be evaluated and compared to both field and laboratory result preliminary action levels, as identified in Section 3.3 of the CAIP, to make the following decisions:

- Presence of COPCs
- Concentrations of COPCs
- COPC concentrations above preliminary action levels

The following decision rules will be used to guide the investigation and subsequent data evaluation.

- If, in the course of the investigation, either of the following occur, then the investigation will be halted and rescoped:
 - The conceptual model fails to such a degree that rescoping is required.
 - Sufficient data are collected to support evaluation of closure options.
- For the subsurface investigation, if field screening indicates no COPCs above field-screening preliminary action levels, then a sample at the next prescribed subsurface location will be field-screened. If no COPCs are indicated, a confirmatory laboratory sample will be collected, and the subsurface investigation will be halted for that boring.
- For the subsurface investigation, if field screening indicates the presence of COPCs above field-screening preliminary action levels, then the investigation will continue to determine extent of COPCs until two, consecutive samples field screening results below field screening preliminary action levels. Samples will be collected for laboratory analysis at those subsurface intervals that exceed field-screening preliminary action levels and as stated in the previous bulleted item.
- For surface and near-surface locations, where field screening indicates the presence of COPCs above preliminary action levels, a sample may be collected for laboratory analysis at the discretion of the site supervisor or geologist.

- If laboratory results indicate the presence of COPCs above preliminary action levels, then a Corrective Action Decision Document (CADD) will be prepared.
- If no COPCs are identified above preliminary action levels, then a CADD for CAUs with Contamination below Regulatory Limits 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.

A.6.0 Decision Error

Decision Error I is the overestimation of COPC concentration and extent resulting in extensive or unnecessary corrective actions. Decision Error II is the underestimation of COPC concentration and extent resulting in failure to adequately address the closure of the site in accordance with corrective action goals, risk standards, and *Federal Facility Agreement and Consent Order* (FFACO) requirements (FFACO, 1996).

The consequence of Decision Error I is the expense associated with the implementation of an unnecessary or overly extensive corrective action. The consequences of Decision Error II are as follows:

- The possibility of human exposure to COPCs above action levels with an associated unacceptable risk
- Insufficient corrective action to meet requirements under the FFACO

Decision Error II has the potential to expose workers or site visitors to possible unacceptable risks; however, the current configuration of the site poses little risk. Intrusive activities under the Decision Error II scenario could result in greater risks if COPC levels are underestimated. Because of the significant size of the site, overestimation of levels and extent of COPCs could significantly impact closure costs. In addition, biased sampling that targets the worst-case scenario, in comprehension with QC sampling, limits the likelihood of missing COPCs or underestimating concentrations.

A.7.0 Sampling Design

Based on the conceptual model of COPC distribution at the FTP, the following sampling design was decided during the DQO process as fulfilling the data needs for the CAU and addressing the problem statement:

- Conduct random and biased sampling during the field investigation to decide if COPCs are present, to decide the distribution of COPCs, and to decide if COPCs exceed preliminary action levels.
- Select preferential surface and near-surface sampling points at each of the site elements.
- Select random surface and near-surface sampling points within the FTP area to account for redistribution of COPCs associated with unknown past activities and regrading of the site.
- Select preferential surface sampling points in areas outside the FTP area with evidence of past burning in the form of charred material and/or debris.
- Select preferential subsurface sampling points at those site elements with the potential for deeper contamination as defined in Table 3-1.
- Select random subsurface sampling points within the FTP area to account for gaps in process knowledge. Conversely, use a preliminary assessment tool to assess potential deeper contamination and limit the subsurface sampling locations based on the preliminary assessment results.
- Conduct field screening for VOCs, TPH, and radiological constituents at all sample locations.
- Conduct laboratory analysis on select samples based on field-screening results and random selection.
- Conduct adequate QA/QC sampling to qualify all data.

A.8.0 References

DOE, see U.S. Department of Energy.

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

EPA, see U.S. Environmental Protection Agency.

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

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Appendix B

Project Organization

B.1.0 Project Organization

The DOE/NV Project Manager is Janet Appenzeller-Wing, telephone (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 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

Nevada Environmental Restoration Project Document Review Sheet

NEVADA ENVIRONMENTAL RESTORATION PROJECT

DOCUMENT REVIEW SHEET

(Page 1 of 3)

1. Document Title/Number <u>Corrective Action Investigation Plan for CAU 342: Area 23 Mercury Fire Training Pit</u>		2. Document Date <u>December 1997</u>		
3. Revision Number <u>Draft Rev. 0</u>		4. Originator/Organization <u>IT Corporation</u>		
5. Responsible DOE/NV ERP Subproject Mgr. <u>J. Appenzeller-Wing</u>		6. Date Comments Due		
7. Review Criteria				
8. Reviewer/Organization/Phone No. <u>NDEP</u>		9. Reviewer's Signature		
10. Comment Number/ Location	11. Type ^a	12. Comment	13. Comment Response	14. Accept
General Waste Management Comment, Section 5.0		<p>Based on the premise that the waste was generated at the time that the release occurred, the only new waste at the site is that which results from the investigation of the old (historic) waste. Thus the new waste is generated at the time of the investigation and should be subject to the regulatory controls for newly generated wastes.</p> <p>Therefore, management of wastes under the FFACO driven corrective actions can fall into 2 types: existing wastes which have already exceeded any 90 day storage limit; and wastes which have not. These existing or historic wastes probably violate several other regulations, such as nonconforming waste piles, nonconforming impoundments, and un-permitted disposal of solid waste, but that is essentially the raison d'etre for the Federal Facility Agreement and Consent Order.</p> <p>Therefore, management of wastes under the FFACO driven corrective actions can fall into 2 types: existing wastes which have already exceeded any 90 day storage limit; and wastes probably violate several other regulations, such as nonconforming waste piles, nonconforming impoundments, and un-permitted disposal of solid waste, but that is essentially</p>	<p>Based on the memorandum from Harry van Drielan to Donald Garrepy dated February 4, 1998 and paraphrased in the comment section of this response form, the waste management section was revised to account for changes in the management of investigation-derived waste. All waste generated from the investigation, such as personal protective equipment and rinsate, will be managed according to regulatory requirements, including the 90-day storage of newly generated waste. Borehole cuttings will be containerized, labeled as "Hazardous Waste Awaiting Analysis" and managed accordingly. Excess soil from surface and near-surface sampling will be minimized during sample collection; any excess soil will be returned to the sample location and will be addressed during the CADD and corrective action process.</p>	

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

(Page 2 of 3)

10. Comment Number/ Location	11. Type ^a	12. Comment	13. Comment Response	14. Accept
		<p>the raison d'etre for the Federal Facility Agreement and Consent Order.</p> <p>In the absence of documented characteristics or process knowledge, the regulatory program to which the historic waste is subject can not be determined with certainty. When the historic waste is characterized and the regulatory program specified, the newly generated wastes must comply with the conditions and limitation of the program, without delay. The historic waste, even that portion disturbed by the investigation, if determined to exhibit a characteristic that requires corrective action, can be effectively and more efficiently extracted, treated and disposed as provided by the corrective action plan.</p> <p>With regard to the CAIP for CAU 342, the waste is indeterminate and the waste is resident in the soil matrix. The newly generated wastes can be and should be containerized for management in accordance with the rules for 90 day storage pads. The historic waste (the possibly contaminated soils and associated debris) does not need to be containerized, although it is cautious to do so. Management of historic waste disturbed by taking of samples for characterization could be returned to the excavation or borehole, as close to the order in which it was extricated, and any excess kept as close as practical and protected from deflation and erosion. In returning the borehole cuttings to the borehole, space at the top should allow for a 1 foot plug of an expansive clay, a minimum temporary plug to avert rain water cascading down a patent borehole.</p>		

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET
(Page 3 of 3)

10. Comment Number/ Location	11. Type ^a	12. Comment	13. Comment Response	14. Accept
		Should the investigation result in a corrective action, the CAP must address the practical alternative and all of the contamination that is historic will be remediated in an approved manner.		

^aComment Types: M = Mandatory, S = Suggested.

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

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M98005239

Report Number (14) DOE/NV--498

Publ. Date (11) 199803

Sponsor Code (18) DOE/DP, XF

UC Category (19) UC-700, DOE/ER

19980622 063