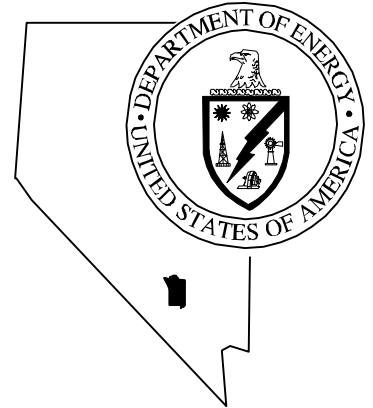


Nevada  
Environmental  
Restoration  
Project

DOE/NV--547



Corrective Action Investigation Plan  
for Corrective Action Unit 406: Area 3  
Building 03-74 & Building 03-58  
Underground Discharge Points and  
Corrective Action Unit 429: Area 3  
Building 03-55 & Area 9 Building 09-52  
Underground Discharge Points,  
Tonopah Test Range, Nevada

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**CORRECTIVE ACTION INVESTIGATION PLAN  
FOR CORRECTIVE ACTION UNIT 406: AREA 3  
BUILDING 03-74 & BUILDING 03-58  
UNDERGROUND DISCHARGE POINTS AND  
CORRECTIVE ACTION UNIT 429: AREA 3  
BUILDING 03-55 & AREA 9 BUILDING 09-52  
UNDERGROUND DISCHARGE POINTS,  
TONOPAH TEST RANGE, NEVADA**

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UNDERGROUND DISCHARGE POINTS,  
TONOPAH TEST RANGE, NEVADA**

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_

Janet Appenzeller-Wing, Project Manager  
Industrial Sites Project

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_

Runore C. Wycoff, Division Director  
Environmental Restoration Division

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## ***List of Acronyms and Abbreviations***

---

ALARA	As low as reasonably achievable
bgs	Below ground surface
BN	Bechtel Nevada
CADD	Corrective Action Decision Document
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site(s)
CAU	Corrective Action Unit
CFR	<i>Code of Federal Regulations</i>
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
DQO	Data Quality Objective(s)
EPA	U.S. Environmental Protection Agency
DU	Depleted uranium
EPA	U.S. Environmental Protection Agency
FFACO	<i>Federal Facility Agreement and Consent Order</i>
ft	Foot (feet)
gal	Gallon(s)
HASP	<i>Health and Safety Plan</i>
HWAA	Hazardous waste accumulation area
IDW	Investigation-derived waste
in.	Inch(es)
IT	IT Corporation
km	Kilometer(s)

## ***List of Acronyms and Abbreviations (Continued)***

---

L	Liter(s)
LLW	Low-level radioactive waste
m	Meter(s)
mi	Mile(s)
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per liter
MARSSIM	<i>Multi-Agency Radiation Survey and Site Investigation Manual</i>
MS/MSD	Matrix Spike/matrix spike duplicate
NAC	<i>Nevada Administrative Code</i>
NaI	Sodium Iodide
NDEP	Nevada Division of Environmental Protection
NEPA	<i>National Environmental Policy Act</i>
NRC	U.S. Nuclear Regulatory Commission
NRS	Nevada Revised Statutes
NTSWAC	<i>Nevada Test Site Waste Acceptance Criteria</i>
PAL	Preliminary action levels
PCB	Polychlorinated biphenyl(s)
pCi/L	Picocurie(s) per liter
PPE	Personal protective equipment
ppm	Part(s) per million
PRG	Preliminary Remediation Goal(s)
QA/QC	Quality assurance/quality control
QAPP	<i>Quality Assurance Project Plan</i>
QC	Quality control
RCRA	<i>Resource Conservation and Recovery Act</i>
SNL	Sandia National Laboratories

## ***List of Acronyms and Abbreviations*** (Continued)

---

SSHASP	Site-specific health and safety plan
SVOC	Semivolatile organic compound(s)
TCLP	Toxicity Characteristic Leaching Procedure
TID	Tamper-indicating device(s)
TPH	Total petroleum hydrocarbon(s)
TTR	Tonopah Test Range
VOC	Volatile organic compound(s)
UDP	Underground discharge point
UPS	Uninterrupted power supply
XRF	X-ray fluorescence

## ***Executive Summary***

The Corrective Action Investigation Plan for Corrective Action Unit 406, Areas 3, 9 Buildings 03-74 & UPS Underground Discharge Points and Corrective Action Unit 429, Areas 3, 9 Photoprocessing Underground Discharge Points, has been developed in accordance with the *Federal Facility Agreement and Consent Order* 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 406 consists of two Corrective Action Sites: 03-51-002-0374, known as the Heavy Duty Shop Underground Discharge Point Sumps, and 03-51-003-0358, UPS Building Underground Discharge Point. Corrective Action Unit 429 also consists of two Corrective Action Sites: 03-51-001-0355, the Photo Shop Underground Discharge Point Drains, and 09-51-001-0952, Mobile Photographic Lab Underground Discharge Points.

Before the early 1990s, underground discharge points were used to dispose of effluent related to maintenance and photographic operations at the Tonopah Test Range. The underground discharge points are typically subgrade shallow dry wells or excavations filled with gravel. Effluent was discharged to the underground discharge points through drainage pipes and then allowed to percolate into the surrounding soil. Soils surrounding the underground discharge points have likely been impacted by wastewater containing chemicals associated with equipment maintenance operations (e.g., hydrocarbons or solvents) or photoprocessing operations (i.e., silver).

Based on site history collected to support the Data Quality Objectives process, contaminants of potential concern for Corrective Action Unit 406 are total petroleum hydrocarbons, volatile organic compounds, semivolatile organic compounds, polychlorinated biphenyls, and heavy metals. The contaminants of potential concern for Corrective Action Unit 429 are volatile organic compounds, semivolatile organic compounds, and *Resource Conservation and Recovery Act* metals. The generalized conceptual site model for both Corrective Action Units 406 and 429 is as follows:

- The volume and concentrations of the contaminants of potential concern are unknown but contamination is expected to be concentrated at the base of the underground discharge points, if present.
- Contaminants of potential concern, primarily in liquid form, were released to the underground discharge points. The effluent was mainly water with low concentrations of contaminants.

- The underground discharge points are no longer in service; however, Building 09-52 septic system is functional but abandoned.
- Contamination is not expected to extend laterally beyond 10 times the width of the underground discharge point.
- Vertical contamination is not expected to exceed three times the vertical dimension of the underground discharge point below the underground discharge point base. Migration is primarily gravity controlled, but geologic control at depth may influence or limit contaminant migration.
- Relatively low contaminant concentrations and volume, low mobility of constituents, and a lack of a driving force will limit the subsurface lateral and vertical migration of contaminants of potential concern.
- Arid climate limits infiltration, while high evapotranspiration rates restrict the mobility of contaminants of potential concern.
- Nearby utilities and buildings, adverse weather conditions, restricted access, and range activities may create practical and/or physical constraints to the field investigation.
- Potential exposures to personnel would be oral ingestion, inhalation, or dermal contact of contaminants of potential concern in the soil during subsurface investigation activities.

A more detailed conceptual site model is presented in [Section 3.0](#) of the investigation plan. The conceptual site model serves as the basis for the sampling strategy.

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

- Perform video surveys to determine location and condition of discharge pipes.
- Determine the locations of the underground discharge points using video surveys, utility location devices, and excavation, as necessary.
- Collect surface and near-surface samples using direct-push techniques at underground discharge point locations that may have discharged to the ground surface.
- Drill boreholes using a hollow-stem auger or other suitable method capable of reaching the expected vertical extent of contaminants of potential concern, penetrating potential leach rock materials (e.g., concrete or gravel) and providing suitable core for sample collection and logging of subsurface conditions.

- Conduct field screening to direct drilling and sampling activities and provide an initial assessment of surface and subsurface impact.
- Collect subsurface soil samples for field screening, laboratory analysis, and geotechnical and biological parameter analysis, as necessary.
- Log core to assess soil characteristics.

Field-screening methods will be used to compare concentrations to field screening levels of volatile organics, radioactivity, hydrocarbons, and silver. Samples will be collected for laboratory analysis from 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 Units 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. 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**

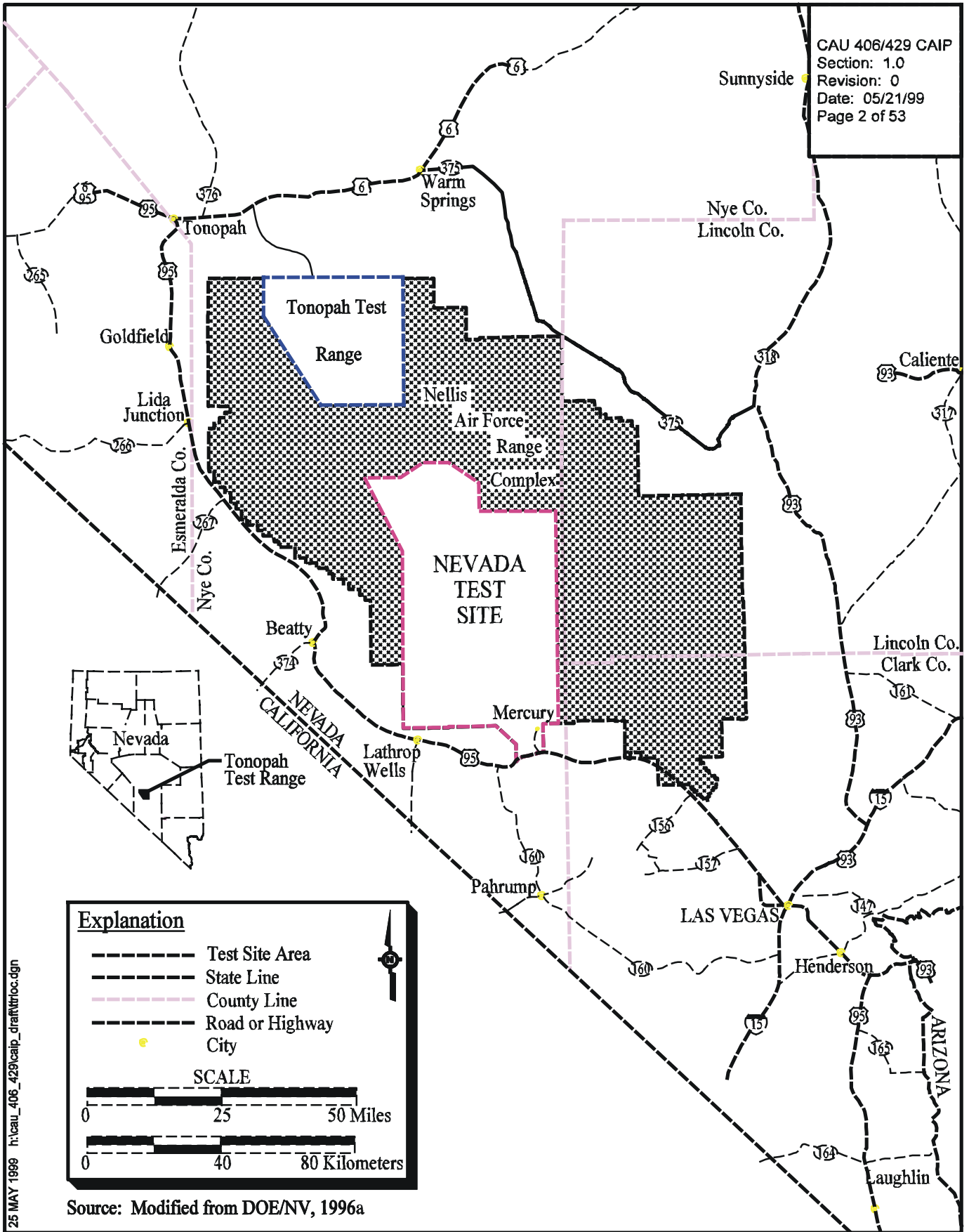
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This Corrective Action Investigation Plan (CAIP) has been developed in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the U.S. Department of Energy, Nevada Operations Office (DOE/NV); the State of Nevada 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 (1996), CASs are sites potentially requiring corrective action(s) and may include solid waste management units or individual disposal or release sites. 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 the Underground Discharge Points (UDPs) included in both CAU 406 and CAU 429. The CAUs are located in Area 3 and Area 9 of the Tonopah Test Range (TTR). The TTR, included in the Nellis Air Force Range, is approximately 255 kilometers (km) (140 miles [mi]) northwest of Las Vegas, Nevada ([Figure 1-1](#)).

Corrective Action Unit 406 is comprised of the Area 3 Heavy Duty Shop (Building 03-74) UDP (CAS 03-51-002-0374) and the Area 3 Uninterrupted Power Supply (UPS) Building UDPs (CAS 03-51-003-0358). Corrective Action Unit 429 is comprised of the Area 3 Photo Shop UDPs (CAS 03-51-001-0355) and the Area 9 Mobile Photographic Lab UDPs (CAS 09-51-001-0952) ([Figure 1-2](#)).

Before the early 1990s, UDPs were used to dispose of effluent related to maintenance and photographic operations at the TTR. The UDPs are typically subgrade shallow dry wells or excavations filled with gravel. Effluent was discharged to the UDPs through drainage pipes and then allowed to percolate into the surrounding soil. Soils surrounding the UDPs have likely been impacted by wastewater containing chemicals associated with the Heavy Duty Shop (e.g., hydrocarbons or solvents) and/or associated with photoprocessing operations (e.g., silver).



**Explanation**

- Test Site Area
- State Line
- County Line
- Road or Highway
- City

**SCALE**

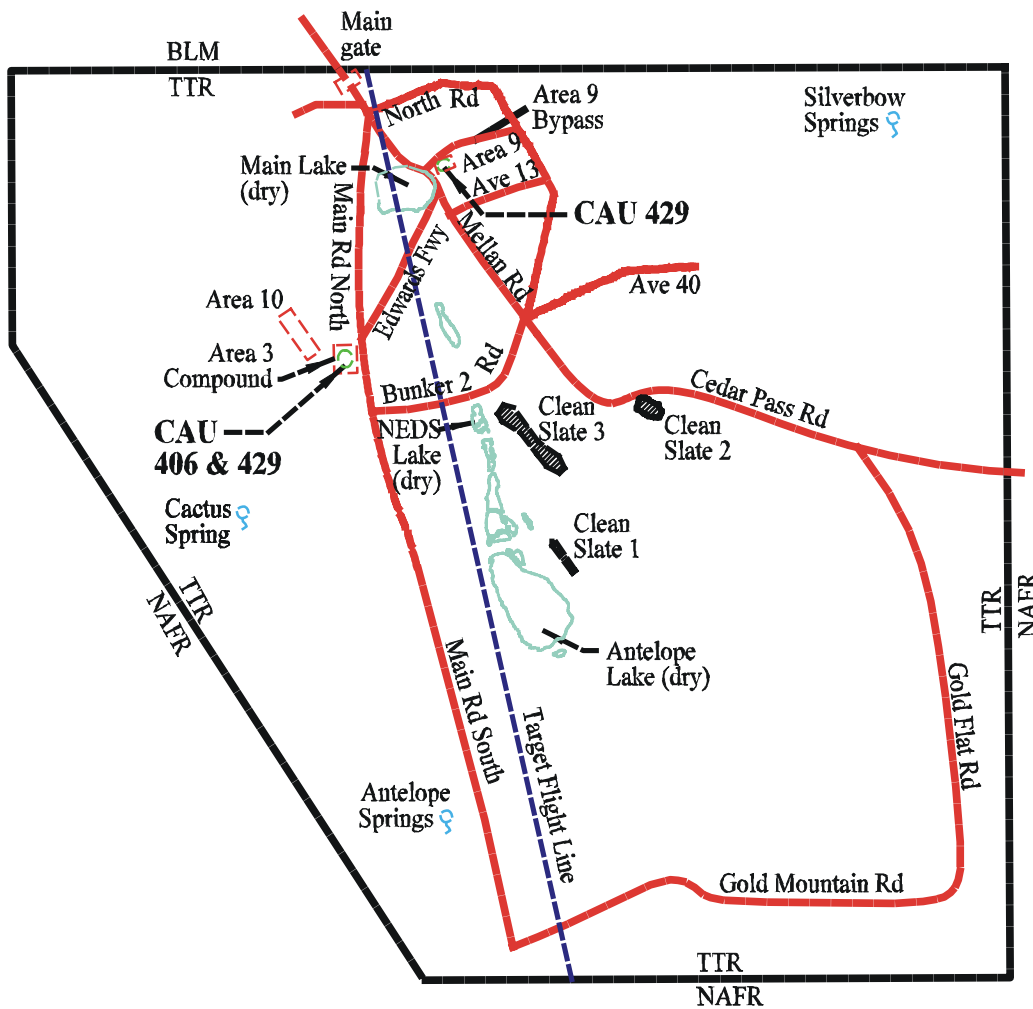
0 25 50 Miles

0 40 80 Kilometers

Source: Modified from DOE/NV, 1996a

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**Figure 1-1  
 Tonopah Test Range Location Map**



**Explanation**

- Tonopah Test Range boundary
- Primary roadway
- Area/gate
- Spring
- BLM Bureau of Land Management
- NAFR Nellis Air Force Range
- TTR Tonopah Test Range
- Operation Roller Coaster sites
- Approximate Location of CAU 406, 429

Scale

0 5 10 Miles  
0 8 16 Kilometers

25 MAY 1999 h:\cau\_406\_429\caip\_draft\area3loc.dgn

Source: Adapted from DOE/NV, 1996a

**Figure 1-2**  
**Location of Area 3 & Area 9, Tonopah Test Range**

## **1.1 Purpose**

The purpose of the corrective action investigation plan is as follows:

- Locate or verify the UDP locations.
- Determine the UDP configurations.
- Identify the presence and nature of the contaminants of potential concern (COPCs) within the UDP.
- Determine the vertical and lateral extent of COPC migration.
- Provide sufficient data to develop and evaluate appropriate corrective actions for each CAS.

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 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](#). A more detailed summary of the DQO process and results is included in [Appendix A](#).

## **1.2 Scope**

The scope of this CAIP is to resolve the problem statement identified in the DQO process, which states that potentially hazardous wastes were discharged to the UDP systems that comprise CAU 406 and CAU 429 and that existing information about the nature and extent of contamination is insufficient to evaluate and select preferred corrective actions for these sites (see [Appendix A](#)). Therefore, the scope of the corrective action investigation for CAU 406 and CAU 429 includes the following tasks:

- Determine the UDP locations using video survey, utility location devices, and excavation, as necessary.
- Evaluate the UDP construction and configuration.
- Collect surface and near-surface samples using direct-push techniques at UDP locations where discharge to the ground surface may have occurred.

- Drill boreholes using a hollow-stem auger or other suitable method capable of reaching the expected vertical extent of COPCs, penetrating potential leach rock materials (e.g., concrete or gravel), and providing suitable core for sample collection and logging of subsurface conditions.
- Conduct discrete field screening to direct drilling and sampling activities and provide an initial assessment of surface and subsurface impact.
- Collect subsurface soil samples for field screening, off-site laboratory analysis, geotechnical, and biological parameter analyses, as necessary.
- Log 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 remainder of the document details the investigation strategy and complies with FFAO (1996) requirements 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) and the site-specific Field Management Plan that will be developed prior to field activities. The technical aspects of this CAIP are contained in [Section 3.0](#) and [Section 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 quality control (QC) samples, are presented in the *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 1996c). In addition, the methods for field QA/QC are further discussed in approved procedures. Field activities will be performed according to the current version of the *Environmental Restoration Project Health and Safety Plan* (HASP) (DOE/NV, 1998), and the approved site-specific HASP (SSHASP) written prior to the start of field work. As required by the DOE Integrated Safety Management System, these

documents outline the requirements for protecting the health and safety of the workers and the public, and procedures for protection of the environment. 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](#), while [Section 7.0](#) provides a list of project references.

## **2.0 Facility Description**

---

Prior to the installation of a consolidated sewer system between the late 1980s to the early 1990s, seven UDPs at the TTR were used to dispose of effluent from maintenance buildings and photography shops. Corrective Action Unit 406 consists of three UDPs and their associated discharge systems:

- One Heavy Duty Maintenance Shop, Building 03-74 UDP
- Two Uninterrupted Power Supply Building 03-58 UDPs

Corrective Action Unit 429 consists of four photoshop UDPs and their associated distribution systems:

- Two Area 3 Photoshop, Building 03-55 UDPs
- Two Area 9 Mobile Photographic Laboratories UDPs

Process knowledge relating to TTR UDP site histories as examined during the DQO process ([Appendix A](#)). This information includes TTR reports describing previous field efforts and sampling results, historical aerial photographs, engineering drawings and site maps, and interviews with TTR personnel.

### **2.1 Physical Setting**

The Heavy Duty Maintenance Shop UDP is most likely located at the south end of the Area 3 West Gate culvert. The UPS UDPs are located in Area 3 approximately 3 meters (m) (10 feet [ft]) west of Building 03-58. The Area 3 Photoshop primary UDP is approximately 68 m (225 ft) south of Building 03-55. The secondary UDP is 9 m (30 ft) southeast of the primary UDP. The Area 9 Mobile Photographic Laboratories UDPs are located near the northeast corner of Building 09-52.

Surface soils around the UDP sites consist of sand, gravel, and cobbles with sparse vegetation. Overall topography slopes gently to the northwest with surface drainage generally flowing in the same direction for most of the Area 3 UDPs. A gentle southward sloping gradient near the Area 3 Photoshop UDPs may cause surface drainage flow to the southwest. Depth to ground water is estimated at 110 to 120 m (360 to 394 ft) below ground surface (bgs) at Area 3 and approximately

40 m (131 ft) bgs at Area 9. The groundwater flow direction is generally to the north-northwest at Area 3 and to the southwest at Area 9 (DOE/NV, 1996a).

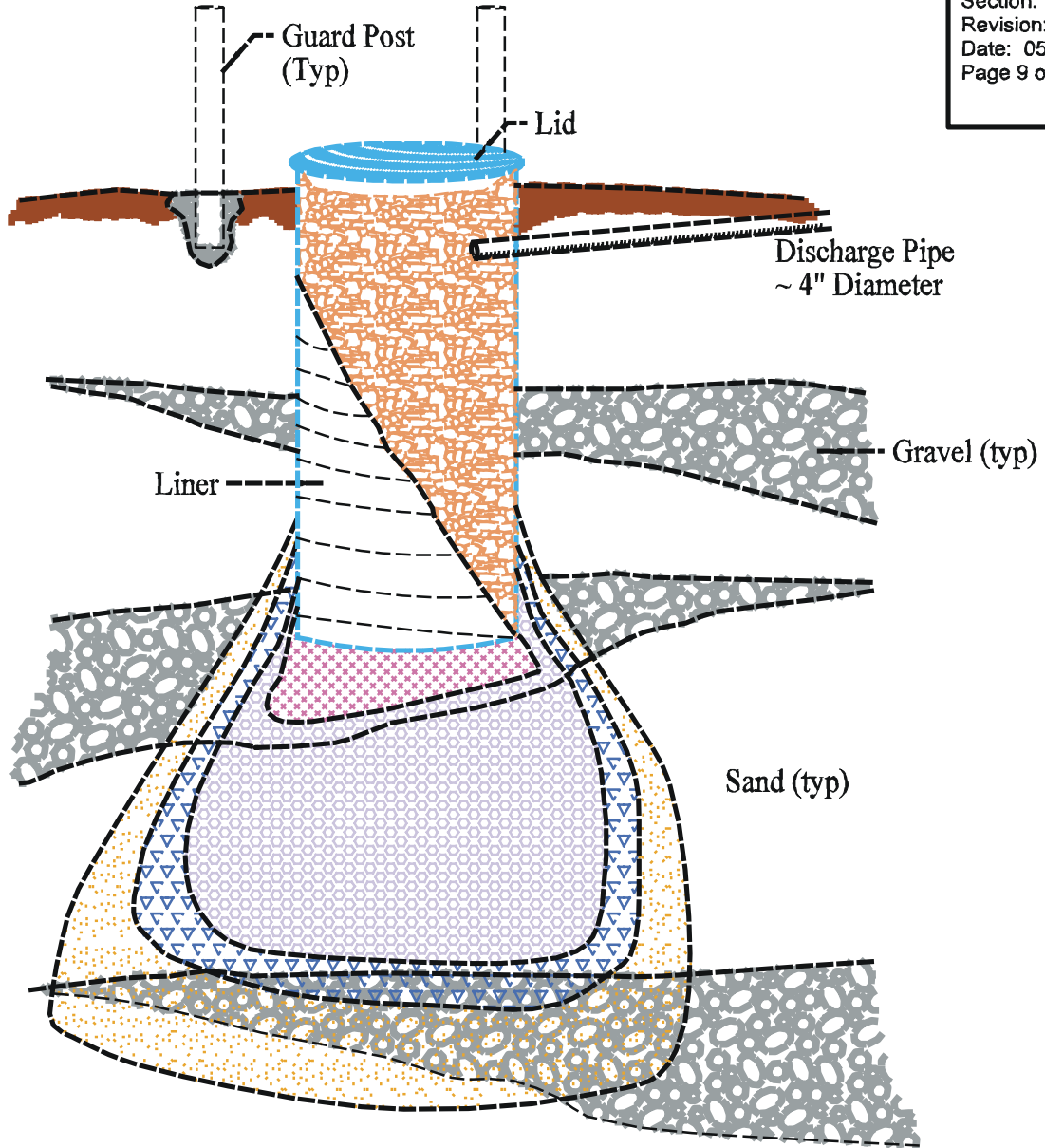
## **2.2 Operational History**

The exact UDP measurements and configurations are unknown for all four CASs. Typically, UDPs at the TTR were constructed by drilling a borehole about 1 m (3 ft) in diameter or by excavating a pit about 3 m (10 ft) deep. The UDP boreholes are usually lined with corrugated steel culvert pipe, steel drums, or other material. After drilling or excavation, the UDP is filled with gravel or other leach rock (e.g., concrete rip-rap). The gravel or leach rock may extend below the bottom of the UDP lining. The liquid waste percolated (or seeped) through the bottom of the UDP into the surrounding soil layers. A cross-sectional view of a typical UDP is shown in [Figure 2-1](#). Specific operational information and construction details for the CAU 406 and CAU 429 UDPs are described in the following sections.








### **2.2.1 Area 3 Heavy Duty Shop UDP**

The Area 3 Heavy Duty Shop, Building 03-74 was constructed and became operational between 1981 and 1983 and is currently used to service heavy equipment and generators. When the Heavy Duty Shop was constructed, the floor drains were connected to the drains from a Steam Cleaning Pad located west of the shop. The Steam Cleaning Pad was constructed during the late 1960s. Effluent from the Steam Cleaning Pad and Heavy Duty Shop was discharged via an underground pipeline to a UDP approximately 180 m (600 ft) northwest of the Heavy Duty Shop near the west gate entrance to the Area 3 Compound ([Figure 2-2](#)). Little information is known about the configuration of this UDP and the integrity of the pipeline. Interviews with former TTR employees suggest the UDP may have been a gravel-filled pit rather than a gravel-filled, lined, large-diameter boring.

The UDP frequently clogged and effluent would overflow onto the Steam Cleaning Pad and the floor of the Heavy Duty Shop. Interviews with former TTR workers indicate the gravel pit was excavated periodically when it became clogged with waste liquids. The resultant contaminated fill material was disposed of in nearby landfills. The use of the UDP was most likely discontinued between 1985 and 1988. However, during the period from 1985 to 1993, there is uncertainty whether the effluent continued to be discharged to this UDP or the nearby septic waste systems addressed as CAU 427.



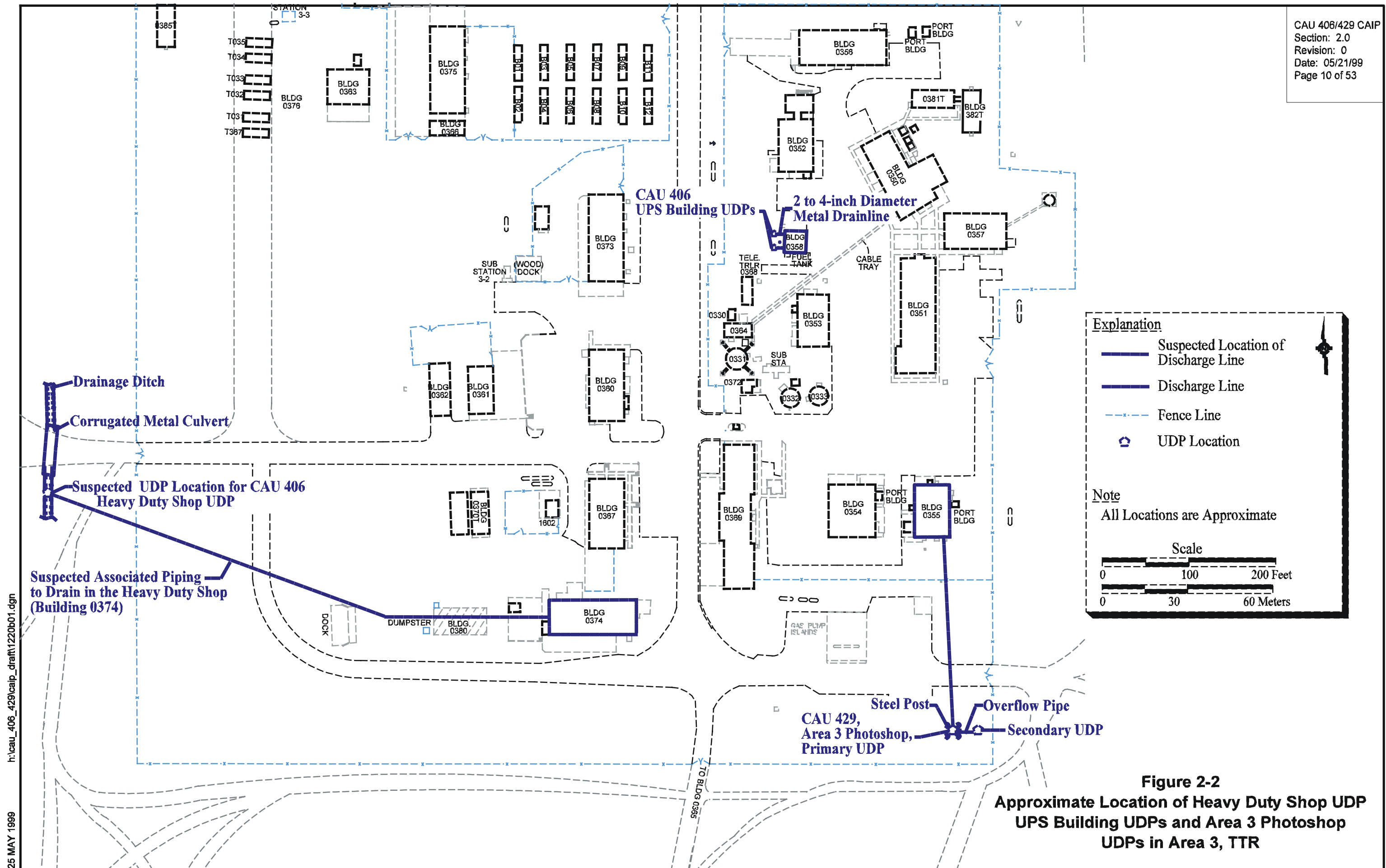
Explanation

- |   |   |   |                          |
|---|---|---|--------------------------|
|  | } Hypothesized Isopleths of Contaminant Concentration and Migration |  | Gravel                   |
|  |   |  | UDP Gravel Fill Material |
|  |   |  | Ground Surface           |
|  |   |   |                          |

Not to Scale

25 MAY 1999 h:\cau\_406\_429\caip\_draft\genudp.dgn

**Figure 2-1**  
**Cross-Sectional View of a Typical UDP Configuration**



**Figure 2-2**  
**Approximate Location of Heavy Duty Shop UDP**  
**UPS Building UDPs and Area 3 Photoshops**  
**UDPs in Area 3, TTR**

During the mid-to-late 1980s, the drain pipes from the Steam Cleaning Pad and the Heavy Duty Shop may have been disrupted or rerouted because of construction activities such as the installation of a water supply line and construction of the nearby Light Duty Shop (Building 03-80). Effluent from the Steam Cleaning Pad and the Heavy Duty Shop drains has been rerouted through an oil-water separator into the Area 3 Consolidated Waste System since about 1993.

The effluent discharged from the Steam Cleaning Pad and Heavy Duty Shop operations to the UDP consisted of water potentially containing petroleum products, hydraulic fluids, solvents, corrosives, *Resource Conservation and Recovery Act* (RCRA) metals, paint, soap, antifreeze, acetylene, and other chemicals associated with the Heavy Duty Shop and steam cleaning operations. Trucks that carried depleted uranium (DU) may have been washed at the Steam Cleaning Pad, introducing DU particles into the drain system and to the UDP (Karas, 1993; West, 1998); however, this practice is in question (Smith, 1998).

### **2.2.2 Area 3 Uninterrupted Power Supply Building UDPs**

The Area 3 UPS Building 03-58 and two UDPs were constructed in 1970. The UPS Building is used to store auxiliary generators to produce emergency power needed for essential electrical systems during power outages in the Area 3 Compound. The emergency power plan utilizes a battery back-up system and a diesel-generator system. No transformers are located in the UPS Building. Two generators located on the floor of the UPS Building may have leaked diesel fuel, motor oil, antifreeze, and possibly other constituents and subsequently discharged through drain gutters located beneath the generators (Quas, 1998). The drains discharged into two UDPs located about 3 m (10 ft) to the west of the UPS Building (see [Figure 2-2](#)).

The UDPs may be either subgrade gravel filled 55-gallon (gal) drums, or possibly unlined gravel pits with a diameter of approximately 1.2 m (4 ft). The depth of both UDPs are unknown. They are connected to the UPS Building by two underground 5 to 10-centimeter (cm) (2 to 4-inch [in.]) metal drain pipes. The exact locations of the drain pipes are not known and surface manifestations of the UDPs are no longer discernible. The UPS UDPs were in use until the late 1980s (Quas, 1998).

In July 1993, a diesel fuel spill from an aboveground fuel tank adjacent to the UPS Building resulted in contaminated soils in an area southwest of the supposed UDP locations. The contaminated soil

from this release was subsequently excavated and removed (DOE/NV, 1996a; Quas, 1993). Approximately 106 liters (L) (32 gal) of diesel fuel were released to the ground surface on January 16, 1998, when a float valve malfunctioned in the UPS Building. Contaminated soil from this release was excavated and removed from an area near the northwest corner of the building. However, some diesel-contaminated soil underneath the UPS Building was not removed; approximately 10 cubic yards of contaminated soil are estimated to remain under the foundation of the building (SNL, 1998). It is unknown if the removal of contaminated soil from historic surface spills near Building 03-58 resulted in the removal of the UDPs features.

At the present time, a 3,790-L (1,000-gal) aboveground diesel tank is located directly to the west of the building.

### **2.2.3 Area 3 Photoshop UDPs**

The Area 3 Photoshop Building 03-55 was completed in 1964 for setup, operation, and storage of camera equipment and for processing black and white and color negatives for photographs and films. Daily film processing operations produced liquid effluent that was discharged to a UDP approximately 68 m (225 ft) south of the Photoshop ([Figure 2-2](#)). The photoshop effluent most likely consisted of large amounts of water and low concentrations of photoprocessing waste, including silver nitrate, acids, caustics, corrosives, and solvents. The UDP was ultimately unable to accommodate the waste volume generated by the photoshop (as evidenced by overflow at the ground surface) and a second UDP was constructed approximately 9 m (30 ft) east of the initial UDP. The exact time period the photoshop discharged waste to the initial UDP is unknown, but discharges probably occurred from about 1964 to about 1989. The exact installation date for the secondary UDP is unknown, but installation occurred after 1964. Building 03-55 is still in use for camera maintenance and limited photoprocessing; however, in 1989 the effluent from the photoshop was rerouted to the Area 3 Consolidated Waste System and use of the UDPs was discontinued.

Both of the Area 3 Photoshop UDPs are cased with corrugated steel culvert pipe that measures approximately 1.2 m (4 ft) in diameter and extends approximately 3 m (10 ft) bgs. In 1993, the initial UDP culvert pipe was visible but badly corroded; the culvert pipe has since disintegrated. Currently, the soil around the initial UDP forms a surface depression and is surrounded by guard posts that

indicate the location of the UDP. The second UDP is marked by a culvert pipe that extends approximately 0.5 m (1.6 ft) above ground surface and is in good condition.

The peak discharge to the Photoshop UDPs was approximately 950,000 L (250,000 gal) per year (Phelan, 1988). Most of the effluent was water used for temperature control or film washing. A 1984 environmental audit reported that 1,730 L (457 gal) of waste chemicals were discharged to the Photoshop UDPs (Schirber, 1984). Sometime after 1987, a silver recovery system was installed on the Houston film processor inside the Photoshop; however, interviews indicate the recovery system was not well-maintained and silver often drained to the UDPs when the system was over-saturated.

#### **2.2.4 Area 9 Mobile Photographic Laboratory UDPs**

At Area 9, X-ray radiography was conducted at two on-site mobile photoprocessing laboratories installed near the Electronics Shop, Building 09-52. Radiography was frequently conducted to inspect the internal components of weapon test units. One of the mobile photoprocessing laboratories is Building 09-15 (a transportainer). The Building 09-15 transportainer was brought to Area 9 between 1982 and 1984. The second mobile photoprocessing laboratory, Trailer 927, was brought to Area 9 between 1984 and 1987 and abandoned in 1990. Both mobile photoprocessing laboratories produced comparatively small volumes of waste streams similar to the Area 3 Photoshop. Relatively large amounts of water and low concentrations of photoprocessing waste were discharged to the breather riser of the septic tank associated with the Building 09-52 septic system. This CAS is the only UDP site that has septic system components.

The Electronics Shop, Building 09-52 septic system includes a 2,840-L (750-gal) underground septic tank that is connected to two UDPs located approximately 7.5 m (25 ft) to the north (Figure 2-3). The UDPs are approximately 9 m (28 ft) apart. This septic system was built sometime after 1974 and was originally installed to serve only the restroom and breakroom of Building 09-52. The septic tank reportedly did not receive any industrial waste associated with test activities or processes within the electronics shop (Samuelson, 1998). The drains within the mobile photoprocessing laboratories were connected to the breather riser of the septic tank by aboveground drain pipes approximately 10-cm (4-in.) in diameter. Information has not been identified that indicates the drain pipes leading from the Building 09-52 restroom, Trailer 927, and the 09-15 transportainer building have been sealed to

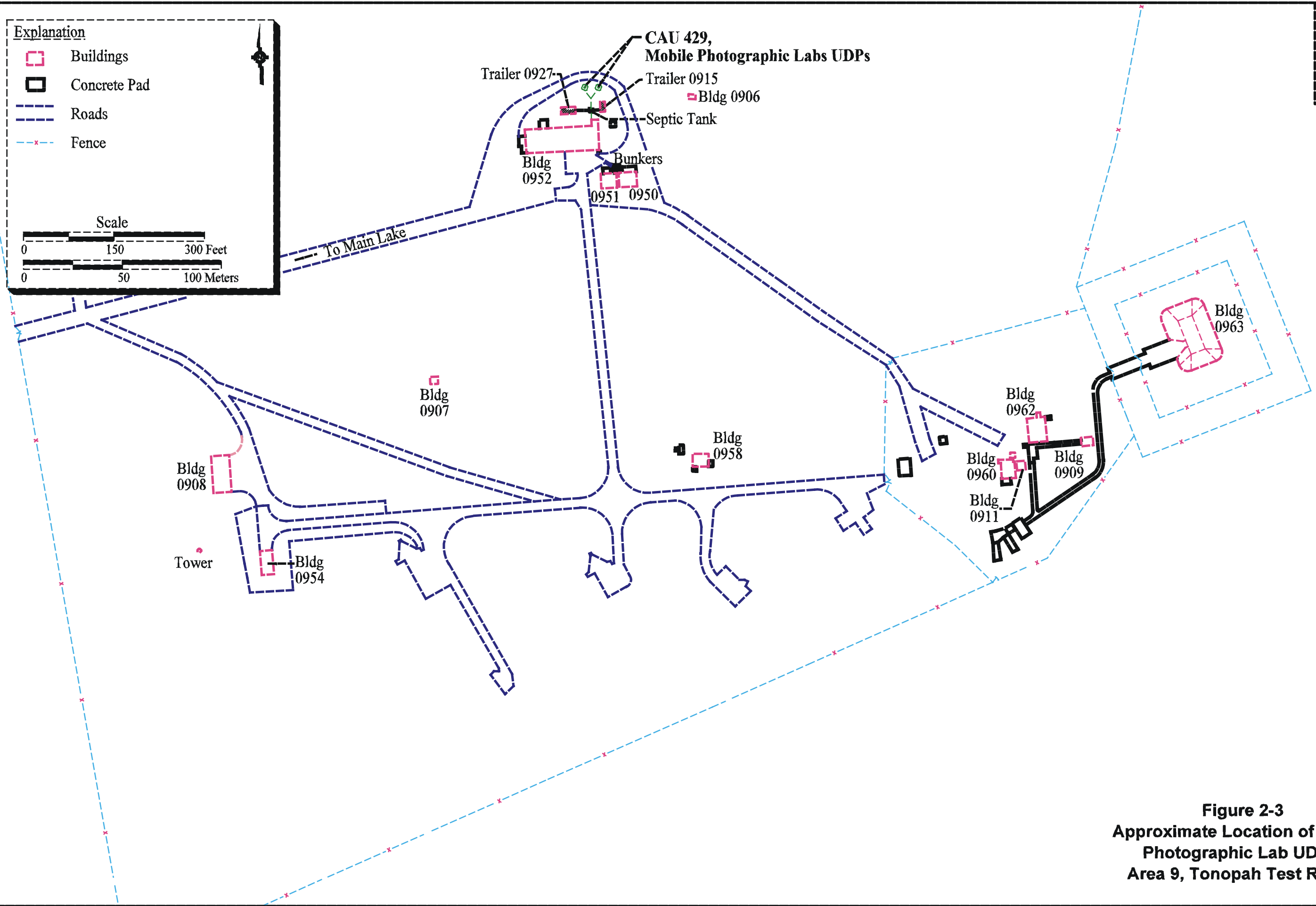
**Explanation**

- Buildings
- Concrete Pad
- Roads
- Fence

**Scale**

0 150 300 Feet

0 50 100 Meters



**Figure 2-3**  
**Approximate Location of Mobile**  
**Photographic Lab UDPs,**  
**Area 9, Tonopah Test Range**

eliminate the possibility of recent effluent discharge into the septic tank and UDPs. However, water has been shut off to Building 09-52 and portable toilets were established nearby.

At the surface, the UDPs are visible as approximately 1-m by 1-m (3-ft by 3-ft) squares constructed with concrete blocks and covered by wooden pallets. Below the bottom of the blocks, the UDPs are believed to increase in diameter to 1.5 m (5 ft) and extend to 3 m (10 ft) bgs. It is unknown if the UDPs are lined; however, the UDPs are believed to be gravel-filled.

The amount of effluent discharged from the Area 9 mobile photoprocessing laboratories is unknown. The exact period that photoprocessing effluent was discharged to the UDPs is uncertain, but most likely occurred between 1982 to the mid-1990s. Use of the Area 9 Mobile Photoprocessing Laboratories for X-rays was discontinued when digital radiography technology use began in the mid-1990s.

### **2.3 Waste Inventory**

No documented inventories of waste removal or waste disposal were identified for any of the UDPs. The total volumes and concentrations of liquid waste discharged to the UDPs are generally unknown. Process knowledge of potential waste inventories for both CAU 406 and 429 is discussed in this section.

The CAU 406 UDPs received liquid waste associated with motorized equipment maintenance and operation and steam cleaning operations which possibly includes petroleum products, hydraulic fluids, coolants, cleaning supplies, and solvents. Only trace amounts of these products are expected. Depleted uranium particles may have been discharged through the Steam Cleaning Pad drains; however, reports of this practice are in question. The length of operations for the Heavy Duty Shop UDP are poorly constrained between 1981 and 1988 while the Steam Cleaning Pad has been in operation since the 1960s. The dates of operation for the UPS Building 03-58 UDPs are uncertain; however, the building and UDPs were constructed around 1970.

The CAU 429 UDPs received waste associated with photoprocessing which may include silver as well as acids, caustics, corrosives, and solvents. The length of operations for the Area 3 Photoshop are between 1964 and 1989 with an estimated 950,000 L (250,000 gal) per year of potentially

contaminated water released to the two UDPs. Operations for the two Mobile Photographic Laboratories at Area 9 are constrained between the early 1980s to early 1990s. The septic tank may still contain septage discharged from Building 09-52.

## **2.4 Release Information**

The UDPs in CAU 406 and CAU 429 are typically subgrade excavations filled with gravel in which liquid wastes were discharged via distribution lines and allowed to percolate into the surrounding soil for disposal. Exact quantities of liquids released to each UDP are unknown. Migration of COPCs will be limited both laterally and vertically due to expected low concentrations of COPCs, lack of a driving force, and relatively low mobility of COPCs.

Historical information suggests that potential UDP surface overflows may have occurred at both the Area 3 Photoshop UDP and the Heavy Duty Shop UDP. Potential overflows at the primary Area 3 Photoshop UDP may have impacted soils most likely in a radial pattern at the surface and/or near surface. The Heavy Duty Shop UDP may have impacted surface and/or near surface soils laterally to the north or south of the west gate culvert for an undetermined distance.

The UPS Building 03-58 UDP systems may have been impacted by historic accidental releases of diesel fuel that occurred near or in the building. Although most of the contaminated soil was removed, historic surface spills and their subsequent remediation may impact this CAS in at least two ways. The features of the UDPs may have been coincidentally removed during the remediation effort of the surface spills. Secondly, distinguishing between diesel related to the UDP system and diesel remaining after the clean-up operations of surface spills will be difficult. Field data generated during this investigation will have to be evaluated against previous sampling efforts in an attempt to distinguish between the separate events. Known diesel-contaminated soil remains under Building 03-58 (DOE/NV, 1996a; SNL, 1998).

## **2.5 Investigative Background**

There have been no geophysical surveys conducted for any of the UDP systems. Sampling data was not identified for any of the UDPs. However, one sampling event was identified for the septic tank associated with the Mobile Photographic Lab UDPs in Area 9. Soil sample results from the 1998

diesel fuel spill at the UPS building were also identified. Both of these sampling events contribute information on the potential COPCs that can be expected during the investigation of the relevant UDPs and are briefly described below.

A sampling effort was conducted in 1993 to collect aqueous and sludge samples from the Area 9 Building 09-52 septic tank (IT, 1994). Analytical results of the aqueous sample indicate that silver is present, but concentrations are below the Toxicity Characteristic standard of 5.0 milligrams per liter (mg/L). An elevated total metal silver concentration of 29.3 milligrams per kilogram (mg/kg) was measured in the sludge sample, which may indicate that it exceeds the Toxicity Characteristic standard of 5.0 mg/L when divided by 20; however, additional sampling of the sludge by Toxicity Characteristic Leaching Procedure (TCLP) for silver would be necessary before a hazardous waste determination could be made. A gross beta concentration of 147 picocuries per liter (pCi/L) was measured in the aqueous sample; however, the sludge sample did not indicate gross beta at abnormal levels. No other contaminants were present in elevated concentrations.

Environmental samples were taken by Sandia National Laboratories (SNL) personnel during the excavation and removal of contaminated soil resulting from the January 16, 1998, diesel fuel spill at the UPS Building 03-58. According to data presented in the *In-Situ Closure Plan Area 3UPS Building* (SNL, 1998), the contaminant present is diesel fuel and the contamination is confined to the site. The SNL's investigation defined the extent of contamination to be approximately 1.8 m (6 ft) bgs. Analytical samples taken from soil adjacent to and beneath the building foundation on February 18, 1998, indicate total petroleum hydrocarbon (TPH) concentrations above 100 mg/kg. Two additional soil samples were collected on March 4, 1998, after further excavation of soil beneath the building foundation was suspended. One sample was taken from the area adjacent to the foundation and the other from the contaminated soil approximately two feet under the foundation (sidewall). The results indicate TPH concentrations above 100 mg/kg (3,440 and 3,740 mg/kg, respectively). The depth and volume of remaining contaminated soil beneath the building foundation are unknown. According to the Closure Plan, the remaining contaminated soil beneath the UPS Building does not pose a threat to human health and the environment.

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 406

and CAU 429. 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.

Site investigation activities associated with CAU 406 and CAU 429 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**

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The DQOs are qualitative and quantitative statements that specify the quality of the data required to support potential courses of action for the UDPs. 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 conceptual site model.

### **3.1 Conceptual Site Model**

The conceptual site model defines the expected nature and extent of contamination at the UDPs based on assumptions formulated using 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 cross-section in Figure 2-1 depicts a graphical representation of the estimated COPCs. The conceptual site models and assumptions for the CAU 406 and CAU 429 UDPs developed in the DQO process are presented in [Appendix A](#) and are summarized in this section.

The description of the conceptual site model presented below is applicable to both CAUs based on similar historical operations, process knowledge, and assumptions for all UDPs included in this project. In addition to the general assumptions outlined in the conceptual site model below, [Sections 3.1.1](#) and [3.1.2](#) discuss unique characteristics and assumptions specific to each CAS within CAU 406 and CAU 429, respectively.

- The volume and concentrations of the COPCs are unknown but contamination is expected to be present and concentrated at the base of the UDPs.
- COPCs primarily in liquid form were released to the UDPs. The effluent was mainly water with small amounts of contaminants.
- The UDPs are no longer in service; however, Building 09-52 septic system is functional but abandoned.
- Contamination is not expected to extend laterally beyond 10 times the width of the UDP.

- Vertical contamination is not expected to exceed three times the vertical dimension of the UDP below the UDP base. Migration is primarily gravity controlled, but geologic control at depth may influence or limit contaminant migration.
- Relatively low contaminant concentrations and volume, low mobility of constituents, and a lack of a driving force will limit the subsurface lateral and vertical migration of COPCs.
- Arid climate limits infiltration and high evapotranspiration rates restrict the mobility of COPCs.
- Nearby utilities and buildings, adverse weather conditions, restricted access, and range activities may present practical and/or physical constraints to the field investigation.
- Potential exposures to personnel would be oral ingestion, inhalation, or dermal contact of COPCs in the soil during excavation.
- Future land use is expected to remain similar to the current use (light industrial).

### **3.1.1 Corrective Action Unit 406**

Corrective Action Unit 406 includes “maintenance” UDPs associated with the Heavy Duty Shop (Building 03-74) and the UPS Building (Building 03-58) in Area 3. The locations and configurations of the UDPs in CAU 406 are poorly constrained. The primary COPCs in the CAU 406 UDPs are hydrocarbons.

#### ***Heavy Duty Shop UDP, CAS 03-51-002-0374***

- The UDP is assumed to have received waste only from the Heavy Duty Shop and Steam Cleaning Pad drains.
- The Heavy Duty Shop UDP may have discharged to the surface and the subsurface.
- The UDP may have received radioactive material derived from washing trucks that transported DU components.
- A gravel pit near the UDP location was reportedly excavated periodically and the resultant contaminated fill material disposed of in the Area 3 landfill(s). This activity may have reduced the volume of potentially contaminated soil near the UDP.
- Potential disruptions of the discharge line from unrelated maintenance and construction events may complicate locating any existing and intact sections of discharge pipe.

### ***Uninterrupted Power Supply Building UDPs, CAS 03-51-003-0385***

- No liquid waste was intentionally disposed of through the floor drains.
- The UDP features may have been removed during unrelated historical diesel-contaminated soil remediation.
- Diesel-contaminated soil remains under Building 03-58. Distinguishing between diesel related to the UDP system and diesel remaining after the clean-up operations of two surface spills will be difficult.

### ***3.1.2 Corrective Action Unit 429***

Corrective Action Unit 429 includes photoprocessing UDPs associated with the Area 3 Photoshop (Building 03-55) and two Mobile Photographic Laboratories in Area 9 (at Building 09-52). The locations and configurations of the UDP features are well defined for CAU 429. The primary COPCs are silver and other photoprocessing waste.

### ***Area 3 Photoshop UDPs, CAS 03-51-001-0355***

- The UDPs are assumed to have received waste only from Building 03-55 via the discharge line.
- The primary UDP was constructed in 1964; however, the secondary UDP installation date is unknown. Both units operated until approximately 1989.
- Surface overflow may have occurred at the primary UDP for Building 03-55 prior to the installation of the secondary UDP.
- The UDPs may have received up to 950,000 L (250,000 gal) of effluent per year with an estimated chemical/water mixture of 0.1 gram per 370 L (100 gal) of water.

### ***Area 9 Mobile Photographic Lab UDPs, CAS 09-51-001-0952***

- The effluent of concern originated in the two mobile photographic laboratories which operated from the early 1980s through the early 1990s.

- The septic system associated with the Building 09-52 restroom is functional but was abandoned a couple of years ago.
- No process waste associated with Building 09-52 electronics shop activities was disposed of through the bathroom drains.

Groundwater impact is unlikely because depth to groundwater is extensive (greater than 39 m [130 ft] below Area 9 and 109 m [360 ft] below Area 3) (DOE/NV, 1996a), and the environmental conditions at the site (i.e., arid climate, high evaporation) are not conducive to downward migration of COPCs.

### **3.2 Contaminants of Potential Concern**

During the DQO process, COPCs for each CAS were identified through process knowledge and site history. The COPCs for both CASs in CAU 429 include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and RCRA metals associated with photoprocessing waste. The primary COPCs for CAU 406 are hydrocarbons associated with equipment and vehicle maintenance operations. The following lists provide the site-specific analytes to be measured to determine the nature of potential contamination at each CAS:

#### ***Heavy Duty Shop UDP:***

- VOCs
- SVOCs
- Total RCRA metals
- Total polychlorinated biphenyls (PCBs)
- TPH

As a precautionary measure, 25 percent of the soil samples collected during the Heavy Duty Shop UDP site investigation will be submitted for isotopic uranium analysis.

#### ***Uninterrupted Power Supply Building UDPs:***

- TPH-diesel/waste oil
- Total PCBs

***Area 3 Photoshop UDPs:***

- Total RCRA metals
- VOCs
- SVOCs

The TCLP for silver will be conducted at the discretion of the Site Supervisor. The decision of which samples to submit will be based on field observations, X-ray fluorescence (XRF) field screening, and waste management requirements.

***Area 9 Mobile Photographic Labs UDPs:***

- Total RCRA metals
- VOCs
- SVOCs

The TCLP for silver will be conducted at the discretion of the Site Supervisor. The decision of which samples to submit will be based on field observations, XRF field screening, and waste management requirements.

While radionuclides are not anticipated at any other UDP sites, samples will be collected for gamma spectroscopy analysis if field screening results exceed field screening levels. [Tables A.3-1 through A.3-3](#) in [Appendix A](#) list the COPCs to be analyzed for each CAS, including field screening methods and levels and preliminary action levels (PALs). [Appendix C](#) provides the analytical requirements which include minimum reporting limits, regulatory limits, analytical methods, precision, and accuracy for all the analytes.

**3.3 Preliminary Action Levels**

The following subsections describe the field screening levels and PALs for CAU 406 and CAU 429. 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 on-site field screening methods:

- Volatile organic compound headspace screening levels using a photoionization detector and a warm water bath are established at 20 parts per million (ppm) or 2.5 times background, whichever is greater.
- Total petroleum hydrocarbon screening levels using appropriate field screening methods (i.e., Hanby™ or other test kit) are established at 100 ppm.
- Silver screening levels using XRF techniques are established at less than 100 ppm.
- Radiation (alpha, beta, and gamma) screening is defined as the mean background activity level plus two times the standard deviation of the mean background activity level (to be determined prior to start of field activities) and monitored during sampling.

Concentrations exceeding field screening levels will 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. Additionally, this data may also be used to select discretionary laboratory sample locations.

### **3.3.2 Chemical Preliminary Action Levels**

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

- NDEP Corrective Action Regulations (*Nevada Administrative Code* [NAC], 1998b) (for purposes of this investigation, EPA Region IX Preliminary Remediation Goals [PRGs] for industrial soils are assumed as the PALs [EPA, 1998])
- TPH concentrations above the TPH limit of 100 ppm per the 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 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 included in the CADD based on the results of this field investigation.

### **3.3.3 Radiological Preliminary Action Levels**

The PALs for radionuclides are isotope-specific and are defined as the maximum concentration for that isotope found in environmental samples taken from undisturbed background locations. Environmental background samples previously taken in the vicinity of Area 3 and Area 9 at the TTR (in the vicinity of CAUs 406 and 429) will be compared with the results for environmental samples taken from other undisturbed background locations on the TTR. In addition, the radionuclide concentrations in the CAUs 406 and 429 and TTR background samples will be compared with the radionuclide concentrations found in environmental samples taken from undisturbed background locations in the vicinity of the NTS, presented in McArthur and Miller (1989) and Atlan-Tech (1992). The PAL for each isotope will be the maximum concentration of that isotope found in any of the samples taken from the undisturbed background location described above.

### **3.4 DQO Process Discussion**

Details of the DQO process are presented in [Appendix A](#). The DQO results for the UDPs indicated the need for a biased sampling approach. Due to potential subsurface migration of COPCs, an investigation consisting of subsurface sampling was identified. In addition, two locations (the Heavy Duty Shop UDP and the Area 3 Photo Shop UDP) have potential surface contamination that will be investigated. [Table A.6-1](#) in [Appendix A](#) provides decision points and rules specific to each CAS that will be used to guide the field investigation. The COPCs, analytical methods, and reporting limits prescribed through the DQO process are provided in [Appendix A](#). The precision and accuracy requirements are stated in [Appendix C](#).

## **4.0 Field Investigation**

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This section of the CAIP contains the sampling approach for investigating the UDPs at the TTR. All sampling activities will be conducted in compliance with the Industrial Sites QAPP (DOE/NV, 1996c) and other applicable, approved procedures and instructions. Quality assurance and quality control requirements for field and laboratory environmental sampling are provided in [Section 4.2.2](#) and in the Industrial Sites QAPP (DOE/NV, 1996c).

Field activities will be performed in accordance with an approved SSHASP which concurs with the U.S. Department of Energy (DOE) Integrated Safety Management System. Safety, health, and protection of the environment take precedence over expediency and short cuts. Site personnel will take every reasonable step to reduce the possibility of injury, illness, or accidents, and to protect the environment during all project activities. The following will be taken into consideration when assessing the hazards associated with the field activities:

- Potential hazards to site personnel and the public include, but are not limited to, chemicals (such as RCRA metals, VOCs, SVOCs, and TPH), adverse and rapidly changing weather, remote location, heavy equipment operations including drilling and excavation
- 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
- 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 Technical Approach**

The following list describes general activities that may be executed during the site investigations for CAU 406 and CAU 429. Specific details for individual field activities at each CAS are provided in [Section 4.3.1](#) to 4.3.4.

- Perform video surveys to determine the location and condition of discharge pipes.
- Excavate areas where video survey fails to locate discharge pipes.
- Excavate at inferred CAU 406 UDP locations to identify UDP features.
- Collect surface and near-surface environmental samples at the Heavy Duty Shop UDP and the Area 3 Photoshop UDPs to investigate potential surface contamination.
- Collect environmental samples from within and around the septic tank at Area 9 Mobile Photographic Laboratories UDPs.
- Drill vertical boreholes at UDP locations where necessary.
- Drill step-out boreholes as necessary to delineate vertical and lateral extent of contamination.
- Conduct field screening for VOCs and radioactivity to direct excavation or drilling, and sampling activities.
- Conduct field screening for TPH only at CAU 406 locations. The TPH screening will not be conducted on any soil in which elevated radiation field screening results are detected.
- Conduct field screening for silver only at CAU 429 locations.
- Conduct laboratory analysis for CAS-specific COPCs.
- Collect quality control samples.
- Collect samples from native soils beneath a UDP at each site and analyze for geotechnical/hydrologic parameters.
- Collect and analyze bioassessment samples at CAU 406 at the discretion of the Site Supervisor if TPH field screening results suggest significant contamination.

## **4.2 Field Activities**

The subsurface investigation of both CAU 406 and CAU 429 may include, but are not limited to, excavation, direct-push methods, and drilling methods to locate and investigate underground discharge points and their associated discharge lines. Drilling will be the primary investigation tool used to evaluate and sample each identified UDP system except for the UPS Building UDPs where drilling will only be used if contamination is more extensive than anticipated. Damage to roads and utilities will be minimized during investigation activities.

### **4.2.1 Video Survey**

Video surveys will be conducted using a commercial down-pipe camera system to locate and inspect UDP discharge pipes where the UDP locations are poorly constrained. Video surveys allow a visual assessment of the system's integrity and can be used to identify obvious breaches, unexpected branchings (i.e., tie-ins or off-shoots), and open joints. A radio locator which emits a signal that can be tracked at the ground surface may be coupled with the video setup and introduced into the piping. The discharge lines and UDP locations may be inspected and physically mapped by tracking the camera head inside the piping network. The survey may not be possible for some lines because of small pipe diameters (i.e., less than 7.5-cm [3-in.] diameter), limited access, pipe damage, blockage, or other factors. The video system can be decontaminated using standard techniques and equipment, and can be sheathed in disposable plastic to simplify decontamination activities, if necessary.

Additional entry points for the video system may be accessed by excavating at the required locations and cutting the discharge pipes as necessary. For investigation of discharge pipes where the video survey fails, excavation at selected locations will be conducted to identify and/or verify the location of the discharge lines.

If additional tie-ins are discovered, the line will be investigated to the source (if possible) and the investigation will be suspended until the NDEP is notified. The discovery of an unexpected contributing line may imply an additional source input and could increase the scope of the investigation. Similar decision rules apply if additional off-shoots or discharge points are discovered.

### **4.2.2 Excavation Activities**

Excavation activities will use a backhoe or shovel to obtain access to discharge lines or sampling locations. Excavation locations will be based on historical information, engineering drawings, surface features, and video surveys. Trenching to locate UDP discharge lines may be required, but may not be possible in some areas due to existing facilities and utilities. Sample collection is not planned during the excavation phase of any of the CASs, except at the UPS UDPs. However, if conditions are encountered during excavation or a video survey that warrant sampling (i.e., staining, odor, or broken pipes), then soil samples will be collected for analysis. Soil will be collected directly out of the backhoe bucket immediately upon retrieval. Excavation activities will uncover only enough pipe or material for inspection and/or sampling to reduce spoils and minimize the potential for damaging buried utilities. Excavated soils will be stored in a manner that will prevent run-on and run-off. When access to the subsurface at a particular location is no longer required, soil excavated during trenching operations will be returned to the excavation as close as practical to its original location.

### **4.2.3 Direct-Push Methods**

The direct-push method may be used, as an alternative to drilling, to collect surface (0 to 0.3 m [0 to 1 ft] bgs) and near-surface (0.9 to 1.5 m [3 to 5 ft] bgs) samples at potential UDP surface overflow areas. This method may also be utilized at sites where mobilizing a drill rig may be inefficient or unnecessary. The number and placement of proposed sampling locations were determined from historical and process knowledge and are described in greater detail in [Section 4.3](#). Extra soil remaining after the direct-push activities will be returned to the direct-push hole it was generated from.

### **4.2.4 Soil Borings**

One boring will be advanced directly through the center of each identified UDP using a hollow-stem auger drill or another appropriate drilling method. Drilling will only be employed at the UPS Building UDPs if contamination detected by field screening or laboratory analysis extends beyond the maximum reach of the backhoe. Field screening and soil sample collection will be conducted at 1.5-m (5-ft) intervals to a depth of 12 m (40 ft) bgs until two consecutive, nondetect field screening

results are obtained. If two consecutive, 1.5-m (5-ft) interval, nondetect field screening results are not obtained above the depth of 12 m (40 ft) bgs, field screening and soil sample collection will then be conducted at 3-m (10-ft) intervals, and drilling will continue until two consecutive, nondetect field screening results are obtained or the maximum drilling depth of the rig is reached.

If elevated field screening results are identified during advancement of the initial boring, step-out borings will be advanced to evaluate the extent of lateral and vertical contaminant migration. The locations of initial step-out borings will be dictated by individual site configurations. Based on field screening results, additional step-outs (beyond the initial step-outs) may also be needed to delineate the plume boundaries. At a minimum, step-out borings will be advanced to the lowest vertical extent of contamination (detected by field screening) in the initial UDP boring. Excess drill cuttings not collected as samples will be returned to the boring from which they originated or be containerized and managed as IDW. All boreholes will be filled to the ground surface with a bentonite grout mixture upon completion of sampling activities.

#### **4.2.5 Field Screening**

Field screening for radiation and VOCs will be conducted for all samples. Field screening for TPH will be conducted only at CAU 406. Field screening for silver (*RCRA* metal) will be conducted only at CAU 429. The field screening methods include screening for VOCs using a headspace method and screening for radioactivity using an alpha/beta scintillator (i.e., Electra<sup>TM</sup>), and a sodium iodide (NaI) detector, or equivalents. The Hanby<sup>TM</sup> method or other hydrocarbon test kit will be used for TPH field screening. To avoid generating mixed waste, TPH screening will not be conducted on any soil in which elevated radiation field screening results are detected. Silver will be screened for in the field using a XRF instrument, if possible.

Field-screening results will provide information to establish the maximum depth of COPCs and the need for step-out borings. If field screening results exceed the field screening levels listed in [Section 3.3](#), additional samples will be collected and step-outs performed using drilling methods as necessary.

### **4.3 Investigation Strategy for CAUs 406 and 429**

The DQO results for the UDPs indicate the need for multiple-phase approaches to investigate each individual CAS. The following subsections describe the investigative strategies for each CAS.

#### **4.3.1 CAU 406, Heavy Duty Shop UDP, CAS 03-51-002-0374**

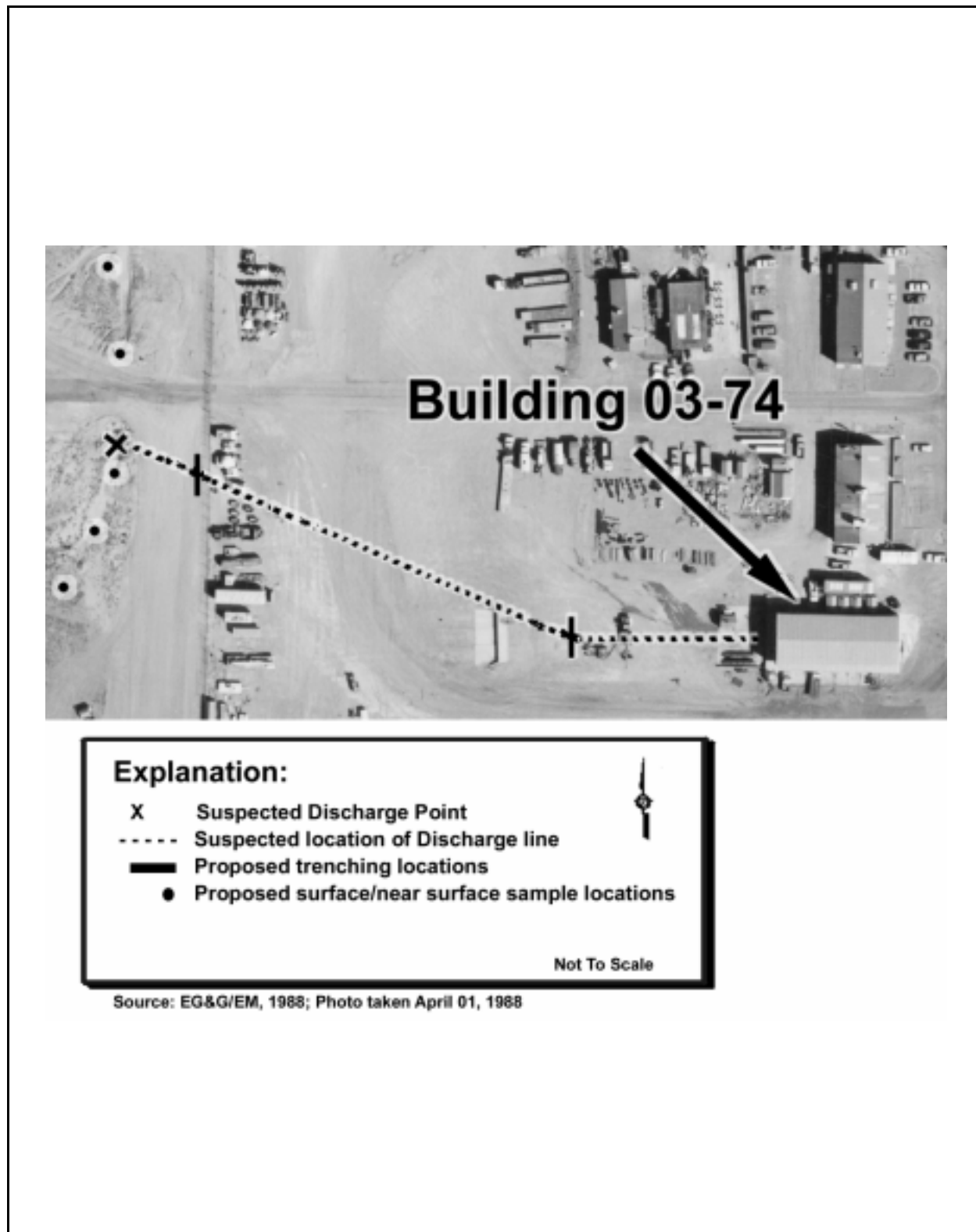
A video camera survey will be attempted on the discharge lines associated with the Heavy Duty Shop UDP. The camera will most likely be inserted in an excavated section of the discharge line midway between the west side of Building 03-80 and the west gate culvert. This survey will attempt to determine the condition of the line and the exact location of the discharge point. A three-phase approach will be used to investigate the UDP:

##### ***Phase I***

- For the purpose of verifying the location of the discharge line or accessing an entry point for the video system, excavate trenches perpendicular to the expected orientation of the discharge line in the following proposed locations ([Figure 4-1](#)):
  - Between Area 3 west fence and perimeter road
  - At expected bend in discharge line near existing loading dock
  - At additional locations if required due to breaks in discharge line
- Use video survey, if possible, to inspect discharge line condition and locate discharge point

##### ***Phase II***

- Collect soil samples from 0.3 m and 1.2 m (1 and 4 ft) bgs within the wash at the following proposed locations ([Figure 4-1](#)):
  - Expected UDP location (south end of culvert)
  - North end of culvert
  - 15 m and 30 m (50 and 100 ft) south of UDP



**Figure 4-1**  
**Proposed Trenching and Sampling Locations for the Heavy Duty Shop UDPs**

- 30 m and 60 m (100 and 200 ft) north of UDP
- If required, collect step-out samples in the same manner as the initial surface samples to define the lateral extent of surface contamination.

### ***Phase III***

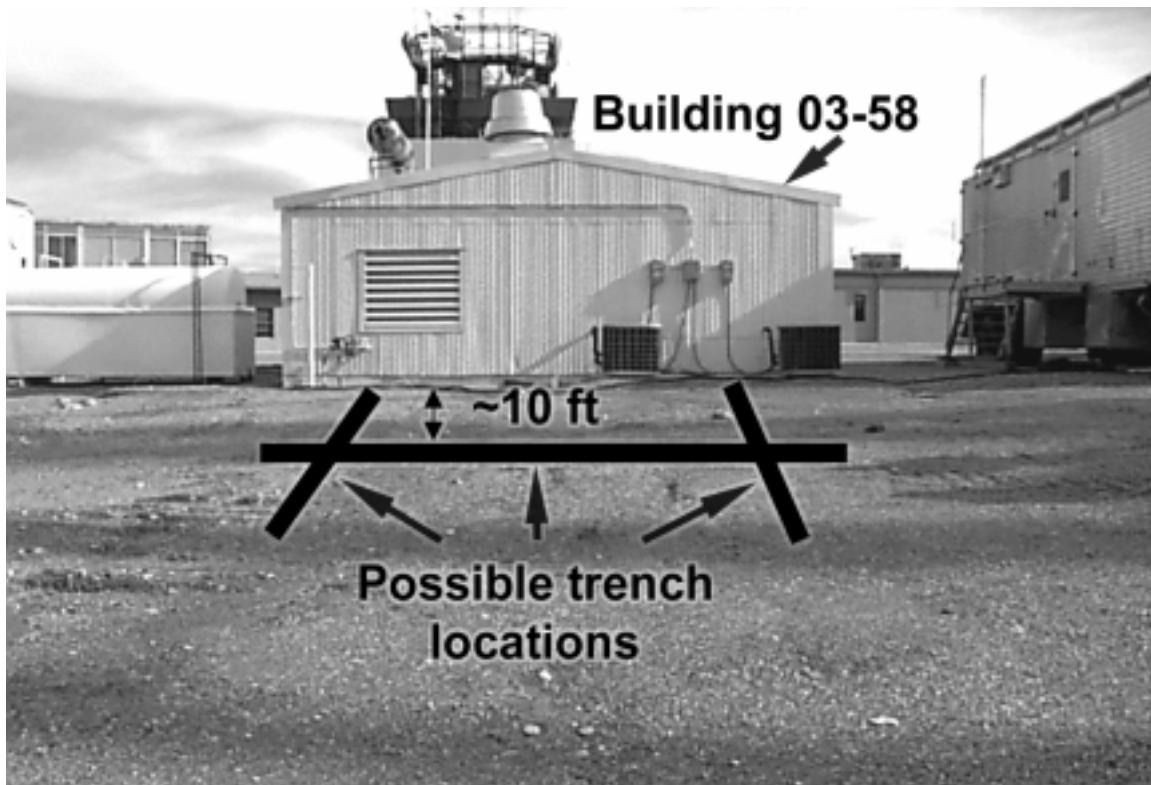
- Drill borehole at the UDP location to 12 m (40 ft) bgs
  - Field screen and sample every 1.5 m (5 ft)
  - Drill stepout borings in a 4.5-m (15-ft) radius pattern from the UDP if field screening levels are exceeded.
  - Additional stepout borings may be drilled as required

#### **4.3.2 CAU 406, UPS UDP, CAS 03-51-003-0358**


A video camera survey will be attempted on the discharge lines associated with the UPS UDPs. The floor drains within Building 03-58 will be the initial insertion point of the camera to determine if the drain lines have been rerouted to the consolidated sewer system. If so, the camera will most likely be reinserted in an excavated section of the discharge line (if located) midway between the west side of Building 03-58 and the suspected location of the UDPs. This survey will attempt to determine the exact location of the discharge points. The investigation of these UDPs will use a two-phase approach:


### ***Phase I***

- Use video survey to locate the discharge points, if possible.
- Excavate three trenches on the west side of the UPS building ([Figure 4-2](#))
  - Two trenches parallel to discharge lines
  - One trench perpendicular to and across the two previous trenches at assumed UDP location
- Collect soil samples from excavations at UDP locations, or assumed UDP locations if UDP features are not identified.



Explanation:



 Proposed trench location

Not To Scale

Source: IT, 1998; Photograph taken January 13, 1998

Figure 4-2  
Proposed Trenching Locations for the UPS Building UDPs

## ***Phase II***

The second phase of this investigation will be initiated only if COPCs are detected above field screening levels at the maximum excavation depth of the backhoe (i.e., 3 m [10 ft]). Based on the conceptual site model, this is not expected.

- One borehole will be drilled to 9 m (30 ft) bgs approximately 3 m (10 ft) west of Building 03-58 near the approximate location of the two UDPs, or based on the results of the excavation activities in phase one.
- Field screen and sample every 1.5 m (5 ft)
- Drill stepout borings in a 4.5-m (15-ft) radius pattern if field screening results exceed screening levels.

### **4.3.3 CAU 429, Area 3 Photoshop UDPs, CAS 03-51-001-0355**

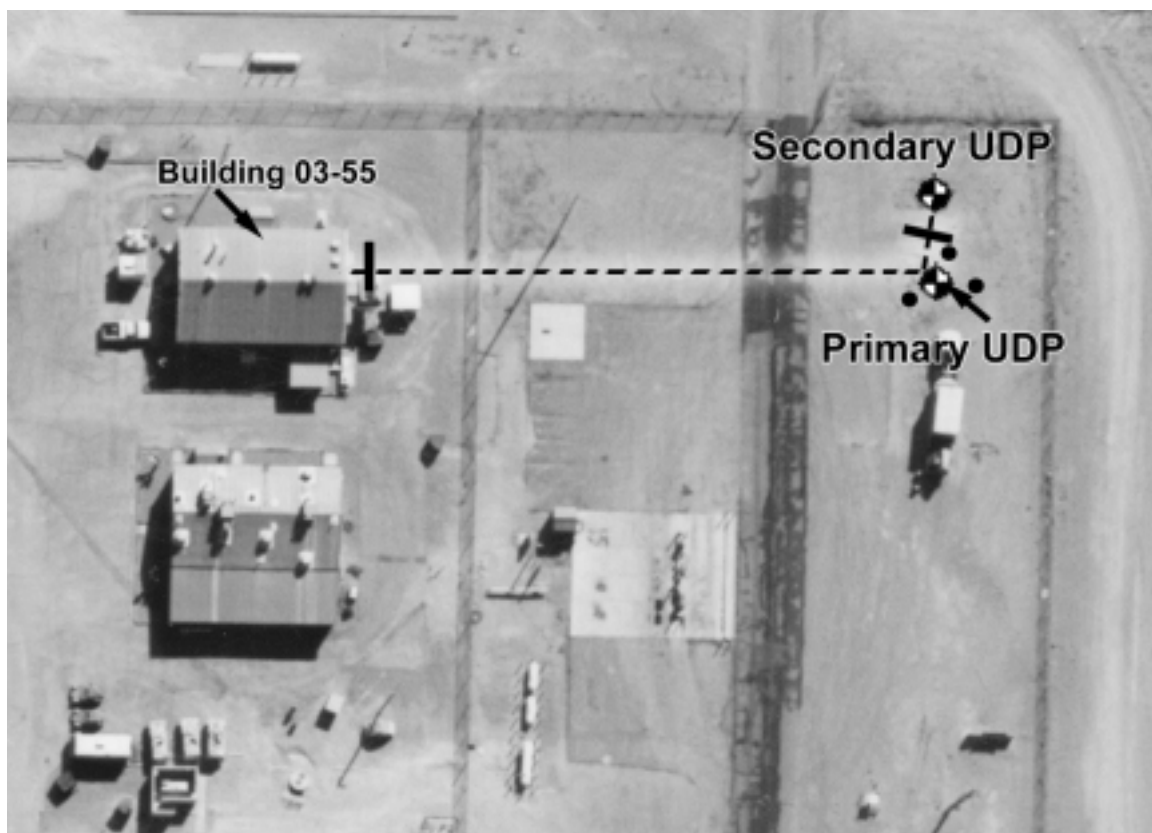
The location of the two UDPs and the nature of contamination in this CAS is well defined; therefore, a video survey of the discharge lines is not planned. This site will be investigated in a three-phase approach:

#### ***Phase I***

- Excavate with backhoe to verify the discharge line is capped or rerouted and no longer discharges to the UDPs ([Figure 4-3](#)).
- Excavate with backhoe between the two UDPs to verify the existence and depth of the overflow pipe ([Figure 4-3](#)).

#### ***Phase II***

- Collect samples using the direct-push method from 0.3 m and 0.9 m (1 and 3 ft) bgs in a 7.6-m (25-ft) radius triangular pattern centered on the primary UDP to detect potential surface or near-surface contamination associated with overflow ([Figure 4-3](#)).
- If required, collect step-out samples in the same manner as the initial surface samples to define the lateral extent of surface contamination.



**Explanation:**

**Approximate location of:**

- Discharge Line
- Proposed trench locations
- Proposed surface/near surface sample locations
- ⊕ Proposed boring location

Not To Scale

Source: EG&G/EM, 1988; Photo taken April 01, 1988

**Figure 4-3**  
**Proposed Trenching and Sampling Locations for the Area 3 Photoshop UDPs**

### ***Phase III***

- Drill borehole through primary UDP to 12 m (40 ft) bgs
  - Field screen and sample every 1.5 m (5 ft)
  - Drill stepout borings in a 4.5-m (15-ft) radius pattern from the UDP, if field screening levels are exceeded.
  - Additional stepout borings may be drilled as required
- Drill borehole through secondary UDP to 12 m (40 ft) bgs
  - Field screen and sample every 1.5 m (5 ft)
  - Drill stepout borings in a 4.5-m (15-ft) radius pattern from the UDP if field screening levels are exceeded.
  - Additional stepout borings may be drilled as required

#### **4.3.4 CAU 429, Area 9 Mobile Photo Lab UDPs, CAS 09-51-001-0952**

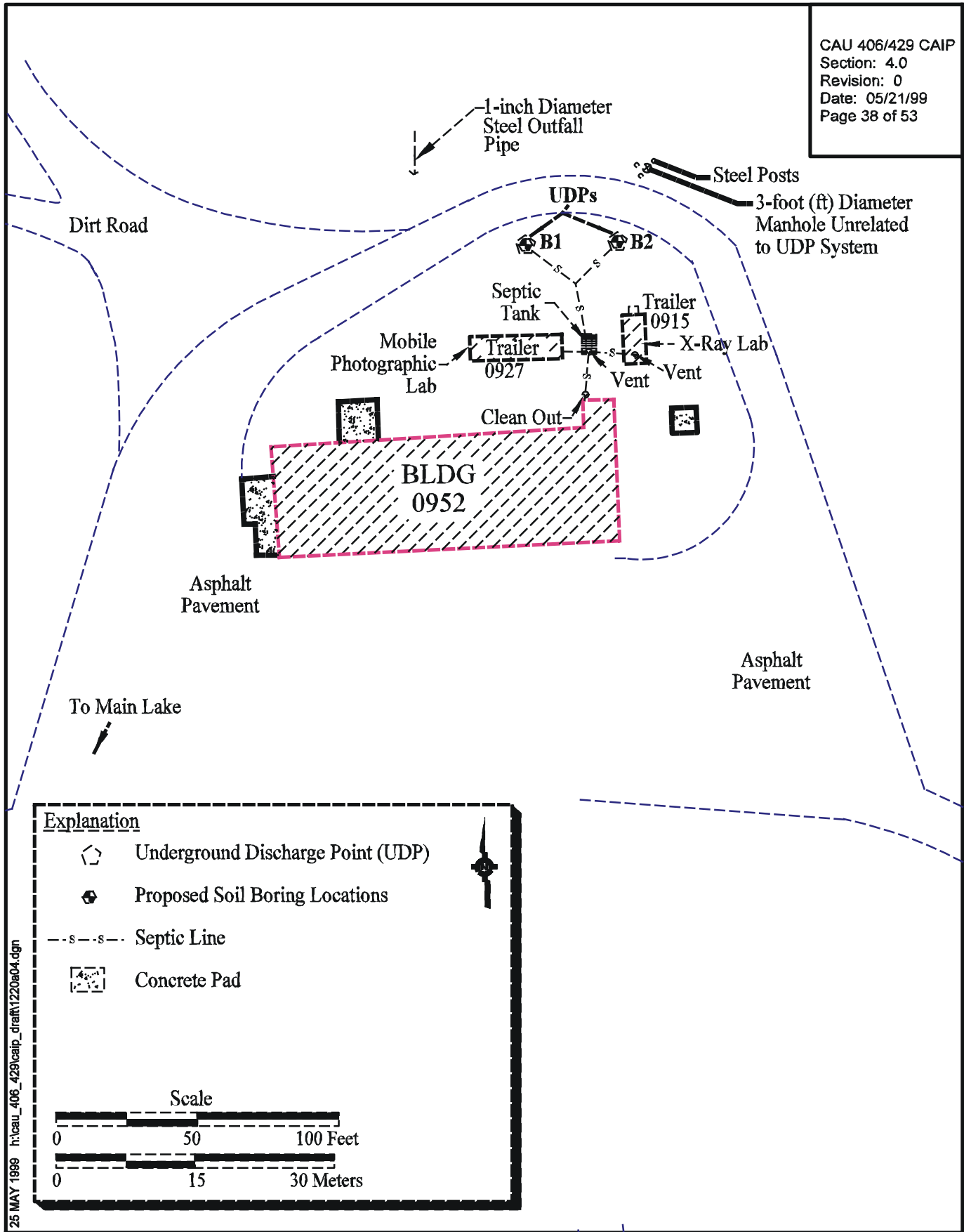
The location of these UDPs and the nature of contamination is well defined; therefore, a video survey of the discharge lines will not be conducted. This site will be investigated in a two-phase approach:

### ***Phase I***

- To prevent unauthorized discharge of materials to the UDP system, the line from Building 09-52 to the septic tank will be excavated and capped.
- The contents of the septic tank will be sampled.
- Soil samples from the influent and effluent ends of the septic tank will be sampled either through excavation or direct-push methods ([Figure 4-4](#)).

### ***Phase II***

- Drill one borehole through each UDP to 12 m (40 ft) bgs
  - Field screen and sample every 1.5 m (5 ft)



**Figure 4-4**  
**Proposed Investigation Areas, Mobile Photoprocessing Lab UDPs**  
**Area 9, Tonopah Test Range**

- Drill stepout borings in a 4.5 m (15 ft) radius pattern around the UDPs if field screening results exceed field screening levels.
- Additional stepout borings may be drilled as required

#### **4.4 Sampling Criteria**

All sampling activities for CAU 406 and CAU 429 will be conducted in compliance with requirements of the Industrial Sites QAPP (DOE/NV, 1996c) and this CAIP. Subsections 4.4.1 through 4.4.5 provide details on the type of sample collection that will be performed during the field investigation. The CAS-specific details on sampling strategy and proposed sampling locations are provided in [Section 4.3](#). Details of the field screening to be conducted at each CAU/CAS are provided in [Section 4.2.5](#).

Records will be maintained for a visual classification of the soil from boreholes, field-screening measurements, and all other relevant data. Pertinent and required sampling information (e.g., 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 assure sample integrity.

All equipment which contacts soil to be sampled will be decontaminated in accordance with written, approved, and controlled procedures. Core barrels (including direct-push barrels) will be decontaminated prior to each sampling event to minimize the potential for cross-contamination of samples from different locations or depths.

##### **4.4.1 Environmental Samples**

Environmental samples collected for laboratory analysis will be samples of fresh (unused) media. Samples will be collected with highest priority given to those that will be analyzed for VOCs. When volatilization of COPCs is not a concern, samples will be collected with priority given to those with the shortest hold times prior to analysis. Samples submitted to the laboratory will be analyzed in accordance with [Appendix C](#).

All surface/near-surface samples collected using the direct-push method will be sent for laboratory analysis. All samples collected from septic system components (i.e., septic tank in CAU 429) will be sent for laboratory analysis. Samples taken from the initial UDP borings will be collected for laboratory analysis based on visual observations (e.g., areas of visible staining) and/or the results of field screening. The interface between the base of the UDP and native soil, if identified, will also be sampled. The two deepest consecutive, nondetect samples for the initial borings will be submitted to the laboratory to bound the vertical extent of contamination and verify field screening readings. In step-out borings (if performed), samples will be collected for laboratory analysis from the highest field-screening interval and the lowest vertical, nondetect interval. If field screening does not detect any contamination in the step-out borings (after drilling to the established minimum depth based on field screening results at the initial UDP boring), the first of the two consecutive samples below field-screening levels will be submitted for confirmation of the nondetect field screening readings.

Discretionary sampling points may also be selected for laboratory analysis based on a visual examination by the Site Supervisor/Geologist. Selection criteria for discretionary samples could include:

- Moist or discolored zones
- Significant changes in soil grain size
- Odor

Proposed analytical parameters were selected based on process and historical knowledge, sampling data, and discussions during the DQO process. The list of CAS-specific analytes for laboratory analyses is stated in [Section 3.2](#) and [Section A.3.0](#) of [Appendix A](#).

#### **4.4.2 Quality Control Samples**

Quality control samples will be collected as required by the Industrial Sites QAPP (DOE/NV, 1996c). These samples will include trip blanks, equipment blanks, source blanks, field blanks, field duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples. Except for trip blanks, all QC samples will be analyzed for applicable parameters as listed in [Tables A.3-1](#) through [A.3-3](#) for each CAS. Trip blanks will only be analyzed for VOCs. With the exception of MS/MSD, QC

samples shall be submitted to the laboratory blind. Additional QC samples may be submitted at the discretion of the Site Supervisor.

#### 4.4.3 Background Samples

Background data on RCRA metals and radionuclides have been previously generated for Area 3 and Area 9 during past investigations and will be used to evaluate data in the CADD. No background samples will be collected during this investigation.

#### 4.4.4 Geotechnical Samples

In addition to environmental samples, at least one geotechnical sample will be collected from each site to characterize the geologic and hydrologic properties of the soil. Analysis of geotechnical parameters listed in [Table 4-1](#) will be performed by an off-site laboratory. The methods shown are minimum standards, and other equivalent or superior testing methods may be used.

**Table 4-1  
 Geotechnical Analyses**

Analysis	Method
Initial moisture content	ASTM <sup>a</sup> D 2216-92
Dry bulk density	ASTM <sup>a</sup> D 2937-94
Calculated porosity	EM <sup>b</sup> -1110-2-1906 or MOSA <sup>c</sup> Chp. 18
Saturated hydraulic conductivity	ASTM <sup>a</sup> D 2434-68(74) MOSA <sup>c</sup> Chp. 28
Unsaturated hydraulic conductivity	van Genuchten <sup>d</sup>
Particle-size distribution	ASTM <sup>a</sup> D 422-63(90)
Water-release (moisture retention) curve	MOSA <sup>c</sup> Chp. 26 ASTM <sup>a</sup> D 2325-68(94) MOSA <sup>c</sup> Chp. 24 Karathanasis and Hajek <sup>e</sup>

<sup>a</sup>ASTM, 1996

<sup>b</sup>USACE, 1970

<sup>c</sup>MOSA, 1986 (Soil Science Society of America)

<sup>d</sup>van Genuchten, 1980

<sup>e</sup>Karathanasis and Hajek, 1982

#### **4.4.5 Bioassessment Samples**

At least one bioassessment sample will be collected from each site in CAU 406 at the discretion of the Site Supervisor if field screening results detect TPH above the field screening levels. Bioassessment is a series of tests designed to evaluate the physical, chemical, and microbiological characteristics of soil. These tests include determinations of nutrient availability, soil pH, microbial population density, and the ability of the microbial population to grow under enhanced conditions. The data will be used in the evaluation of alternatives in the CADD.

## **5.0 Waste Management**

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Management of investigation-derived waste (IDW) will be based on regulatory requirements, field observations, process knowledge, and the results of laboratory analysis of the CAU investigation samples. Decontamination activities will be performed according to approved contractor procedures specified in the contractor field sampling instructions and as appropriate for the COPCs identified for these CAUs.

Waste other than soil such as disposable sampling equipment, personal protective equipment (PPE), and rinsate, is 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 or other samples may be taken to support waste management activities (e.g., TCLP silver and isotopic uranium soil samples). 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.

No process knowledge has been identified to indicate that any specific “listed” hazardous wastes were released or disposed at the Area 3 or Area 9 photo shops or at the UPS building UDPs. Therefore, if contaminants are identified at these sites, it is likely they would be characteristic rather than listed hazardous wastes.

Process knowledge indicates that listed solvents may have been disposed of via the floor drains at the Heavy Duty Shop. The IDW generated during the investigation of the Heavy Duty Shop UDP will be considered listed waste if either 1,2-dichlorobenzene (ortho-dichlorobenzene) or cresol are identified in associated soil samples. Other contaminants identified at this site, likely would be characteristic rather than listed.

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. No process knowledge indicates radioactive wastes were disposed of in the UDPs other than

possibly CAS 03-51-002-0374 (Heavy Duty Shop UDP). Depleted uranium has been documented as a COPC for this site. However, based on the process knowledge it is not believed that DU will be present in levels which would require disposal as LLW. Therefore, when the waste is initially generated, the waste will be managed according to hazardous waste requirements until laboratory analyses are received and a final waste determination is made.

### **5.1 Waste Minimization**

Corrective action investigation activities have been planned to minimize IDW generation. Decontamination activities will only use as much water as necessary to decontaminate equipment and personnel to minimize the amount of rinsate generated. Disposable sampling equipment, decontamination rinsate, and PPE 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 (e.g., plastic, aluminum foil) and PPE
- Decontamination rinsate
- Soil
- Wastes associated with the use of TPH

Waste will be segregated by waste stream and will be traceable to its source and to associated 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. IDW generated will be managed as potentially hazardous waste until laboratory results indicate either the presence or absence of RCRA regulated constituents.

### **5.3.1 Sanitary Wastes**

Sanitary wastes not directly associated with sampling activities typically consist of plastic, food, and paper products. This waste will be contained in plastic bags and will be transported to an approved solid waste management unit.

### **5.3.2 Low-Level Radioactive Waste**

Radiological COPCs other than DU are not anticipated at these CAUs. Radiological controls, including the requirements detailed in this subsection, will not be instituted unless field-screening results exceed field-screening levels specified in [Section 3.3.1](#). If field-screening levels are exceeded, the waste will be managed as LLW pending analysis. If LLW is generated, it 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).

All drums will be locked or fitted with tamper-indicating devices (TIDs) and labeled “Radioactive Material Pending Analysis.” The drums will be staged at a designated Radioactive Controlled Area pending disposal. If field screening results indicate that activity levels meet the criteria for placement in a Radioactive Materials Area, one will be established.

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

Soil generated during investigation activities that is not returned to the origin of removal will be collected in drums containing 6 mil liners. Drums used to contain soil shall be inspected prior to use. If a drum is damaged, cannot be locked, or cannot accommodate a TID, it shall not be used.

Absorbent Stergo™ pads shall be added to drums of radiologically contaminated soil.

Contractor-specific waste tracking tags shall be used and may be attached to the inside liner, the exterior of the drums, or marked with the drum’s unique identification number, and stored with the contractor-specific logbook. The sample number must be placed on each tracking tag. Drum inspection and absorbent addition shall be documented on the appropriate form.

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

### **5.3.3 Hydrocarbon**

The action level for soil contaminated with hydrocarbons is 100 mg/kg in the State of Nevada (NAC, 1998b). Soils and associated IDW with TPH levels above 100 mg/kg which contains RCRA regulated constituents below regulatory limits shall be managed as hydrocarbon waste and shall be disposed of in accordance with all applicable regulations.

### **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 in accordance with 49 *Code of Federal Regulations* (CFR) 172 (CFR, 1998d) which 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, incompatible waste encountered in the field 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 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 will be marked with the words "Hazardous Waste Pending Analysis" until its regulatory status can be determined through interpretation and evaluation of laboratory results. The IDW shall be traceable to its source and to associated samples. Traceability shall be maintained by assigning a unique waste tracking number to each container and by maintaining records that trace the IDW back to the samples. After receipt of analytical results, if

hazardous waste is identified, it will be labeled and marked in accordance with the requirements of 40 CFR 262.31 and 40 CFR 262.32 (CFR, 1998b) and State of Nevada requirements.

Hazardous waste, if identified, will be evaluated against the *Nevada Test Site Performance Objectives for Certification of Nonradioactive Hazardous Waste* (BN, 1995).

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

Suspected hazardous waste will be accumulated in a HWAA 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 Wastes**

No mixed waste is expected to be generated at this site. However, if mixed waste is generated, the waste 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 they are not required for radioactive waste. Conversely, while RCRA does not require documented traceability, the NTSWAC 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 licensed hazardous waste hauler to the Nevada Test Site 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 the DOE and the State of Nevada (NDEP, 1995). NDEP will be notified if any mixed waste is generated.

## **6.0 *Duration and Records Availability***

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### **6.1 *Duration***

After the submittal of the CAIP to NDEP (FFACO milestone date of June 30, 1999), 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. Samples will be shipped to meet laboratory holding times.
- Day 110: The field work will be completed.
- Day 185: The quality-assured laboratory analytical sample data will be available for review.
- The FFACO date for the CADD is March 31, 2000.

### **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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# **Appendix A**

## **Data Quality Objectives**

## ***A.1.0 Introduction***

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### ***A.1.1 Problem Statement***

Potentially hazardous wastes were discharged to the UDP systems that comprise CAU 406 (CASs 03-51-002-0374 and 03-51-003-0358) and CAU 429 (CASs 03-51-001-0355 and 09-51-001-0952). Existing information about the nature and extent of contamination is insufficient to evaluate and select preferred corrective actions for these sites.

These CAUs will be investigated based on DQOs developed by representatives of NDEP and DOE/NV. This investigation will determine if COPCs are present and if concentrations exceed regulatory levels in soils surrounding the UDPs. If COPCs are detected, the lateral and vertical extent of contamination will be delineated. 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 CAUs. 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	Meeting Date
		Kickoff Meeting August 4, 1998	February 25, 1999
Steve Adams	IT	X	
Rob Boehlecke	SAIC	X	
Kevin Cabble	DOE	X	X
Mark DiStefano	IT	X	
Syl Hersh	IT	X	
Jodi Markowsky	SAIC	X	
Mike McKinnon	NDEP	X	
Jason Moore	SAIC	X	X
Greg Raab	NDEP	X	
Cheryl Rodriquez	IT	X	
Jeff Smith	BN	X	
Mary Todd	SAIC	X	
Jeanne Wightman	Mactec	X	
Dawn Arnold	SAIC		X
Shannon Parsons	BN		X

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

## ***A.2.0 Conceptual Model***

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Before the early 1990s, UDPs were used to dispose of liquid waste related to several operations at the TTR, Nevada. The UDPs are typically subgrade shallow dry wells or excavations filled with gravel. Waste liquids were discharged to the UDPs via distribution lines and allowed to percolate into the surrounding soil for disposal. [Section 2.0](#) of the CAIP describes the UDPs, their operational histories, waste inventories, release information, and investigative backgrounds.

The conceptual model for the CAU 406 and CAU 429 UDPs is provided in [Table A.2-1](#).

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

Conceptual Model Element	Description	Source
Heavy Duty Shop UDP (CAS 03-51-002-0374)	Exact location uncertain, but most likely at south end of Area 3 West Gate culvert	DOE/NV, 1996a; SNL, 1985; Quas, 1998a; and Process knowledge
	Likely a gravel-filled excavation that received effluent from the Building 03-74 floor drains and steam cleaning pad drains; gravel trench was reportedly "mucked out" periodically and the resultant contaminated fill material disposed in Area 3 Landfill(s)	Quas, 1998a
	Heavy Duty Shop UDP operated from 1981 or 1983 to around 1985 or 1988	Quas, 1998a; SNL, 1992; and Process knowledge
	May have received antifreeze, petroleum products, hydraulic fluids, solvents, metals, and corrosive chemicals washed off shop floor or dislodged during equipment cleaning	DOE/NV, 1996a; Atencio, 1994; and Quas, 1998a
	May have received radioactive material derived from washing trucks that transported test units containing depleted uranium components	Smith, 1998; West, 1998
	Volumes of water and COPCs disposed of through the UDP system are unknown; relatively large amounts of water and relatively small amounts of COPCs were discharged	Process knowledge
UPS Building UDPs (CAS 03-51-003-0358)	Two UDPs located approximately 10 ft west of Building 03-58	Quas, 1993; DOE/NV, 1996a
	UDP's probably constructed from subgrade gravel filled 55-gal drums, possibly unlined gravel pits; features may have been removed during unrelated historical diesel remediation	Quas, 1998a; Quas, 1993
	May have received trace amounts of waste from floor drains located in Building 03-58; however, no evidence for intentional routine disposal through these floor drains. While some waste (i.e., drips, leaks, spills) was washed down the floor drains, all routine maintenance wastes (i.e., oil changes) were transported to maintenance shops for disposal	SNL, 1990-93; Quas, 1998b
	May have received trace amounts of diesel fuel, motor oil, and antifreeze	Quas, 1998b; IT 1994a
	At least two accidental releases of diesel fuel occurred at the surface; most contaminated soil was removed. Distinguishing between diesel related to the UDP system and diesel remaining after the surface spills clean up operations will be difficult; known diesel-contaminated soil remains under Building 03-58	Quas, 1993; DOE/NV, 1996a; Forston, 1998; and SNL, 1998

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

Conceptual Model Element	Description	Source
Area 3 Photoprocessing Lab (CAS 03-51-001-0355)	Primary UDP approximately 240 ft south of Building 03-55. Secondary UDP subsequently installed 30 ft southeast of primary UDP	AEC, 1964; SNL, 1989
	Both UDPs constructed from 4-ft diameter, 10-ft deep vertical steel culvert filled with gravel	Quas, 1994; DOE/NV, 1996a
	Primary UDP installed in 1964, but secondary UDP installation date is unknown. Both units operated until approximately 1989	AEC, 1964; SNL, 1989
	Received photoprocessing chemicals from color and black and white film development, including silver nitrate, acids, caustics, corrosives, and solvents	Phelan, 1988a; Schirber, 1984
	Silver recovery system installed sometime after 1987	Blackburn, 1998; SNL 1987; preliminary assessment notes
	Major COPC is silver; soils probably buffered other contaminants	Process knowledge
	May have received as much as 250,000 gallons of effluent per year; rough estimate of typical chemical/water mixture is 0.1 gram per 100 gallons of water	Phelan, 1988b; Smith, 1994b
Area 9 Mobile Photo Labs (CAS 09-51-001-0952)	Two UDPs and septic tank associated with septic system installed for Building 09-52 restroom; located near northeast corner of Building 09-52	SNL, 1982a and b
	At the surface, the UDPs are 3-ft by 3-ft square excavations lined with concrete blocks and filled with gravel. The UDPs are approximately 10 ft deep	DOE/NV, 1996a; SNL, 1982b
	X-ray radiography film processing waste disposed of from early 1980s to early 1990s.	Smith, 1998; Bull, 1998; DOE/NV, 1996a
	Received low concentrations of silver and photoprocessing chemicals including acids, bases, and corrosives	Smith, 1994a
	Silver from X-ray radiography film processing is major COPC. According to sampling results, historical records and personnel interviews, no other potentially hazardous or radioactive contaminants were disposed of in this system	IT, 1994b; Samuelson, 1998; and process knowledge
	Total volume and concentration of photoprocessing chemicals used unknown	Smith, 1994b
	No process waste associated with Building 09-52 electronics shop activities were disposed of through the bathroom drains. General meetings for explosives work and electronic workups for explosive components are performed in this building	Samuelson, 1998; Fahrenheit, 1998a and b

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

Conceptual Model Element	Description	Source
Lateral extent of potential contaminants	Subsurface effects limited by relatively low contaminant concentrations and volume and/or low mobility of constituents	Process knowledge
	Potential UDP surface overflow complicates Heavy Equipment Shop and Area 3 Photoshop site investigations	
	The radius of lateral contamination is not expected to extend beyond 10 times the width of the UDP	Proportions based on experience with CAU 423
Vertical extent of potential contaminants	Vertical extent is unknown but is limited by low contaminant concentrations and volumes, lack of driving force, relatively low mobility of COPCs, and typically decreasing permeability with increasing depth	Process knowledge
	Vertical contamination is not expected to exceed 3 times the vertical dimension of the UDP below the UDP base	Proportions based on experience with CAU 423
System dynamics	COPCs primarily in liquid form were released to the UDPs; effluent was mainly water with small amounts of contaminants	Quas, 1998a; R. Smith, 1998; and process knowledge
	Migration is primarily gravity controlled, but geologic control at depth may influence or limit contaminant migration.	Process knowledge
	The UDPs are no longer in service; however, the Building 09-52 septic system is functional but abandoned	FADLs
	Arid climate limits infiltration; evapotranspiration rates are high	TTR Workplan (DOE/NV, 1996a)
	The migration of contamination at the Building 03-60 UDP (CAU 423), a similar site nearby, was limited both laterally and vertically	DOE/NV, 1998
Physical and practical constraints	Nearby utilities and buildings; adverse weather conditions; restricted access; U.S. Air Force and/or Sandia range activities	Process knowledge
Future use	Similar to current use (light industrial)	DOE/NV, 1996b
Potential exposures	Oral ingestion, inhalation, or dermal contact (absorption) of COPCs in the soil due to inadvertent exposure during excavation	Process knowledge
	Very low exposure potential related to unlikely groundwater contamination. Ground water is estimated to be at least 130 feet below Area 9 and 360 feet below Area 3. These depths are between 2.5 and nearly 10 times the expected maximum contamination depths.	DOE/NV, 1996a; and process knowledge

### ***A.3.0 Potential Contaminants***

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[Section 3.0](#) of the CAIP provides additional information on the COPCs for the UDP CAUs, including PALs and QA/QC requirements ([Table A.3-1](#)).

The COPCs for the UDPs form two basic groups:

- CAU 406 UDPs mainly received hydrocarbons associated with motorized equipment maintenance and operation and includes coolants, oils, fuels, and solvents. Only trace amounts of these products are expected. [Tables A.3-1](#) and [A.3-2](#) identify the COPCs for each CAS in CAU 406.
- CAU 429 UDPs mainly received RCRA Metals (especially silver) associated with photoprocessing waste. [Table A.3-3](#) identifies the COPCs for CAU 429.

**Table A.3-1  
CAU 406 Contaminants of Potential Concern  
(Heavy Duty Shop, CAS 03-51-002-0374)**

Potential Contaminants	Comments	Field Screening Method	Field Screening Level	Conduct Analytical?	Preliminary Action Level	Analytical Method	Practical Quantitation Limit (soil/water)
Volatile Organic Compounds	Waste discharged includes coolants, oils, fuels, and solvents	Headspace	20 ppm or 2.5X background (use greater value)	Yes	PRGs <sup>a</sup> NAC 445A <sup>b</sup>	See Appendix C	See Appendix C
Semivolatile Organic Compounds	Waste discharged includes coolants, oils, fuels, and solvents	N/A	N/A	Yes	PRGs <sup>a</sup> NAC 445A <sup>b</sup>		
Total RCRA Metals	Metals may have been discharged at the Heavy Duty Shop UDP	N/A	N/A	Yes	PRGs <sup>a</sup> NAC 445A <sup>b</sup>		
Total Petroleum Hydrocarbons	Waste discharged includes coolants, oils, fuels, and solvents	Hanby™	>100 ppm	Yes	100 ppm <sup>b</sup> NAC 445A		
Total PCBs	Highly unlikely, but transformers oils may have entered the Heavy Duty Shop or Steam Cleaning Pad drains	N/A	N/A	Yes	PRGs <sup>a</sup> NAC 445A <sup>b</sup>		
Radionuclides	Unlikely, but some radioactive material may have been washed from vehicles into UDP	Electra™ (alpha/beta scintillator)	Mean plus 2 standard deviations of 20 background sample readings	Only if field screening criteria exceeded	Isotope-specific value based on maximum isotopic background data		
Pesticides and Herbicides	Not expected	N/A	N/A	No			

<sup>a</sup>EPA Region IX Preliminary Remediation Goals (PRGs) (EPA, 1998)

<sup>b</sup>Nevada Administrative Code (NAC, 1998)

N/A - Not applicable

**Table A.3-2  
CAU 406 Contaminants of Potential Concern  
(Uninterrupted Power Supply Building, CAS 03-51-003-0358)**

Potential Contaminants	Comments	Field Screening Method	Field Screening Level	Conduct Analytical?	Preliminary Action Level	Analytical Method	Practical Quantitation Limit (soil/water)
Volatile Organic Compounds	Unlikely	Headspace	20 ppm or 2.5X background (use greater value)	No			
Semivolatile Organic Compounds	Unlikely	N/A	N/A	No			
Total RCRA Metals	Unlikely	N/A	N/A	No			
Diesel/Waste Oil Range Petroleum Hydrocarbons	Small amounts of diesel, motor oil, and antifreeze were probably discharged to the UDPs	Hanby™	>100 ppm	Yes	100 ppm NAC 445A <sup>a</sup>	See <a href="#">Appendix C</a>	See <a href="#">Appendix C</a>
Total PCBs	Unlikely, but UPS building may have housed a transformer	N/A	N/A	Yes	PRGs <sup>b</sup> NAC 445A <sup>a</sup>		
Radionuclides by Gamma Spectroscopy	Unlikely	Electra™ (alpha/beta scintillator)	Mean plus 2 standard deviations of 20 background sample readings	Only if field screening criteria exceeded	Isotope-specific value based on maximum isotopic background data		
Pesticides and Herbicides	Not expected	N/A	N/A	No			

<sup>a</sup>Nevada Administrative Code (NAC, 1998)

<sup>b</sup>EPA Region IX Preliminary Remediation Goals (PRGs) (EPA, 1998)

N/A - Not applicable

**Table A.3-3  
CAU 429 Contaminants of Potential Concern**

Potential Contaminants	Comments	Field Screening Method	Field Screening Level	Conduct Analytical?	Preliminary Action Level	Analytical Method	Practical Quantitation Limit (soil/water)
TCLP Metals	Likely (esp. silver)	X-ray fluorescence (XRF)	<100 ppm	Limited	40 CFR 261.24 Table 1 <sup>a</sup>	See <a href="#">Appendix C</a>	See <a href="#">Appendix C</a>
Total RCRA Metals				Yes	PRGs <sup>b</sup> NAC 445A <sup>c</sup>		
Volatile Organic Compounds	Possible, not expected	Headspace	20 ppm or 2.5X background (use greater value)	Yes	PRGs <sup>b</sup> NAC 445A <sup>c</sup>		
Semivolatile Organic Compounds	Possible, not expected	N/A	N/A	Yes	PRGs <sup>b</sup> NAC 445A <sup>c</sup>		
Total Petroleum Hydrocarbons	Not expected	N/A	N/A	No			
Radionuclides	Not expected (elevated beta results in Area 9 septic tank sample)	Electra <sup>TM</sup> (alpha/beta scintillator)	Mean plus 2 standard deviations of 20 background sample readings	Only if field screening criteria exceeded	Isotope-specific value based on maximum isotopic background data	See <a href="#">Appendix C</a>	See <a href="#">Appendix C</a>
Pesticides and Herbicides	Not expected	N/A	N/A	No			
Polychlorinated Biphenyls	Not expected	N/A	N/A	No			

<sup>a</sup>Title 40 Code of Federal Regulations Part 261 (CFR, 1998)

<sup>b</sup>EPA Region IX Preliminary Remediation Goals (PRGs) (EPA, 1998)

<sup>c</sup>Nevada Administrative Code (NAC, 1998)

N/A - Not applicable

## ***A.4.0 Decisions and Inputs***

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### ***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 2)

Decision	Input	Existing Data	Data Gap	Strategy
Are COPCs present above PALs at site?	Potential contaminant identification	Process knowledge of potential discharges	Exact COPCs	Collect laboratory samples; analyze for COPCs
	Potential contaminant concentration	No sampling data available; septic tank samples from Building 09-52 septic tank are available	COPC concentrations; do concentrations exceed PALs?	Collect field screening and laboratory samples at biased locations that represent worst case for contamination; compare results to field screening levels or to PALs
	Potential contaminant distribution	Locations of UDPs are known or generally known with some degree of certainty; vertical and lateral extent limited by small concentrations and volumes, lack of driving force, mobility of COPCs	Exact vertical and lateral extent	Excavate to locate discharge lines and UDPs as needed; drill through center of UDPs to establish worst case depth of COPCs; drill step-out borings to determine lateral extent if COPCs are detected; collect laboratory samples to confirm extent
Are potential contaminants migrating?	Meteorologic data	Data on annual precipitation, evapotranspiration, and weather	None identified	No specific meteorological data collection anticipated; weather and wind speed and direction noted on daily field notes
	Geologic/hydrologic data	General geologic/hydrologic characteristics of site; specific geologic conditions of nearby sites (i.e., CAU 423, 427, 453)	Existence and characteristics of differing permeability zones	Field log all core by qualified geologist; collect and analyze geotechnical samples
	Biological degradation factors	Potential hydrocarbons release in CAU 406	Presence of biomass; biological parameters to evaluate natural biological process	Collect microbial samples from hydrocarbon sites for analysis of biological parameters
	Radioactive decay	Radionuclides not expected in Area 3; low probability of DU at Heavy Duty Shop	Presence and type of radionuclides at CAU 406	Establish background; field screen for alpha/beta radiation using Electra™ instruments; collect samples for gamma spec based on field screening

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

Decision	Input	Existing Data	Data Gap	Strategy
Data sufficient to support closure options?	No further action	Historical evidence that COPCs released to the environment; assume no actions	Presence, concentration, and extent of COPCs	Insufficient evidence to proceed without investigation. Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/Closure Report
	Closure in place	Potential for TPH and RCRA constituents; assume industrial PRGs per NAC 445A (NAC, 1998); assume use restrictions with signs and fencing as needed	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
	<i>In situ</i> bioremediation	Hydrocarbons release in CAU 406; assume 100 ppm PAL per NAC 445A	Presence, concentration, and extent of COPCs; biodegradation parameters	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 TPH and RCRA constituents; assume industrial PRGs per NAC 445A	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

## ***A.5.0 Investigation Strategy***

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Samples collected from both CAUs will be analyzed according to the appropriate COPC table as provided in [Section A.3.0](#). At least one geotechnical sample will be collected from each site and analyzed for:

- Initial moisture content
- Dry bulk density
- Calculated porosity
- Moisture retention characteristics
- Particle size distribution
- Saturated and unsaturated hydraulic conductivity

At least one bioassessment sample will be collected from each site in CAU 406 if field screening detects COPCs.

Investigation of these CAUs may include use of a backhoe, direct-push method, and or hollow stem auger drill rig.

### ***A.5.1 Heavy Duty Maintenance Shop UDP***

Investigate the UDP using a three-phased approach:

- Excavate two to three trenches perpendicular to expected discharge line location; use video mole to inspect discharge line condition if possible:
  - Between Area 3 West Fence and perimeter road
  - At location of expected bend in discharge line near existing loading dock
  - At additional locations if required due to breaks in discharge line
- Collect direct-push samples from 1 and 5 ft bgs in wash
  - Expected UDP location (south end of culvert)
  - North end of culvert

- 50 and 100 ft south of UDP
- 100 and 200 ft north of UDP
- Drill 1 borehole to 40 ft bgs at UDP location (UDP assumed <10 ft deep)
  - 5 ft field screening and sampling interval
  - Drill three stepout borings in triangular pattern at 25 ft from the UDP if field screening levels are exceeded
  - Additional stepout borings may be drilled as required

### **A.5.2 Uninterrupted Power Supply Building UDPs**

Investigate the UDPs using a two phased approach:

- Excavate three trenches
  - Two trenches parallel to discharge lines
  - One trench perpendicular to and across two previous trenches at assumed UDP location
- Collect samples from excavations at assumed UDP locations

The second phase of this investigation will be initiated if COPCs are detected above field screening levels at the inferred UDP locations. One borehole will be drilled to 30 ft bgs approximately 10 ft west of Building 03-58 near the approximate location of the two UDPs or based on the results of the excavation activities in phase one. Field screening will be conducted in 5-ft intervals. If COPCs are detected above field screening levels in this borehole, three stepout boreholes will be drilled in a triangular pattern 15 ft from this borehole. It will be difficult to distinguish between contamination related to surface fuel spills and waste liquid disposal related to the UDPs in both field screening and laboratory analysis. Additional stepout borings may be drilled as required.

### **A.5.3 Area 3 Photoshop UDPs**

The location of these UDPs and the nature of contamination is well constrained. This site will be investigated in a three-phased approach:

- Collect direct-push samples from 1 and 3 ft bgs in a 25-ft radius triangular pattern centered on primary UDP to detect potential surface or near surface contamination associated with overflow.

- Drill borehole through initial UDP to 40 ft bgs.
  - 5-ft field screening and sampling interval
  - Drill three 25-ft radius stepout borings in triangular pattern if field screening results exceed screening levels
- Drill borehole through secondary UDP to 40 ft bgs.
  - 5-ft field screening and sampling interval
  - Drill three 25-ft radius stepout borings in triangular pattern if field screening results exceed screening levels
  - Additional stepout borings may be drilled as required

#### **A.5.4 Area 9 Mobile Photo Labs UDPs**

The location of these UDPs and the nature of contamination is well constrained. Investigation of this site will require sampling the septic tank and drilling a borehole to 40 ft bgs through each UDP. A 5-ft field screening and sampling interval will be used. If PALs are exceeded, 15-ft radius stepout borings will be drilled in a triangular pattern around the particular borehole(s). To prevent unauthorized discharge of materials to the UDP system, the line from Building 09-52 to the septic tank will be excavated and capped. Soil samples from the influent and effluent ends of the septic tank will be sampled either through excavation or drilling. Additional stepout borings may be drilled as required.

## ***A.6.0 Decision Rules***

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The following decision rules are applicable to all four UDP CASs and 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 as necessary:
  - The conceptual model fails to such a degree that rescoping is required.
  - Sufficient data are collected to support evaluation of corrective actions.
- For the subsurface investigation, if field screening indicates no COPCs above field-screening 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 levels, then the investigation will continue to determine extent of COPCs until two, consecutive samples with field screening results below field screening levels are obtained. Samples will be collected for laboratory analysis at the subsurface interval that represents the worst-case, field-screening result and as stated in the previous bulleted item.
- 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 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.

Table A.6-1 provides additional decision points and rules specific to each CAS.

**Table A.6-1**  
**CAS-Specific Decision Points and Rules**  
 (Page 1 of 2)

Investigation Activity	Decision Point	Decision Result	Decision Rule
<b>Heavy Duty Shop UDP (CAS 03-51-002-0374)</b>			
Trenching	Can discharge line system be located?	Yes	Proceed with surface and subsurface investigation
		Yes, but in a different location	Adjust investigation location
		No	Line may have been removed; proceed with surface and subsurface investigation; evaluate field data to determine if investigation is properly located; notify NDEP; adjust investigation location as required
Surface and Near-Surface Investigation	Do field data from the wash upgradient and downgradient of the UDP indicate contamination above field screening levels?	No	UDP represents point source; continue with planned subsurface investigation
		Yes	UDP represents potential surface discharge; conceptual model fails; notify NDEP and rescope investigation
Subsurface Investigation: Drill through UDP; field screen at 5-foot intervals	Are field data above field screening levels?	No	Collect confirmatory samples from bottom of boring and end investigation
		Yes	Continue drilling to obtain two consecutive samples below field screening levels; drill step-out borings as needed to define lateral extent of contamination

**Table A.6-1**  
**CAS-Specific Decision Points and Rules**  
 (Page 2 of 2)

Investigation Activity	Decision Point	Decision Result	Decision Rule
<b>UPS UDPs (CAS 03-51-003-0358)</b>			
Pipeline Camera Survey and Trenching	Can discharge line and UDP locations be identified?	Yes	Proceed with surface and subsurface investigation
		Yes, but in a different location	Adjust investigation location
		No	Lines and UDPs may have been removed; proceed with surface and subsurface investigation; evaluate field data to determine if investigation is properly located; notify NDEP; adjust investigation location as required
<b>Photoprocessing UDPs (CAS 03-51-003-0358 &amp; 09-51-001-0952)</b>			
Field Screening of Soil for Silver	Does XRF reliably indicate silver?	Yes	Proceed with surface and subsurface investigation
		Unknown	Collect additional samples for laboratory analysis; use alternate soil screening technique(s)
		No	Notify NDEP, use alternate soil screening technique(s)

## ***A.7.0 Decision Error***

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Biased sampling will be conducted on surface and subsurface samples at CAUs 406 and 429 as identified in [Section A.4.0](#), [A.5.0](#), and [A.6.0](#). Biased sampling is appropriate because the UDPs are believed to be point sources and the locations are known or can be reasonably assumed. For the Heavy Duty Shop UDP, the assumed location will be verified prior to the surface and subsurface investigation. [Section A.6.0](#) describes actions if the location cannot be identified. Because biased sampling is to be performed, confidence levels are built into the sampling program. The sampling strategy targets the worst-case contamination by drilling through, field screening, and sampling the individual UDPs. This will reduce the possibility of false positives and yield the highest confidence that the contamination problem has been adequately located and identified. Statistical sampling is not necessary for this type of investigation. In lieu of a quantitative determination of sampling error, the false positive error will be minimized by the following actions: two consecutive samples below field screening levels will be obtained from the soil borings to define the lower limit of the affected soils, and these field screening results will be confirmed clean through off-site laboratory analysis.

## ***A.8.0 References***

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# **Appendix B**

## **Project Organization**

## ***B.1.0 Project Organization***

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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**

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

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

**Appendix C**  
**Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and**  
**Radiochemistry Analytical Requirements for Industrial Sites**  
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Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD) <sup>a</sup>	Percent Recovery (%R) <sup>b</sup>
Hexachlorobenzene	Aqueous	1311/8270C <sup>c</sup>	0.10 mg/L <sup>d</sup>	0.13 mg/L <sup>d</sup>	50 <sup>e</sup>	9-127 <sup>e</sup>
Hexachlorobutadiene			0.10 mg/L <sup>d</sup>	0.5 mg/L <sup>d</sup>		
Hexachloroethane			0.10 mg/L <sup>d</sup>	3 mg/L <sup>d</sup>		
Nitrobenzene			0.10 mg/L <sup>d</sup>	2 mg/L <sup>d</sup>		
Pentachlorophenol			0.50 mg/L <sup>d</sup>	100 mg/L <sup>d</sup>		
Pyridine			0.10 mg/L <sup>d</sup>	5 mg/L <sup>d</sup>		
2,4,5-Trichlorophenol			0.10 mg/L <sup>d</sup>	400 mg/L <sup>d</sup>		
2,4,6-Trichlorophenol			0.10 mg/L <sup>d</sup>	2 mg/L <sup>d</sup>		
Total Pesticides	Water	8081A <sup>c</sup>	Analyte-specific (CRQL) <sup>e</sup>	NA	27 <sup>e</sup>	38-131 <sup>e</sup>
	Soil				50 <sup>e</sup>	23-139 <sup>e</sup>
TCLP Pesticides						
Chlordane	Aqueous	1311/8081A <sup>c</sup>	0.0005 mg/L <sup>e</sup>	0.03 mg/L <sup>d</sup>	27 <sup>e</sup>	38-131 <sup>e</sup>
Endrin			0.001 mg/L <sup>e</sup>	0.02 mg/L <sup>d</sup>		
Heptachlor			0.0005 mg/L <sup>e</sup>	0.008 mg/L <sup>d</sup>		
Heptachlor Epoxide			0.0005 mg/L <sup>e</sup>	0.008 mg/L <sup>d</sup>		
Gamma-BHC (Lindane)			0.0005 mg/L <sup>e</sup>	0.4 mg/L <sup>d</sup>		
Methoxychlor			0.005 mg/L <sup>e</sup>	10 mg/L <sup>d</sup>		
Toxaphene			0.05 mg/L <sup>e</sup>	0.5 mg/L <sup>d</sup>		
Polychlorinated Biphenyls (PCBs)	Water	8082 <sup>c</sup>	Analyte-specific contract required quantitation limits (CRQL) <sup>e</sup>	NA	Lab-specific <sup>f</sup>	Lab-specific <sup>f</sup>
	Soil					
Total Herbicides	Water	8151A <sup>c</sup>	1.3 µg/L <sup>c</sup>	NA	Lab-specific <sup>f</sup>	Lab-specific <sup>f</sup>
	Soil		66 µg/kg <sup>c</sup>			
TCLP Herbicides						
2,4-D	Aqueous	1311/8151A <sup>c</sup>	0.002 mg/L <sup>d</sup>	10 mg/L <sup>d</sup>	Lab-specific <sup>f</sup>	Lab-specific <sup>f</sup>
2,4,5-TP			0.00075 mg/L <sup>d</sup>	1 mg/L <sup>d</sup>		

**Appendix C**  
**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) <sup>a</sup>	Percent Recovery (%R) <sup>b</sup>
Total Petroleum Hydrocarbons (TPH)	Water Gasoline	8015B modified <sup>c</sup>	0.1 mg/L <sup>g</sup>	NA	Lab-specific <sup>f</sup>	Lab-specific <sup>f</sup>
	Soil Gasoline		0.5 mg/kg <sup>g</sup>			
	Water Diesel		0.5 mg/L <sup>g</sup>			
	Soil Diesel		25 mg/kg <sup>g</sup>			
Explosives	Water	8330 <sup>c</sup>	14 µg/L <sup>c</sup>	NA	Lab-specific <sup>f</sup>	Lab-specific <sup>f</sup>
	Soil		2.2 mg/kg <sup>c</sup>			
Polychlorinated Dioxins and Furans	Water	8280A/8290 <sup>c</sup>	0.05 µg/L <sup>c</sup>	NA	Lab-specific <sup>f</sup>	Lab-specific <sup>f</sup>
	Soil		5 µg/kg <sup>c</sup>			
<b>INORGANICS</b>						
Total Resource Conservation and Recovery Act (RCRA) Metals						
Arsenic	Water	6010B/7470A <sup>c</sup>	10 µg/L <sup>g,h</sup>	NA	20 <sup>h</sup>	75-125 <sup>h</sup>
	Soil	6010B/7471A <sup>c</sup>	1 mg/kg <sup>g,h</sup>			
Barium	Water	6010B/7470A <sup>c</sup>	200 µg/L <sup>g,h</sup>			
	Soil	6010B/7471A <sup>c</sup>	20 mg/kg <sup>g,h</sup>			
Cadmium	Water	6010B/7470A <sup>c</sup>	5 µg/L <sup>g,h</sup>			
	Soil	6010B/7471A <sup>c</sup>	0.5 mg/kg <sup>g,h</sup>			
Chromium	Water	6010B/7470A <sup>c</sup>	10 µg/L <sup>g,h</sup>			
	Soil	6010B/7471A <sup>c</sup>	1 mg/kg <sup>g,h</sup>			
Lead	Water	6010B/7470A <sup>c</sup>	3 µg/L <sup>g,h</sup>			
	Soil	6010B/7471A <sup>c</sup>	0.3 mg/kg <sup>g,h</sup>			
Mercury	Water	6010B/7470A <sup>c</sup>	0.2 µg/L <sup>g,h</sup>			
	Soil	6010B/7471A <sup>c</sup>	0.1 mg/kg <sup>g,h</sup>			
Selenium	Water	6010B/7470A <sup>c</sup>	5 µg/L <sup>g,h</sup>			
	Soil	6010B/7471A <sup>c</sup>	0.5 mg/kg <sup>g,h</sup>			
Silver	Water	6010B/7470A <sup>c</sup>	10 µg/L <sup>g,h</sup>			
	Soil	6010B/7471A <sup>c</sup>	1 mg/kg <sup>g,h</sup>			

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

## Appendix C

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

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<sup>a</sup>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:

$RPD = 100 \times \frac{|C_1 - C_2|}{(C_1 + C_2)/2}$ , where  $C_1$  = Concentration of the analyte in the first sample aliquot,  $C_2$  = Concentration of the analyte in the second sample aliquot.

<sup>b</sup>%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:  $\%R = 100 \times (C_s - C_u / C_n)$ , 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

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

<sup>d</sup>Estimated Quantitation Limit as given in SW-846 (EPA, 1996)

<sup>e</sup>EPA Contract Laboratory Program Statement of Work for Organic Analysis (EPA, 1988b; 1990; 1991; and 1994b)

<sup>f</sup>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  $\pm 2$  SD and  $\pm 3$  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.

<sup>g</sup>*Industrial Sites Quality Assurance Project Plan* (DOE/NV, 1996)

<sup>h</sup>EPA Contract Laboratory Program Statement of Work for Inorganic Analysis (EPA, 1988a; 1993; and 1994a)

<sup>i</sup>RCRA Regulations and Keyword Index, 1998 Edition

<sup>j</sup>Isotopic minimum detectable concentrations are defined during the DQO process and specified in the CAIP as applicable

<sup>k</sup>*Prescribed Procedures for Measurements of Radioactivity in Drinking Water* (EPA, 1980) or equivalent method

<sup>l</sup>*Environmental Measurements Laboratory Procedures Manual* (DOE, 1992) or equivalent method

<sup>m</sup>Isotope-Specific Minimum Reporting Limit to be specified in CAIP

<sup>n</sup>The Radiochemistry of Plutonium (Coleman, 1965) or equivalent method

<sup>o</sup>*Separation and Preconcentration of Actinides from Acidic Media by Extraction Chromatography* (Horwitz, 1993) or equivalent method

<sup>p</sup>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)

<sup>q</sup>The Radiochemistry of Uranium (Grindler, 1962) or equivalent method

<sup>r</sup>*Separation and Preconcentration of Uranium from Acidic Media by Extraction Chromatography* (Horwitz, 1992) or equivalent method

<sup>s</sup>Standard Methods for the Examination of Water and Waste Water (APHA, 1992) or equivalent method

<sup>t</sup>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)

<sup>u</sup>Determination of Strontium-89 and -90 in soil with Total Sample Decomposition (Analytical Chemistry, 1979) or equivalent method

<sup>v</sup>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:

$\mu\text{g}/\text{kg}$  = Microgram(s) per kilogram

$\text{mg}/\text{kg}$  = Milligram(s) per kilogram

$\text{pCi}/\text{L}$  = Picocurie(s) per liter

$\text{mg}/\text{L}$  = Milligram(s) per liter

$\text{pCi}/\text{g}$  = Picocurie(s) per gram

$\mu\text{g}/\text{L}$  = Microgram(s) per liter

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

# **Appendix D**

## **NDEP Comments**

## NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number: Corrective Action Investigation Plan for Corrective Action Unit 406: Area 3 Building 03-74 & Building 03-58 Underground Discharge Points and Corrective Action Unit 429: Area 3 Building 03-55 & Area 9 Building 09-52 Underground Discharge Points, TTR, NV Draft		2. Document Date: March 1999		
3. Revision Number: 0		4. Originator/Organization: IT Corporation		
5. Responsible DOE/NV ERP Project Mgr.: Janet Appenzeller-Wing		6. Date Comments Due:		
7. Review Criteria:				
8. Reviewer/Organization/Phone No.: Gregory Raab, NDEP. 486-2867			9. Reviewer's Signature:	
10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
1) Page ES-2 of ES-3, 1 <sup>st</sup> Paragraph After Bullet List		A more detailed conceptual <u>site</u> model is presented ...The conceptual <u>site</u> model serves...	The text has been added.	Yes
2) Section 3.1 Page 19 of 52, 1 <sup>st</sup> Paragraph After 2 <sup>nd</sup> Sentence		The cross-section in Figure 2-1 depicts a graphical representation of the estimated COPCs	The text has been added.	Yes
3) Section 3.1, Page 19 of 52, 2 <sup>nd</sup> Paragraph, 1 <sup>st</sup> Sentence		The <del>description of the</del> conceptual site model presented...	The text has been added.	Yes

## NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
4) Section 3.3.3, Page 25 of 52, Radiological Preliminary Action Levels, 1 <sup>st</sup> Paragraph		The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) has not yet been agreed to by NDEP for use at the NTS. NDEP cannot concur with this method until DOE establishes how MARSSIM integrates with other DOE radiological survey protocols.	Section 3.3.3, 1 <sup>st</sup> paragraph, has been changed to read as follows:  "The PALs for radionuclides are isotope-specific and are defined as the maximum concentration for that isotope found in environmental samples taken from undisturbed background locations. Environmental background samples previously taken in the vicinity of Area 3 and Area 9 at the TTR (in the vicinity of CAUs 406 and 429) will be compared with the results for environmental samples taken from other undisturbed background locations on the TTR. In addition, the radionuclide concentrations in the CAUs 406 and 429 and TTR background samples will be compared with the radionuclide concentrations found in environmental samples taken from undisturbed background locations in the vicinity of the NTS, presented in McArthur and Miller (1989) and Atlan-Tech (1992). The PAL for each isotope will be the maximum concentration of that isotope found in any of the samples taken from the undisturbed background location described above."	Yes
5) Section 5.3.5, Page 46 of 52, Mixed Waste, Last Paragraph after First Sentence		NDEP will be notified if any mixed waste is generated.	The text has been added to the end of the last paragraph.	Yes

<sup>a</sup> Comment Types: M = Mandatory, S = Suggested.

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

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