Nevada
Environmental
Restoration
Project

DOE/NV--528

Corrective Action Investigation Plan for Corrective Action Unit 500: Test Cell A Septic System, Nevada Test Site, Nevada

Controlled Copy No.: ___
Revision No.: 0

December 1998

Environmental Restoration
Division

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CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 500: TEST CELL A SEPTIC SYSTEM, NEVADA TEST SITE, NEVADA

DOE Nevada Operations Office
Las Vegas, Nevada

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**CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 500:
TEST CELL A SEPTIC SYSTEM,
NEVADA TEST SITE, NEVADA**

Signatures Approved | | 12/17/98
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Approved by: ______________________________ Date: ______________

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Environmental Restoration Division

Table of Contents

Table of Contents (Continued)

List of Figures

List of Tables

Number ***Title*** ***Page***

List of Acronyms and Abbreviations

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(s)
COPC	Contaminant(s) of potential concern
cm	Centimeter(s)
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)
EDL	Equipment Drain Line
FFACO	*Federal Facility Agreement and Consent Order*
ft	Foot (feet)
gal	Gallon(s)
IDW	Investigation-derived waste
in.	Inch(es)
km	Kilometer(s)
L	Liter(s)
m	Meter(s)
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per liter
mi	Mile(s)
NDEP	Nevada Division of Environmental Protection
NRDS	Nuclear Rocket Development Station

List of Acronyms and Abbreviations (Continued)

NTS	Nevada Test Site
PAL	Preliminary action level(s)
PCB	Polychlorinated biphenyl(s)
ppm	Parts per million
QAPP	*Quality Assurance Project Plan*
QA/QC	Quality assurance/quality control
RCRA	*Resource Conservation and Recovery Act*
REECo	Reynolds Electrical & Engineering Company, Inc.
SNPO	Space Nuclear Propulsion Office
SVOC	Semivolatile organic compound(s)
TPH	Total petroleum hydrocarbon(s)
VCP	Vitrified clay pipe
VOC	Volatile organic compound(s)

Executive Summary

The Corrective Action Investigation Plan for Corrective Action Unit 500, the Test Cell A Septic System, has been developed in accordance with the *Federal Facility Agreement and Consent Order* that was agreed to by the U.S. Department of Energy, Nevada Operations Office; the State of Nevada Division of Environmental Protection; and the U.S. Department of Defense. Corrective Action Unit 500 consists of the Corrective Action Site 25-04-05 septic tank and associated leachfield system.

This Corrective Action Investigation Plan is used in combination with the *Work Plan for Leachfield Corrective Action Units: Nevada Test Site and Tonopah Test Range, Nevada* (DOE/NV, 1998c). The Leachfield Work Plan was developed to streamline investigations at leachfield Corrective Action Units by incorporating management, technical, quality assurance, health and safety, public involvement, field sampling, and waste management information common to a set of Corrective Action Units with similar site histories and characteristics into a single document that can be referenced. This Corrective Action Investigation Plan provides investigative details specific to Corrective Action Unit 500.

Corrective Action Unit 500 is located southeast of Building 3124, which is located southwest and adjacent to Test Cell A. Test Cell A was built in 1958, and was operational during the 1960s to test nuclear rocket reactors in support of the Nuclear Rocket Development Station. Operations associated with Buildings 3113B, 3115, and 3116 from 1962 through 1972 resulted in liquid waste releases to the leachfield and associated collection systems. The surface and subsurface soils in the vicinity of the collection systems, outfall, and leachfield may have been impacted by effluent containing contaminants of potential concern generated by support activities associated with Test Cell A reactor testing operations.

Based on site history collected to support the Data Quality Objectives process, contaminants of potential concern for the site include radionuclides, oil/diesel range total petroleum hydrocarbons, polychlorinated biphenyls, and *Resource Conservation and Recovery Act* characteristic volatile organic compounds, semivolatile organic compounds, and metals. Additional samples will be analyzed for geotechnical and hydrological properties and a bioassessment may be performed. A general conceptual site model for the leachfield Corrective Action Units is developed in the

Leachfield Work Plan. No Corrective Action Unit-specific deviations from the model were identified during the Data Quality Objectives process for Corrective Action Unit 500.

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

- Conducting a radiological walkover survey
- Conducting a video survey of subsurface piping
- Conducting discrete field screening
- Sampling the contents of the septic tank
- Conducting exploratory trenching and excavations of particular subsurface components for visual inspection and to access sampling horizons
- Conducting subsurface investigations and sampling in the area of the equipment drain line outfall, the septic tank, the diversion chamber, and in specific locations underlying the leachfield
- Collecting environmental samples for laboratory and geotechnical/hydrological analyses and waste management purposes
- Conducting subsurface sampling from soil borings, where needed, which are capable of reaching the expected vertical extent of contaminants of potential concern
- Logging core recovered from soil borings to assess soil characteristics

Additional sampling and analytical details are presented in Section 4.0of the Corrective Action Investigation Plan and in the Leachfield Work Plan. Details of the waste management strategy for the Corrective Action Unit are included in the Leachfield Work Plan.

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

1.0 Introduction

This Corrective Action Investigation Plan (CAIP) has been developed in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the U.S. Department of Energy, Nevada Operations Office (DOE/NV); the State of Nevada Division of Environmental Protection (NDEP); and the U.S. Department of Defense (FFACO, 1996). The CAIP is a document that provides or references all of the specific information for investigation activities associated with Corrective Action Units (CAUs) or Corrective Action Sites (CASs). According to the FFACO (1996), CASs are sites potentially requiring corrective action(s), and may include solid waste management units, individual disposal sites, 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 will be used in conjunction with the *Work Plan for Leachfield Corrective Action Units: Nevada Test Site and Tonopah Test Range, Nevada* (DOE/NV, 1998c), hereafter referred to as the Leachfield Work Plan. Under the FFACO, a work plan is an optional planning document that provides information for a CAU or group of CAUs where significant commonality exists. This CAIP contains CAU-specific information including a facility description, environmental sample collection objectives, and the criteria for conducting site investigation activities at CAU 500.

This CAIP addresses one of three leachfield systems associated with Test Cell A, which is located in Area 25 at the Nevada Test Site (NTS). The NTS is approximately 105 kilometers (km) (65 miles [mi]) northwest of Las Vegas, Nevada (see Leachfield Work Plan Figure 1-1). Corrective Action Unit 500 is comprised of the Test Cell A Septic System (CAS 25-04-05) and the associated leachfield system presented in Figure 1-1 (FFACO, 1996).

The leachfield is located 60 meters (m) (200 feet [ft]) southeast of the Building 3124 gate, and approximately 45 m (150 ft) southwest of Building 3116 at Test Cell A. Test Cell A operated during the 1960s to support nuclear rocket reactor testing as part of the Nuclear Rocket Development Station (NRDS) (SNPO, 1970). Various operations within Buildings 3113B (Mechanical Equipment Room), 3115 (Helium Compressor Station), 3116 (Pump House), a water tank drain and overflow, a “yard and equipment drain system” outside of Building 3116, and a trailer have resulted in potentially

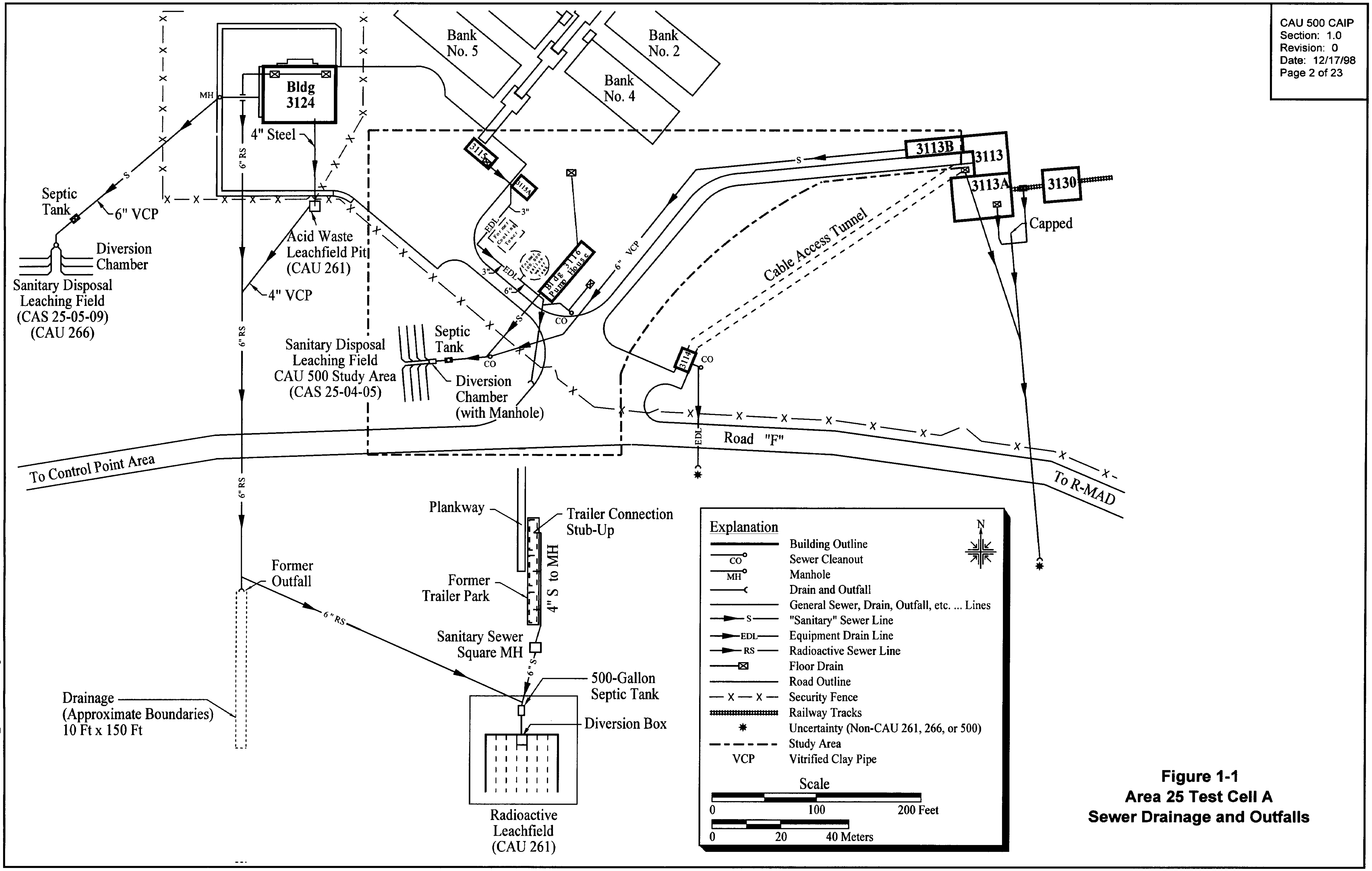

Figure 1-1
Area 25 Test Cell A
Sewer Drainage and Outfalls

hazardous effluent releases to the leachfield system (DOE, 1988a). The leachfield system components include discharge lines, manways, a septic tank, an outfall line, a diversion chamber, and a 15 by 30 m (50 by 100 ft) leachfield (see Leachfield Work Plan Figure 3-1 for explanation of terminology). In addition, engineering drawings show an outfall system that may or may not be connected to the CAU 500 leachfield. In general, effluent contributed to the leachfield was sanitary wastewater associated with floor drains, toilet and lavatory facilities in Building 3113B and floor drains in the remaining source buildings. The surface and subsurface soils in the vicinity of the collection system, outfall, and leachfield may have been impacted by effluent containing contaminants of potential concern (COPCs) generated by support activities associated with Test Cell A reactor testing operations.

1.1 Purpose

This CAIP describes the investigation of the nature and extent of COPCs at CAU 500. The general purpose of corrective action investigations for leachfield CAUs is described in the Leachfield Work Plan.

1.2 Scope

The scope of this CAIP is to resolve the problem statement identified in the Data Quality Objective (DQO) process (see Appendix A). This statement is that sanitary and light industrial effluents may have been released at the CAU, and that existing data are insufficient to support the development and evaluation of potential corrective actions and selection of a preferred corrective action for the CAU. Therefore, the scope of the corrective action investigation at the CAU includes the following activities to answer the problem statement:

- Conducting a radiological walkover survey
- Conducting a video survey of subsurface piping
- Conducting discrete field screening
- Sampling the contents of the septic tank
- Conducting exploratory trenching and excavations of particular subsurface components for visual inspection and to access sampling horizons

- Conducting subsurface investigations and sampling in the area of the equipment drain line (EDL) outfall, the septic tank, the diversion chamber, and in specific locations underlying the leachfield

- Collecting environmental samples for laboratory and geotechnical/hydrological analyses and waste management purposes

- Conducting subsurface sampling from soil borings, where needed, which are capable of reaching the expected vertical extent of COPCs

- Logging core recovered from soil borings 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. The FFACO (1996) requires that CAIPs address the following elements:

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

The managerial aspects of this project are discussed in the DOE/NV *Project Management Plan* (DOE/NV, 1994) and the site-specific Field Management Plan that will be developed prior to field activities. The technical aspects of this CAIP are contained in the Leachfield Work Plan, 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 QC samples, are presented in the *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 1996b). The health and safety aspects of this project are documented in the *Environmental Restoration Project Health and Safety Plan* (DOE/NV, 1998b), and will also be supplemented with a site-specific Health and Safety Plan written prior to the start of field work. No CAU-specific public involvement activities are planned at this time; however, an overview of public involvement is documented in the “Public Involvement Plan” in Appendix V of the FFACO (1996). Field sampling activities are discussed in the Leachfield Work Plan and in Section 4.0 of this CAIP and waste management issues are discussed in the Leachfield Work Plan and in Section 5.0 of this CAIP. The project schedule and records availability information for this CAIP are discussed in Section 6.0 of this CAIP. Section 7.0 provides a list of project references.

2.0 Facility Description

General background information pertaining to the history of the NTS and Area 25, a geologic assessment, and an overview of the area hydrogeology including depths to groundwater are provided in the *Yucca Mountain Site Characterization Plan* (DOE/NV, 1988b) and in Appendix A of the Leachfield Work Plan.

2.1 Physical Setting

The CAU is located at the Test Cell A Facility in Area 25 of the NTS, 60 m (200 ft) southeast of Building 3124 (now known as the Treatability Test Facility) gate, and approximately 45 m (150 ft) southwest of Building 3116 (see Figure 1-1).

2.2 Operational History

Test Cell A was operational between initial construction in 1958 and eventual deactivation in 1972. Documentation of specific operations and past disposal practices conducted at the CAU 500 facilities has not been discovered. Interviews with former workers have been conducted but did not yield significant information regarding Test Cell A waste disposal. Based on engineering drawings, field inspections, and interviews, the CAU 500 leachfield system received effluent from the following:

- Building 3116 sanitary system
- Building 3113B operations system
- Equipment drain line system

2.2.1 Source Buildings

The Building 3116 toilet, lavatory drains, and possibly floor and pump drains lead to the septic tank and leachfield. Operations within Building 3116 (also called the Pump House) consisted of pumping process water, reactor cooling water, and condenser cooling water (Figure 1-1) in support of reactor tests at Test Cell A. The water supply was treated with a rust inhibitor and contained in a 380,000 liter (L) (100,000 gallon [gal]) "ground water tank" adjacent to Building 3116. The cooling and process water was apparently pumped to Building 3113 and 3113A, and serviced reactor railcars through these buildings. This water may have been recirculated through a cooling tower during early operations, but process wastewater may have alternatively been disposed of using a “process water reactor cooling and floor drain waste line” terminating at an outfall south of Test Cell A. This process and cooling water operation is not addressed by CAU 500. Based on drawing number RE 3116-M1, the reactor coolant system is not connected to the CAU 500 leachfield (BN, 1997).

According to facility drawings, Building 3113B served as a “Mechanical Equipment Room.” Effluent produced by operations in this building were routed from a floor drain approximately 150 m (500 ft) through 15-centimeter (cm) (6-inch [in.]) vitrified clay pipe (VCP) into the CAU 500 septic tank and leachfield. Building 3113B is a potential source of hydrocarbons (i.e., oil, grease, and total petroleum hydrocarbons [TPH]) identified by previous septic tank sampling results (REECo, 1995) provided in Appendix A. Restrooms in Building 3113B were also routed to the leachfield.

2.2.2 Yard and Equipment Drain System

The EDL system at Test Cell A may or may not have contributed effluent to the leachfield system, but will be investigated as part of CAU 500. Several floor drains and pump drain lines inside Building 3116, and yard drains (grated openings with disposal pipes) received wastes as a separate system. Yard drains originated in a fenced yard outside Building 3116 and the yard southeast of Building 3116. The yard drains were probably used to dispose of liquids generated in temporary trailers used at the site. Additional drains contributing to the system include a floor drain or “equipment waste piping” located in Building 3115 (Helium Compressor Station), the cooling tower overflow line, and the 380,000 L (100,000 gal) water tank drain and overflow line. This individual “drain system” was apparently available to route other wastewaters unrelated to sanitary (toilet and lavatory drains) sewage. These discharge lines are collectively referenced as the EDL system.

The EDL system discharge lines apparently terminated at an outfall south of Building 3116. It is also conceivable that this line contributed to the CAU 500 or CAU 261 leachfield systems after undocumented system modifications. These alternatives will be investigated using the video survey addressed in Section 4.2.1. Surface and near-surface sampling of the EDL Outfall area, investigation of the CAU 500 leachfield system, and investigation of the CAU 261 leachfield system will adequately define any contamination associated with the EDL system.

2.2.3 Sanitary Leachfield and Collection System Description (CAS 25-04-05)

Figure 1-1 is a composite drawing derived from three archived engineering drawings. These resources are referenced as drawings 25-TC-A-C1, 3103-SW1, and 400-004-C6.1 (BN, 1997). Field verified inspection of these drawings indicates that a 15-cm (6-in.) VCP sanitary sewer line from Building 3116 feeds into a 1500-L (400-gal) capacity septic-tank (Evenson, 1998). A similar discharge line from Building 3113B also terminates into the septic tank. The system allowed effluent to flow from the septic tank to the diversion chamber before reaching a leachfield west of the diversion chamber and septic tank. The septic tank lid is accessible but the manhole cover on the diversion chamber was not located during field inspection. The cover is probably present, but not visible because it is buried.

The leachfield is labeled as a “Sanitary Disposal Leaching Field” in the engineering drawings reviewed. Leachfield details are provided in drawings numbers 3103-SW2, 3103-SW3, and RE 3116-M1 (BN, 1997). The piping configuration consists of two distribution manifolds extending from the diversion chamber into the leachfield. Four sets of 10-cm (4-in.) jointed VCP lateral distribution pipes branch from each distribution manifold. The dimensions of the leachfield are 15 by 30 m (50 by 100 ft). Drawings and aerial photos show that the area overlying the leachfield was used as a storage yard and parking lot in the mid to late 1960s. The area over the suspected leachfield area is sparsely covered with vegetation.

2.3 Waste Inventory

No details concerning the waste inventory within the source buildings during the years of operation could be found. Information based on interpretations of engineering drawings (BN, 1997) and descriptions of processes from historical reports indicate that sanitary and industrial wastewaters were disposed of in the collection systems. Records of liquid waste quantities discharged through the collection systems are not available. No documented evidence of disposal operations or transfer of liquids from other facilities has been discovered. The DQO process evaluated available information including historical sampling results (Appendix A) and a list of potential contaminants was developed.

2.4 Release Information

The source of potential contamination related to the CAU 500 leachfield system was wastewater routed through drain lines from the source buildings. The effluent was released to the leachfield after it passed through the septic tank and diversion chamber. The leachfield was designed for liquid to be dispersed over an area just below the leachfield base (leachrock/native soil interface), and to percolate into the underlying soil. The driving force for downward migration of the contamination was the discharge from the septic tank. The possibility of leakage at points along the collection system exists, but there is no evidence of documented leaks or releases. The leachfield system is now inactive.

The source of potential contamination related to the EDL system is surface discharge of wastewater at the EDL Outfall or subsurface discharge at either the CAU 500 or CAU 261 leachfields.

2.5 Investigative Background

General site investigation activities are described in Section 2.0 of the Leachfield Work Plan. The U.S. Department of Energy's Environment, Safety and Health, Office of Environmental Audit reviewed available historical information, collected soil samples, and prepared an environmental survey as a preliminary report in April 1988 (DOE, 1988a). The analytical results provided for "Test Cell A Leachfield" are apparently associated with CAU 261 rather than this CAU (see Figure 1-1). No CAU-specific information was recovered from this source. The survey team discovered that there is very little documentation regarding the past activities at the NRDS facilities.

Additional investigations at the Test Cell A leachfield systems include a Reynolds Electrical and Engineering Company, Inc. (REECo) leachfield system sampling effort that sampled 20 septic tank systems at the NTS during 1993 and 1994. The sampling effort purpose was to determine the presence and concentrations of specific organic, inorganic, and radioactive constituents in inactive septic-tank systems (REECo, 1995). During this effort, samples were collected from a septic tank and soil within a leachfield. This septic tank and leachfield are apparently the same as those addressed by CAU 500. The septic tank sample was labeled as A25TCA-T-S and the leachfield sample was labeled A25TCA-LF-1. The analytical results for these samples were reviewed during the DQO scoping, and are provided as Appendix D. Elevated concentrations of oil and grease at 6,900 milligrams per kilogram (mg/kg), TPH as oil at 7,580 mg/kg, and cadmium at 0.12 mg per liter (mg/L) were recorded for the septic tank sample. A background sample (A25TCA-BG) was also collected.

3.0 Objectives

A discussion of general objectives for leachfield CAUs is presented in Section 3.0 of the Leachfield Work Plan. Objectives addressed in this CAIP are based on the Leachfield Work Plan and CAU-specific DQOs. Unless otherwise noted, objectives for CAU 500 are identical to those developed in the Leachfield Work Plan.

3.1 Conceptual Site Model

The conceptual model for CAU 500 is analogous to the general leachfield conceptual model presented in Section 3.1 of the Leachfield Work Plan and is described in detail in Appendix A, Table A.2-1. The scope and strategy of this investigation may be revised if the conceptual model provided in this CAIP and applicable portions of the conceptual model provided in the Leachfield Work Plan fail. The CAU 500 conceptual model may fail if substantially different historical operational information is discovered, or field observations demonstrate the nature or extent of contamination associated with the CAU is substantially different than anticipated. If necessary, a rescoping of the investigation will be conducted.

3.2 Contaminants of Potential Concern

Potential types of contaminants that could be present were identified through a review of site history documentation, subjective process knowledge, and inferred activities associated with the CAU. Contaminants are expected to be similar to those in septage from sanitary and light duty industrial sewage systems. Laboratory analysis of soil samples will provide the means for a quantitative measurement of the COPCs. The following analytes will be measured to determine the nature of potential contamination at CAU 500:

- Total volatile organic compounds (VOCs)
- Total semivolatile organic compounds (SVOCs)
- Total *Resource Conservation and Recovery Act* (RCRA) Metals
- Polychlorinated biphenyls (PCBs)
- Total petroleum hydrocarbons (oil/diesel-range organics)
- Gamma-emitting radionuclides (25 percent of samples)

The analytical methods and minimum reporting limits for each analyte are provided in Table 3-1 of the Leachfield Work Plan. Minimum reporting limits for gamma-emitting radionuclides are 0.2 picocuries per gram for soil and 20 picocuries per liter for water (DOE/NV, 1996b).

Geotechnical and hydrological analysis will be performed according to the requirements of Section 3.2.1 of the Leachfield Work Plan. Bioassessment samples will be collected and analyzed according to the requirements of the Leachfield Work Plan, if field screening detects TPH concentrations greater than field screening levels.

3.3 Preliminary Action Levels

Screening levels for on-site field screening methods and preliminary action levels (PALs) for off-site analytical methods will be used to determine the presence of contamination. The screening levels and PALs appear in Section 3.3 of the Leachfield Work Plan, and were agreed upon during the CAU-specific DQO process. For radiological constituents, PALS are the average concentrations found in an unimpacted area plus two standard deviations.

3.4 DQO Process Discussion

Details of the DQO process are presented in Appendix A. The DQO results for CAU 500 indicated the need for a biased sampling approach. Due to potential subsurface migration of COPCs, an investigation consisting of subsurface sampling was identified. The applicable COPCs, analytical methods, and reporting limits agreed upon during the DQO process are provided in Table 3-1 of the Leachfield Work Plan and Section 3.2. Data quality will be verified and evaluated as stated in the Leachfield Work Plan.

4.0 Field Investigation

The investigation activities to be performed at CAU 500 are based on general field investigation activities discussed in Section 4.0 of the Leachfield Work Plan.

4.1 Technical Approach

The technical approach for CAU 500 consists of the following activities:

- Perform a radiological walkover survey.
- Perform video pipeline and radiation surveys of the discharge and outfall lines.
- Collect samples from within the septic tank.
- Conduct exploratory trenching to provide access to subsurface components.
- Collect surface and near-surface samples near the location of the EDL Outfall.
- Collect subsurface soil samples in areas of the collection system including the septic tank and outfall end of the diversion chamber.
- Collect subsurface soil samples underlying the leachfield distribution pipes via trenching.
- Field screen samples for VOCs, TPH, and radiological activity.
- Drill boreholes and collect subsurface soil samples if required.
- Analyze soil samples for total VOCs, total SVOCs, total RCRA metals, PCBs, TPH (oil/diesel range organics), and gamma-emitting radionuclides (25 percent of samples).
- Collect samples from native soils beneath the distribution system and analyze for geotechnical/hydrologic parameters.
- Collect and analyze bioassessment samples if TPH exceeds field-screening levels.

This investigation strategy will allow the extent of contamination associated with the leachfield system to be established. In general, the contents of the leachfield and the underlying soil will be investigated until soil samples from two consecutive intervals with contaminant concentrations below appropriate field screening levels (as stated in Section 3.3) are obtained. If contamination is more extensive than anticipated and drilling is necessary, the maximum investigation depth will be limited by the capability of the drilling rig. If this occurs, the investigation will be rescoped.

4.2 Field Activities

Excavation and trenching will be the primary investigation tool for this leachfield system. Excavation locations will be based on interpretation of engineering drawings, surface features, and video surveys. Excavated soil will be stored in a manner which will prevent run-on and run-off. Soil excavated during trenching operations will be returned to the excavation as close to its original location as possible upon completion of the excavation investigation activities.

All sampling activities will be conducted in compliance with the Industrial Sites QAPP (DOE/NV, 1996b). Requirements for field and laboratory environmental sampling are also contained in the Industrial Sites QAPP (DOE/NV, 1996b) and the Leachfield Work Plan.

4.2.1 Video Survey

A video survey will be conducted inside the discharge and outfall lines to inspect the pipes associated with the collection system. The collection system will be mapped by following the piping, and locating or ruling out the existence of other possible tie-ins. This 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 camera and cable system will be introduced through various manholes and cleanouts associated with the collection system (Figure 4-1). A manhole in the diversion chamber may be used to access the outfall line. Other entry points may be accessed by excavating at the required locations.

The video survey will evaluate the existence of unexpected contributing collection system lines from Test Cell A. If a tie-in is discovered, the line will be investigated to the source (if possible) and sampling activities will be suspended until an action consensus is reached between members of the scoping team. The discovery of an unexpected contributing line may imply an additional source input and could increase the scope of the investigation.

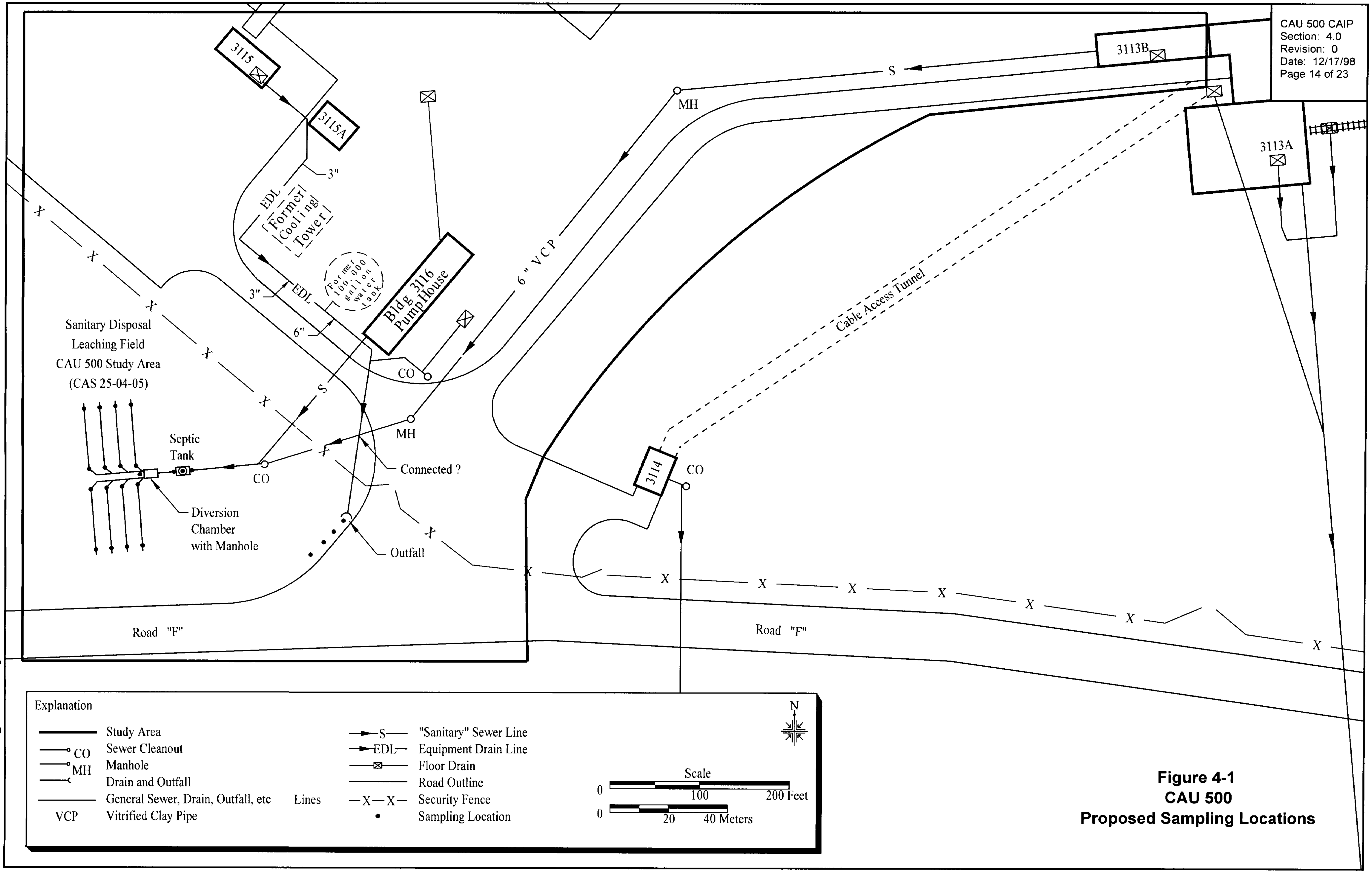

Figure 4-1
CAU 500
Proposed Sampling Locations

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4.2.2 Field Screening

Field screening methodology is discussed in Section 4.1.3 of the Leachfield Work Plan. Field screening for VOCs, TPH, and radiological activity will be performed to guide the investigation and sampling selection and to assist with health and safety and waste management decisions.

4.2.3 Leachfield System Investigation

The investigation of the CAU 500 leachfield system focuses on both accidental and designed effluent releases. While leachfields are designed to release effluent to the underlying soil, collection system releases are typically caused by a loss of system integrity. Potential accidental releases will be identified by sampling at specific collection system features, including soil outside the septic tank and diversion chamber. Soil underlying breached discharge and outfall lines identified during the video survey will also be sampled. The impact of designed releases will be determined by sampling the septic tank contents and soil underlying the leachfield. The impact of effluent release at the EDL Outfall will be determined as described in Section 4.2.3.1

4.2.3.1 Equipment Drain Line Outfall Sampling

The EDL Outfall was apparently designed for disposal of waste liquids associated with the EDL system. Surface and near-surface samples will be collected from the EDL Outfall area to determine the impact of potential soil contamination associated with surface discharge from the system. The area surrounding the assumed outfall location has been disturbed during road shoulder maintenance activities performed for Road F (Evenson, 1998). The outfall has apparently been obscured by these grading activities and its exact location is unknown. The location of the EDL Outfall may be estimated based on engineering drawings or located through limited excavation. The video survey may be used in an attempt to locate the EDL Outfall.

Eight samples will be collected from two depths at four locations extending away from the EDL Outfall at 1.5 m (5 ft) intervals as shown on Figure 4-1. The first samples will be collected at the estimated or known EDL Outfall location. The uppermost sample interval will consist of soil collected from 0.1 to 0.4 m (0.25 to 1.25 ft) below ground surface (bgs). This upper-interval should consist of soil that approximates the original grade. Ideally, these samples will exclude soil at the surface so recently disturbed or transported material will be eliminated from the investigation. A lower-interval sample will be collected from 0.8 to 1.1 m (2.5 to 3.5 ft) bgs.

4.2.3.2 Collection System Sampling Activities

A first stage of soil samples will be collected in five general areas to investigate possible release points associated with collection system components of the leachfield system. Samples will be collected from the following locations:

- Pipe disruptions identified by video survey
- Inside the septic tank
- Both ends of septic tank
- Outfall end of diversion structure
- Both ends of distribution pipes

These locations are presented in Figure 4-1. Most samples will be collected directly from excavations or the backhoe bucket, but some surface and near-surface samples may be collected using hand tools or direct push (i.e., Geoprobe™) methods. If results show that contaminant concentrations exceed field screening levels and/or PALs, a second stage of samples described in Section 4.3 will be collected as step-outs or at greater depths below the first stage of samples.

At least three samples will be collected from excavations at the septic tank and diversion chamber. Soil samples from both ends of the septic tank and the outfall end of the diversion chamber (see Figure 4-1) will be collected from approximately 1.5 to 1.8 m (5.0 to 6.0 ft) bgs. This is the estimated depth of connecting collection system piping and components at this portion of the leachfield. Samples will also be collected from soil surrounding pipe breaks or other apparent losses of system integrity identified by the video survey. These samples will be representative of soil likely to have been impacted if leachfield system leakage occurred.

The septic tank contents will be sampled and analyzed to determine the contents and the nature of the most recent discharge to the leachfield system. More than one sample may be required if the septic tank contents appear to have separated into multiple phases (i.e., liquid over solid phase). The results of these samples should be representative of the effluent stream discharged to the system subsequent to the most recent septic tank pumping event. It is unknown if septage has ever been removed from this septic tank. The contents of the diversion chamber may be sampled at the discretion of the Site Supervisor if effluent is present.

4.2.3.3 Leachfield Sampling Activities

The leachfield was designed for disposal of effluent after it passed through the septic tank. The leachfield will be investigated using a backhoe equipped with a narrow bucket to excavate at least four trenches within the leachfield area. Two linear trenches parallel to the lengths of the distribution manifold and perpendicular to the lengths of the distribution pipes will be excavated on each side of the leachfield.

On both sides of the leachfield, the first trench will be excavated 1.5 m (5 ft) from the estimated location of each distribution manifold on the distribution pipe side (see Figure 4-1). Limited excavations may be used to verify the location of the distribution manifold ends and establish the pipes orientation and location if these cannot be reasonably estimated based on surface features and engineering drawings. A second trench will be excavated 1.5 m (5 ft) from the distal end of the distribution pipes based on estimated pipe lengths. The extent of these trenches will be more limited and based on the distribution pipe locations observed in the first trenches.

Trenching activities will expose just enough pipe or material to access the required sampling horizons and will be conducted within the leachfield boundaries. Sampling locations within the trenches will be positioned below each of the four distribution pipes. Eight samples per depth-interval will be collected from each side of the leachfield for a total of 16 samples per horizon. Soil will be collected with a stainless-steel scoop out of the backhoe bucket immediately upon retrieval. Only material (soil) suitable for sampling will be submitted to the laboratory for analysis. Leachrock will not be sampled. If extra volume for a given sampling event is required, then sample collection will be extended laterally at the same depth.

An estimated depth to the leachfield base for a shallow system is 0.6 to 0.9 m (2 to 3 ft), and for a deep system is 0.9 m (3 ft) to a maximum of 1.8 m (6 ft) (DOE/NV, 1998a). The actual depth to the leachfield base for the CAU 500 leachfield is unknown. The interval 0.3 m (1.0 ft) below the leachfield base (i.e., the leachrock and native soil interface) will define the uppermost sampling interval (see Figure 4-1 of the Leachfield Work Plan). A second sampling interval 0.75 m (2.5 ft) to

1.1 m (3.5 ft) beneath the leachfield base will be exposed by deeper trenching within the same walls. If samples from a particular sampling location exceed field screening levels, a third 0.3-m (1-ft) sampling interval 2.3 m (7.5 ft) below the leachfield base may be sampled if accessible by the backhoe.

Approximately 16 first-stage samples will be obtained from each sampling interval within the area of the leachfield based on the conceptual model. Samples will be collected from at least two sampling intervals, resulting in at least 32 samples. While all of the samples will be field screened, a limited number of these samples will be submitted to the off-site laboratory. Samples to be analyzed will be selected based on the results of field screening and minimum sampling requirements. The actual number of samples analyzed will depend on decisions made in the field.

A sample of the basement soil beneath the leachfield/soil interface will be collected to assess its geotechnical and hydrologic characteristics and bioassessment samples may be collected if TPH is detected by field screening. These samples will be collected within brass sleeves (or other container, as appropriate) so as not to disturb the natural physical characteristics of the soil. Section 3.2.1 of the Leachfield Work Plan addresses these analyses.

4.3 Second-Stage Activities

The first stage sampling results from the leachfield trenches will be used to determine if second stage samples are required. Analytical results from first-stage samples will be considered if they are available, but further investigation may be initiated based on field screening data. If field screening or analytical results indicate contamination extent is not defined because concentrations exceed specified field screening levels or PALs, additional sampling locations or depths will be selected to determine the contamination extent.

Additional investigation may consist of boreholes drilled within the leachfield to determine the vertical extent of contamination or step-out boreholes designed to establish lateral contamination extent as required for successful site investigation. Initial step-out boreholes will be drilled 4.6 m (15 ft) outside the margins of the leachfield. Boreholes will be advanced to depths adequate to determine the vertical extent of contamination. Samples will be collected at 1.5-m (5-ft) intervals beginning at the greatest depth contamination exceeding field screening levels or PALs was detected at adjacent first-stage sample locations. Sample collection will begin at the established leachfield base depth if boreholes without associated first-stage sample locations are required.

At least one confirmatory sample will be submitted from each borehole. If contamination is detected by field screening, the sample with the highest contamination concentration will be submitted. Additional samples may be submitted at the discretion of the Site Supervisor.

Alternative approaches outlining borehole placement strategies should certain site conditions be encountered are addressed in Section 4.1.2.1 of the Leachfield Work Plan.

5.0 Waste Management

Waste management activities to be performed for CAU 500 are addressed in Section 5.0 of the Leachfield Work Plan. All potential waste types and waste streams associated with the leachfield CAUs are covered in the Leachfield Work Plan. Based on process knowledge obtained for CAU 500, possible hazardous wastes are anticipated at this site. There is no process knowledge that suggests a specific "listed" hazardous waste may have been discharged to this leachfield; therefore, any RCRA regulated waste generated will be "characteristic." Radiological contamination may be present but is not expected. Action levels for investigation-derived waste (IDW) contaminants are as stated in Table 5-1 of the Leachfield Work Plan.

Waste will be managed according to hazardous waste requirements until laboratory analyses are received and a final waste determination is made. If field screening or laboratory analysis detects radiological activity above background levels, the waste will subsequently be managed according to the mixed waste requirements addressed in the Leachfield Work Plan.

Any IDW generated during this investigation will be segregated by waste stream and placed in U.S. Department of Transportation (DOT)-compliant containers appropriate for the type and amount of waste generated. The IDW generated at CAU 500 will be contained in DOT-compliant containers meeting the specifications outlined in the Leachfield Work Plan.

6.0 Time Frame and Records Availability

6.1 Time Frame

After submittal of the Final CAIP for CAU 500 to NDEP (FFACO milestone deadline of February 26, 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 NDEP review.
- The FFACO date for the Corrective Action Decision Document (CADD) is September 30, 1999.

6.2 Records Availability

Historic information and documents referenced in this plan are retained in the DOE/NV project files in Las Vegas, Nevada, and can be obtained through written request to the DOE/NV Project Manager. This document is available in the U.S. Department of Energy (DOE) public reading rooms located in Las Vegas and Carson City, Nevada, or by contacting the DOE Project Manager. The NDEP maintains the official Administrative Record for all activities conducted under the auspices of the FFACO.

7.0 References

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

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Appendix A

Data Quality Objectives Worksheets

A.1.0 Introduction

A.1.1 Problem Statement

Potentially hazardous wastes were discharged to the Area 25 Test Cell A Leachfield System (CAU 500). Corrective Action Unit 500 consists of a single CAS, namely CAS 25-04-05. Existing information about the nature and extent of contamination is insufficient to evaluate and select the preferred corrective action for this site.

This CAU 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 leachfield and associated collection system. 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 that may be required prior to submittal of the CAIP. 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
		Scoping Meeting August 20, 1998
Steve Adams	IT	X
Clayton Barrow	DOE	X
Rob Boehlecke	SAIC	X
Jerry Bonn	BN	X
Mark DiStefano	IT	X
Marjorie England	SAIC	X
Grant Evenson	SAIC	X
Syl Hersh	IT	X
Mike McKinnon	NDEP	X
Jason Moore	SAIC	X
Angela Olson	BN	X
Greg Raab	NDEP	X
Dan Tobiason	BN	X
Mary Todd	SAIC	X
Jeanne Wightman	Mactec	X

IT - IT Corporation
SAIC - Science Applications International Corporation
BN - Bechtel Nevada

A.2.0 Conceptual Model

The conceptual site model describes the most probable scenario for current conditions at CAU 500. The presence of COPCs within soils is the result of releases from the following known or potential contaminant sources:

- Discharges from designated floor drains within the source building through collection system lines and into a possible outfall. This occurred at locations when lines did not terminate into the leachfield during certain periods of operation. With an intact and interconnected (complete) collection system, the discharges reached the in-line septic tank and were subsequently dispersed through the leachfield.
- Possible leakage from collection system lines leading to leachfield distribution system
- Possible leakage from the leachfield distribution box
- Possible leakage from the septic tank
- Potential for contaminants dispersed by the leachfield itself

A conceptual model for the CAU 500 Leachfield is provided in Table A.2-1.

Table A.2-1
Conceptual Model for the CAU 500 Leachfield System
(Page 1 of 3)

Conceptual Model Element	Assumptions	Source
System dynamics	Infiltration and concentration of contaminants in the form of liquid waste into the soil directly below (surrounding) the outfall leachlines and within the leachfield has occurred.	Knowledge of similar sites
	Minor lateral migration (due to soil anisotropy) of contaminants in the form of liquid waste into the soil exists.	Knowledge of similar sites
	Infiltration is limited to less than 7.6 m (25 ft) vertically and 4.5 m (15 ft) horizontally from piping and known leachfield boundaries. Underground lines extending out of the area could extend the lateral migration pathways further and discovery of this would violate the conceptual model.	Knowledge of similar sites
	Groundwater contamination is unlikely because environmental conditions at the site; such as an arid climate and low permeabilities, and depth to groundwater at approximately 950 ft, are not conducive to downward migration.	Knowledge of similar sites
	No driving forces other than limited precipitation and infiltration. Also, fluid inputs through the pipings have not occurred since cessation of operations.	Knowledge of similar sites
	Potential soil contamination along collection lines due to loss of integrity may exist.	Knowledge of similar sites
Source locations (CAU 500)	A detailed drawing shows that within Building 3116, only the toilet and lavatory drains lead to the septic tank and leachfield.	Archival engineering drawings
	Building 3113B served as a “mechanical equipment room.” Effluent resulting from operations within this building were routed approximately 500 feet through a 6-inch clay pipe into the septic tank and leachfield. Operations in the building were the likely source of the detectable hydrocarbon concentrations in the septic tank.	REECo (Table “16A” - Septic System A25 TCA)

Table A.2-1
Conceptual Model for the CAU 500 Leachfield System
(Page 2 of 3)

Conceptual Model Element	Assumptions	Source
Source location (CAU 500)	Several floor drains and pump-drainage lines inside of Building 3116, as well as yard drains, were in operation to receive wastes as a separate system (the yard and equipment drain system). These system lines are shown to have terminated into an outfall south of Building 3116. Other yard drains originated in a fenced area outside of 3116, specifically a floor drain or “equipment waste piping” from Building 3115 (Helium Compressor Station), a “drain hand-hole” open to the yard southeast of Building 3116, the cooling tower overflow line, and the 100,000 gallon water tank drain and overflow line. This individual “drain system” was apparently available to route other wastewaters unrelated to the sanitary (toilet and lavatory drains) sewage.	Archival engineering drawings
Lateral extent of potential contaminants	Subsurface effects limited by relatively low contaminant concentrations and volume and/or low mobility of constituents	Process knowledge
	The potential lateral migration of contaminants is unknown, but if migration has occurred, it will likely be confined to the boundaries as defined in the conceptual model. Breaches along the collection system also may have contributed to potential contaminant migration.	CAU 500 - Analytical results for the septic tank contents and the single soil sample are available (REECo, 1995). In general, breach areas will be identified and targeted during the course of the investigation.
Vertical extent of potential contaminants	The vertical extent of potential contamination is unknown but likely (if existent) will be confined to the boundaries as defined in the conceptual model. Vertical extent would be limited by low contaminant concentrations and volumes, lack of driving force, relatively low mobility of COPCs, and typically decreasing permeability with increasing depth.	See above. In addition, this is based on knowledge of similar sites.
Physical and practical constraints	Nearby utilities and buildings; adverse weather conditions; restricted access; heavy equipment and resource availability; health and safety concerns; approval of the CAIP and Work Plan.	Site knowledge

Table A.2-1
Conceptual Model for the CAU 500 Leachfield System
(Page 3 of 3)

Conceptual Model Element	Assumptions	Source
Future use	See "Source" (adjacent column box).	Assumptions are defined in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (DOE/NV, 1996a)*
Potential exposures	Ingestion of COPCs in the soil due to inadvertent exposure during excavation	Process knowledge

A.3.0 Potential Contaminants

Section 3.0 of the CAIP provides additional information on the COPCs for the Leachfield CAUs, including PALs and QA/QC requirements.

The CAU 500 Leachfield mainly received effluent from a sanitary wastewater system, overflow and drain water from a storage tank, a mechanical equipment room, and a yard and equipment drain system. Total VOCs, total SVOCs, total RCRA Metals, PCBs, and TPH as diesel/oil are likely COPCs. Soil displaying measurable quantities of gamma activity also may be present, but lab analyses will only be conducted on a limited number (25 percent) of samples. Field screening for alpha, beta, gamma will be conducted. Geotechnical properties will also be evaluated. At least one bioassessment sample will be collected from the leachfield, distribution box, and ends of the septic tank in CAU 500 if TPH field screening exceeds the action level (100 parts per million [ppm]). Geotechnical properties will also be evaluated. Table 3-1 of the Leachfield Work Plan identifies the analytical requirements for general COPCs, and the CAU-specific COPCs will be based on this table.

A.4.0 Decisions and Inputs

A.4.1 Decisions

Decisions to be resolved by the investigation include:

- Determine if COPCs are present at the site.
- Determine the types and concentrations of COPCs at the site.
- Determine if COPC concentrations exceed PALs.
- Determine the extent of COPCs 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. Information inputs, existing data, identified data gaps, and brief strategies are discussed in Table A.4-1. A more detailed discussion of investigation strategies is found in Section A.5.0.

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

Decision	Input	Existing Data	Data Gap	Strategy
Are COPCs present above PALs at site?	Potential contaminant identification	Process knowledge of potential discharges	Exact COPCs	Collect and analyze samples for COPCs
	Potential contaminant concentration	A sample of the septic tank contents results are available for CAU 500 (oil and grease at 7,200 ppm, and Cadmium)	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 the leachfield and associated components, and outfall, 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	Trench to locate leachfields and associated components as needed; collect trenched samples; drill where needed to establish worst case depth or lateral extent of COPCs; if COPCs are detected, drill stepout borings to determine lateral extent and collect laboratory samples to confirm extent. Additionally, investigate the outfall via potholing and continue in this same fashion.

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

Decision	Input	Existing Data	Data Gap	Strategy
Are potential contaminants migrating?	Relative mobility of potential contaminant	Heavy metals relatively low mobility; TPH volume limited; limited migration at similar sites	As discussed above	As discussed above
	Potential contaminant distribution	Limited by contaminant-specific, geological, operational, and meteorological characteristics		
	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
Are potential contaminants migrating?	Geologic/hydrologic data	General geologic/hydrologic characteristics of site; specific geologic conditions of nearby sites (i.e., Building 650 Leachfield)	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 500	Presence of biomass; biological parameters to evaluate natural biological process	Collect microbial samples from hydrocarbon sites for analysis of biological parameters if TPH is detected above 100 ppm via field screening
	Radioactive decay	Low probability of radionuclides CAU 500	Presence and type of radionuclides at Test Cell A	Establish background; field screen for alpha/beta radiation using Electra instruments; collect samples for gamma spectroscopy based on field screening at a frequency of 25% and where field screening results exceed action levels

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

Decision	Input	Existing Data	Data Gap	Strategy
Data sufficient to support closure options?	No further action	Historical evidence 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 Corrective Action Decision Document/ Closure Report (CADD/ Closure Report)
	Closure in place	Potential for TPH and RCRA constituents; assume industrial preliminary remediation goals (PRGs) per *Nevada Administrative Code* (NAC, 1996) NAC 445A; 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
	In situ bioremediation	Documented concentrations in CAU 500 (limited to a single sample); 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

Biased sampling will be conducted during the field investigation to confirm or refute the conceptual model for the site to assess the migration of the COPCs, and to determine if COPCs are present in concentrations exceeding the PALs for the site.

Sampling points will be selected within the leachfield, at both ends of the septic tank, and at the distribution box. Soil samples will also be collected at near-surface depths at the outfall grade (now covered) in four locations. Soil surrounding piping showing obvious breaches, leakages, and loss of system integrity will be targeted as additional sampling points. These breaches will be identified with a pipeline video camera (mole) that can be introduced through the piping.

At both the proximal and distal ends of the leachfields, trenches will be cut to transect actual distribution lines and inspect the contents of individual leachfields. These transect locations will be positioned at field-established coordinates (based on engineering drawings) of the leachfield. Subsurface soil samples will be collected at various depths below the distribution lines.

Regions exceeding the field screening levels/PALs would require horizontal stepout or deeper borings to investigate any potential migration of subsurface contaminants.

Field screening of soil for volatile organic concentrations, total petroleum hydrocarbons, and radiological constituents will be conducted during the investigation.

In general, the contents of the leachfields and the surrounding media (soil intervals) will be investigated to a maximum depth (as defined in the primary model) of 7.6 m (25 ft) and two consecutive intervals below appropriate screening levels as determined by field screening and other analytical methods.

Soil samples will be collected primarily by means of a backhoe; and if stepouts or greater-depth borings are required, Geoprobe™, and/or hollow stem auger drill rig.

A.5.1 CAU 500

Investigate the leachfield using a staged approach as generally described in the Leachfield Work Plan. Deviations or additional areas of concern from the basic sampling design includes:

- Collect four near-surface soil samples separated by 5 ft, beginning at the outfall terminus in the vicinity of the outfall south of Bldg. 3116.
- Collect four subsurface samples at the grade (depth) of the outfall, immediately underneath the near-surface samples.

At least one bioassessment sample will be collected from each leachfield, distribution box, and ends of the septic tank in CAU 500, if field screening detects TPH.

A.6.0 Decision Rules

The following decision rules are applicable to the CAU 500 leachfield system and will be used to guide the investigation and subsequent data evaluation.

- If either of the following occur in the course of the investigation, 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 confirmatory laboratory analysis at the subsurface interval that represents the worst-case, field-screening result and as stated in the previous bulleted item.
- If confirmatory 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
CAU 500 - Specific Decision Points and Rules
(Page 1 of 2)

Investigation Activity	Decision Point	Decision Result	Decision Rule
Pipeline Camera Survey	Can collection system lines be completely surveyed (i.e. entire distance from building[s] to septic tanks?)	Yes	Proceed with subsurface investigation and select soil underlying identified breach locations as sampling points.
		Yes, but unexpected tie-ins/ offshoots are discovered	Continue to mole new segments; target breaches and possible ends (where they may terminate) as additional sampling points.
		No	1. Lines have been blocked with residue or contain effluent; proceed with subsurface investigation; evaluate field data (to include radiological screening) and collect samples of the pipe contents at a maximum frequency of 15 linear feet along the blocked section. 2. Lines may have been removed; proceed with subsurface investigation; collect samples at locations as if the piping was in place and use field screening results to guide the investigation.
Exploratory Trenching and Sample Collection	Can tanks, distribution box/center, and leachfield distribution lines be located?	Yes	Proceed with subsurface investigation and collect samples at the prescribed locations.
		Yes, but in a different location	Adjust investigation location.
		No	Lines may have been removed but evidence of leachfield components or other installations exists: proceed with subsurface investigation; evaluate field data; collect subsurface samples at frequencies indicated in the Work Plan and at locations as components as indicated on available engineering drawings.
Near-Surface Investigation	Do field data from the outfall downgradient of the Building 500 EDL indicate contamination above field screening levels?	No	Collect the four near-surface and four sub-surface (outfall grade) soil samples (the planned subsurface investigation)
		Yes	Outfall received fluid input; continue with field screening; collect additional samples to determine extent within bounds of conceptual model; if conceptual model fails; notify NDEP and rescope investigation.

Table A.6-1
CAU 500 - Specific Decision Points and Rules
(Page 2 of 2)

Investigation Activity	Decision Point	Decision Result	Decision Rule
Additional Subsurface Investigations: Begin drilling 5-feet below (and/ or stepping-out from) regions exceeding PALs; and perform field screenings at 5-foot intervals	Are field data above field screening levels?	No	Collect confirmatory samples from bottom of boring and end investigation.
		Yes	Begin drilling below trench sample locations to obtain two consecutive samples below field screening levels; drill step-out borings as needed to define lateral extent of contamination.

A.7.0 Decision Error

Biased sampling will be conducted at the CAU 500 system. The sampling strategy targets the worst-case contamination by sampling directly at selected locations, conducting field screening, and sampling individual components of the leachfield and collection system. This will reduce the possibility of missing contamination and yield the highest confidence that the extent of the contamination problem has been adequately bounded. 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

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

NAC, see *Nevada Administrative Code.*

Nevada Administrative Code. 1996. NAC445A.345 - 445A.22755, "Corrective Action Regulations." Carson City, NV: Nevada Division of Environmental Protection.

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

Appendix B

Project Organization

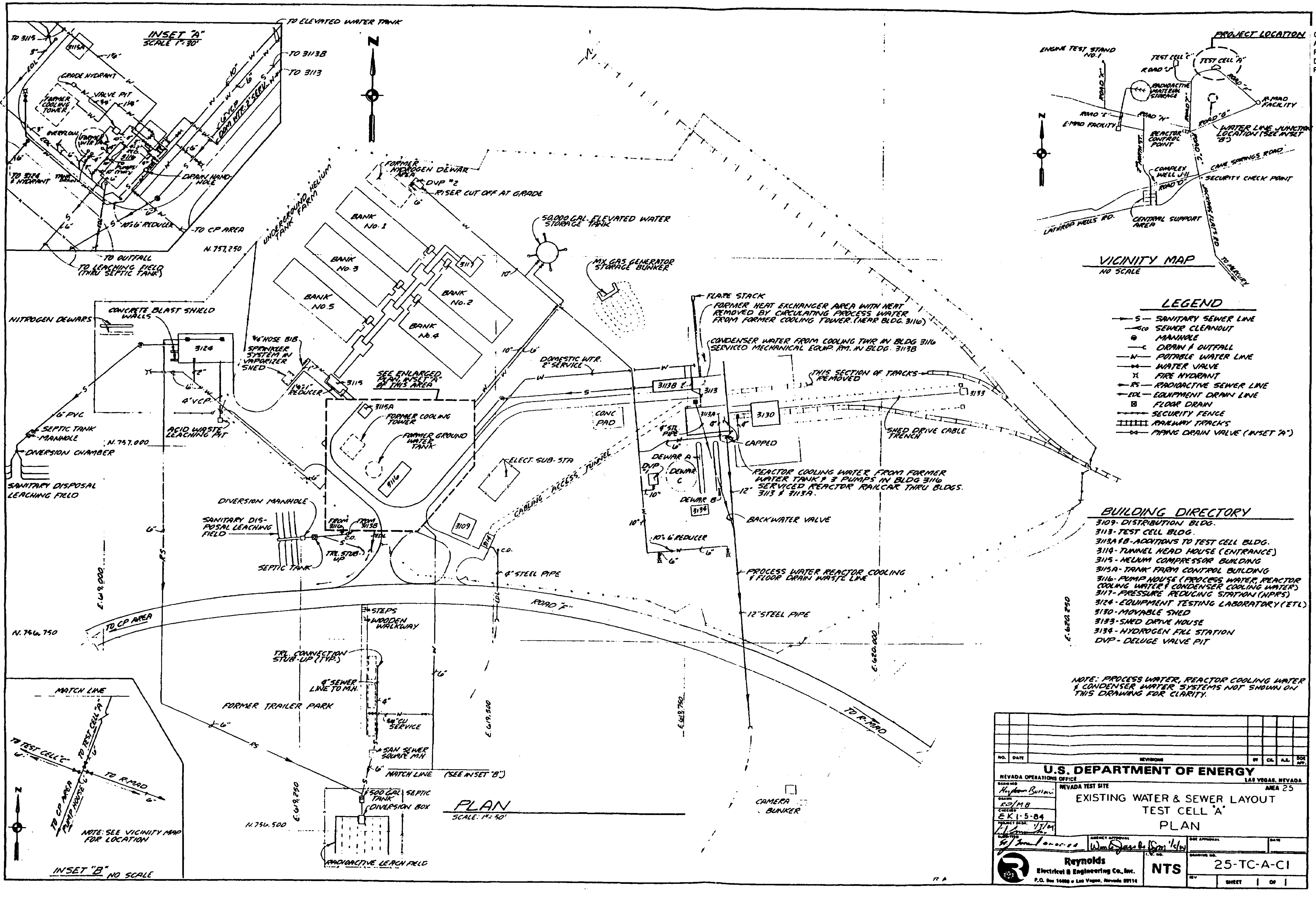
B.1.0 Project Organization

The DOE/NV Industrial Sites Project Manager is Janet Appenzeller-Wing and her telephone number is (702) 295-0461.

The identification 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

Existing Water & Sewer Layout, Test Cell “A” Plan


INSET "A"
SCALE 1"=30'
TO ELEVATED WATER TANK
TO 3113B
TO 3113
TO 3115
3115A
GRADE HYDRANT
VALVE PIT
FORMER COOLING TOWER
OVERFLOW
TO 3124 & HYDRANT
DRAIN HAND-HOLE
10"x6" REDUCER
TO CP AREA
TO OUTFALL
TO LEACHING FIELD (THRU SEPTIC TANK)
N.757,250
UNDERGROUND HELIUM TANK FARM
FORMER HYDROGEN DEWAR AREA
DVP #2
RISER CUT OFF AT GRADE
BANK No. 1
BANK No. 3
BANK No. 5
BANK No. 2
BANK No. 4
3117
50,000 GAL. ELEVATED WATER STORAGE TANK
MX GAS GENERATOR STORAGE BUNKER
NITROGEN DEWARS
CONCRETE BLAST SHIELD WALLS
3124
3/4" HOSE BIB
SPRINKLER SYSTEM IN VAPORIZER SHED
4"x2" REDUCER
3115
SEE ENLARGED PLAN, INSET "A" OF THIS AREA
4" VCP
ACID WASTE LEACHING PIT
6" PVC
SEPTIC TANK
MANHOLE
DIVERSION CHAMBER
SANITARY DISPOSAL LEACHING FIELD
N.757,000
3115A
FORMER COOLING TOWER
FORMER GROUND WATER TANK
3116
DOMESTIC WTR. 2" SERVICE
FLARE STACK
FORMER HEAT EXCHANGER AREA WITH HEAT REMOVED BY CIRCULATING PROCESS WATER FROM FORMER COOLING TOWER. (NEAR BLDG. 3116)
CONDENSER WATER FROM COOLING TWR IN BLDG 3116 SERVICED MECHANICAL EQUIP. RM. IN BLDG. 3113B
THIS SECTION OF TRACKS REMOVED
3113B
3113
3113A
3130
3133
CONC PAD
4" STL PIPE
CAPPED
SHED DRIVE CABLE TRENCH
ELECT. SUB-STA
CABLING ACCESS TUNNEL
DEWAR A
DVP
DEWAR C
DEWAR B
3134
REACTOR COOLING WATER FROM FORMER WATER TANK & 3 PUMPS IN BLDG 3116 SERVICED REACTOR RAILCAR THRU BLDGS. 3113 & 3113A.
BACKWATER VALVE
10"x6" REDUCER
PROCESS WATER REACTOR COOLING & FLOOR DRAIN WASTE LINE
12" STEEL PIPE
DIVERSION MANHOLE
SANITARY DISPOSAL LEACHING FIELD
FROM 3116
FROM 3113B
TRL. STUB-UP
SEPTIC TANK
3109
3114
4" STEEL PIPE
ROAD "F"
TO CP AREA
N.756,750
E.619,000
STEPS
WOODEN WALKWAY
TRL. CONNECTION STUB-UP (TYP.)
4" SEWER LINE TO M.H.
3/4" CU SERVICE
FORMER TRAILER PARK
SAN SEWER SQUARE M.H.
MATCH LINE (SEE INSET "B")
500 GAL. SEPTIC TANK
DIVERSION BOX
RADIOACTIVE LEACH FIELD
N.756,500
E.619,250
E.619,500
E.619,750
E.620,000
E.620,250
TO R-MAD
CAMERA BUNKER
PLAN
SCALE: 1"=50'
MATCH LINE
TO TEST CELL "C"
TO TEST CELL "A"
TO R-MAD
TO CP AREA
PUMP HOUSE
NOTE: SEE VICINITY MAP FOR LOCATION
INSET "B" NO SCALE
PROJECT LOCATION
ENGINE TEST STAND NO. 1
TEST CELL "C"
TEST CELL "A"
ROAD "S"
RADIOACTIVE MATERIAL STORAGE
R-MAD FACILITY
E-MAD FACILITY
ROAD "E"
ROAD "N"
ROAD "G"
REACTOR CONTROL POINT
WATER LINE JUNCTION LOCATION (SEE INSET "B")
CANE SPRINGS ROAD
COMPLEX WELL J-11
SECURITY CHECK POINT
LATHROP WELLS RD.
CENTRAL SUPPORT AREA
JACKASS FLATS RD
TO MERCURY
VICINITY MAP
NO SCALE
LEGEND
S — SANITARY SEWER LINE
CO SEWER CLEANOUT
MANHOLE
DRAIN & OUTFALL
W — POTABLE WATER LINE
WATER VALVE
FIRE HYDRANT
RS — RADIOACTIVE SEWER LINE
EDL — EQUIPMENT DRAIN LINE
FLOOR DRAIN
SECURITY FENCE
RAILWAY TRACKS
PIPING DRAIN VALVE (INSET "A")
BUILDING DIRECTORY
3109 - DISTRIBUTION BLDG.
3113 - TEST CELL BLDG.
3113A & B - ADDITIONS TO TEST CELL BLDG.
3114 - TUNNEL HEAD HOUSE (ENTRANCE)
3115 - HELIUM COMPRESSOR BUILDING
3115A - TANK FARM CONTROL BUILDING
3116 - PUMP HOUSE (PROCESS WATER, REACTOR COOLING WATER & CONDENSER COOLING WATER)
3117 - PRESSURE REDUCING STATION (HPRS)
3124 - EQUIPMENT TESTING LABORATORY (ETL)
3130 - MOVABLE SHED
3133 - SHED DRIVE HOUSE
3134 - HYDROGEN FILL STATION
DVP - DELUGE VALVE PIT
NOTE: PROCESS WATER, REACTOR COOLING WATER & CONDENSER WATER SYSTEMS NOT SHOWN ON THIS DRAWING FOR CLARITY.
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
NEVADA TEST SITE
AREA 25
EXISTING WATER & SEWER LAYOUT
TEST CELL "A"
PLAN
RD/MB
EK 1-5-84
Reynolds Electrical & Engineering Co., Inc.
P.O. Box 14400 • Las Vegas, Nevada 89114
NTS
25-TC-A-C1

Appendix D

Septic System A25TCA: Summary of Analytical and Radioanalytical Results

Figure D.1-1
Septic System A25TCA: Summary of Analytical Results

SAMPLE ID	TOTAL PETROLEUM HYDROCARBONS [A]			VOCs [B] (mg/l)	SEMI-VOCs [C] (mg/l)	TOTAL ETALS (mg/l)	TCLP [E]			pH [F]	PCBs [G] (mg/kg)	OIL & GREASE [H] (mg/kg)
	GASOLINE (mg/kg)	DIESEL (mg/kg)	OIL (mg/kg)				VOCs (mg/l)	SEMI-VOCs (mg/l)	METALS (mg/l)			
A25-TCA-T-S	<5.0	<100 (D)	7,580	NA	NA	NA	ND ND (RE)	ND	Ba 0.078 Cd 0.12	5.34	9.75*	6,900
A25-TCA-LF-1	0.11	<10.0	<10.0	NA	NA	NA	ND	ND	Ba 0.28	7.70	<0.033	20
A25-TCA-BG	<5.0	<10.0	<10.0	NA	NA	NA	ND	ND	Ba 0.41	7.49	<0.167	10

[A] TPH: Total petroleum hydrocarbons (gasoline, diesel, & oil) analyzed using U.S. EPA Method 8015 Modified.
[B] VOCs/TCLP VOCs: Volatile organic compounds analyzed using U.S. EPA Method 8260.
[C] Semi-VOCs/TCLP Semi-VOCs: Semi-Volatile Organic Compounds analyzed using U.S. EPA Method 8270.
[D] Metals/TCLP Metals: Metals analyzed using U.S. EPA Method 7470. Extraction by Method 1311.
[E] TCLP: Toxicity Characteristic Leaching Procedure (40 CFR, Part 261.24).
[F] pH: Analyzed using U.S. EPA Method 1010.
[G] PCBS: Polychlorinated Biphenyls analyzed using U.S. EPA Method 8080 (*Aroclor 1260).
[H] Oil & Grease: Analyzed using U.S. EPA Method 503E.
(D): Identifies all compounds identified in an analysis at a secondary dilution factor.
(RE): Sample reanalyzed for a specific analyte.
ND: Not detected above laboratory detection limits.
NA: Not analyzed
(mg/l or mg/kg): Milligrams per Liter (for liquid), Milligrams per Kilogram (for soil)
(Based upon matrix anazlyzed)

The analytical packets for the above sample results are as follows:
94-08-063: A25TCA-T-S: TCLP:VOCs,Semi-VOCs, Radioanalytical
94-08-064: A25TCA-T-S: TPH, PCBs
94-08-065: A25TCA-T-S: TCLP-Metals, pH
94-08-066: A25TCA-T-S: Oil & Grease
94-09-014: A25TCA-BG: Oil & Grease
94-09-019: A25TCA-BG: TCLP-Metals, pH, Radioanalytical
94-09-020: A25TCA-BG: TCLP:VOCs,Semi-VOCs
94-09-021: A25TCA-BG: TPH, PCBs
95-03-016: A25TCA-LF-1: TPH, TCLP:VOCs,Semi-VOCs,Metals, pH, PCBs, Oil & Grease, Radioanalytical

Figure D.1-2
Septic System A25TCS: Summary of Radioanalytical Results

SAMPLE ID	GAMMA			TRITIUM		PLUTONIUM		
	NUCLIDES	VALUE	UNITS	VALUE	UNITS	NUCLIDES	VALUE	UNITS
A25TCA-T-S	Ac-228	4.01E-07	uCi/g	3.24E-06	uCi/g	Pu-238	1.30E-08	uCi/g
	Bi-212	8.11E-07	uCi/g			Pu-239	2.27E-08	uCi/g
	Bi-214	3.57E-08	uCi/g					
	Cs-137	2.55E-06	uCi/g					
	K-40	5.97E-06	uCi/g					
	Ra-226	2.37E-07	uCi/g					
	Tl-208	1.47E-07	uCi/g					
A25TCA-LF-1	K-40	2.94E+01	pCi/g	2.88E+00	pCi/g	Pu-238	-6.18E-03	pCi/g
	Ra-226	8.84E-01	pCi/g			Pu-239	-3.88E-03	pCi/g
	Th-228	2.59E+00	pCi/g					
	Th-232	1.64E+00	pCi/g					
A25TCA-BG	Eu-152	2.19E-01	pCi/g	1.94E+00	pCi/g	Pu-238	5.00E-03	pCi/g
	K-40	3.36E+01	pCi/g			Pu-239	Not Detected	NA
	Ra-226	1.22E+00	pCi/g					
	Th-228	4.39E+00	pCi/g					
	Th-232	2.38E+00	pCi/g					

Notes:
pCi/g = picocuries per gram
uCi/g = microcuries per gram
NA = Not Applicable

Appendix E

NDEP Document Review Sheet

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number: CAIP for CAU 500: Test Cell A Septic System, NTS	2. Document Date: October 1998
3. Revision Number: Draft	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.: Greg Raab/NDEP/486-2867	9. Reviewer's Signature:

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
Page 9 of 21, 2nd Para, 1st Sentence		...of the leachfield Work Plan <u>and described in detail in Appendix A, Table A.2-1</u> (Note: underlined portions represent the desired inserts or additions.)	Comment accepted	Yes
On all Figures with maps		What is the significance of the inward pointing arrows on the north arrow symbol? A more traditional north arrow with a compass rose, might be more appropriate.	This issue will be discussed programmatically. Future documents will use a simpler north arrow.	No changes
Page A-13, Sect. A.6.0 Decision Rules, 1st Sentence		The following decision rules are applicable to the <u>CAU 500</u> Leachfield System	Comment accepted	Yes
General		According to the format agreed upon by DOE and NDEP, add Appendix A2. (or B) Project Organization, which includes: 1. Name and office telephone of the Project Manager 2. The following statement, "The identification of the project Health and Safety Officer and the Quality Assurance Officer can be found in the appropriate DOE 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."	Comment accepted. The Leachfield Work Plan contains Appendix B; this was originally considered applicable to all the related CAIPs. However, because project management changes may occur, the information will be included in the individual CAIPs.	Yes

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