Nevada
Environmental
Restoration
Project

DOE/NV--721

Corrective Action Investigation Plan for Corrective Action Unit 405: Area 3 Septic Systems, Tonopah Test Range, Nevada

Controlled Copy No: ___
Revision No: 0

April 2001

Approved for public release; further dissemination is unlimited.

Environmental Restoration
Division

U.S. Department of Energy
Nevada Operations Office

RECORD OF TECHNICAL CHANGE

Technical Change No. 1 Page 1 of 5

Project/Job No. 799417.01040210 Date 0 8/10/01

Project/Job Name CAU 405, Area 3 Septic System, Tonopah, Nevada

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The following technical changes (including justification) are requested by:

Dustin Wilson (Name) CAU 405 Task Manager (Title)

The following changes were made to reflect the modification to the conceptual model for SWS 4 (CAS: 03-05-002-SW04) based on field investigation observations:

Page 8, Section 2.2.2, first paragraph, sentences 3, 4 and 5

Combined and rewritten to read, "The leachfield consists of one distribution pipe draining to the west into a layer of pea gravel. The leachfield dimensions and the total length of piping from the source buildings to the leachfield are unknown."

Page 25, Section 4.6, first paragraph, third sentence

Third sentence rewritten to read, "The SWS 7 leachfield is expected to be a parallel, three-pipe system similar..."

Pages 11, 12, and 27, Figures 2-3, 2-4, and 4-2, respectively

Replace Figures 2-3, 2-4 and 4-2 with the attached revised figures.

Page 29, Section 4.6, first paragraph, sixth sentence

Delete "SWS 4 and"

Add after sixth sentence, "The SWS 4 leachfield is a single distribution line discharging into a layer of pea gravel."

Page 35, Section 7.0

Add reference: IT Corporation. 2001. CAU 405 Field Activity Daily Log prepared by D. Wilson, 25 July. Las Vegas, NV.

The project time will be (Increased)(Decreased)(Unchanged) by approximately -0- days.

Applicable Project-Specific Document(s):

Corective Action Investigation Plan for Corrective Action Unit 405: Area 3 Septic Systems, Tonopah Test Range, Nevada, Rev. 0, DOE/NV--721. Las Vegas, NV.

Approved By: Date 8/14/01

Janet Appenzeller-Wing, Project Manager
Industrial Sites Project

Date 8/14/01

Runore C. Wycoff, Division Director
Environmental Restoration Division

Client Notified Yes X No ____ Date 7/25/01

NDEP Concurrence Yes X No ____ Date 7/25/01 – Verbal

Contract Change Order Required Yes ____ No X

Contract Change Order No. N/A

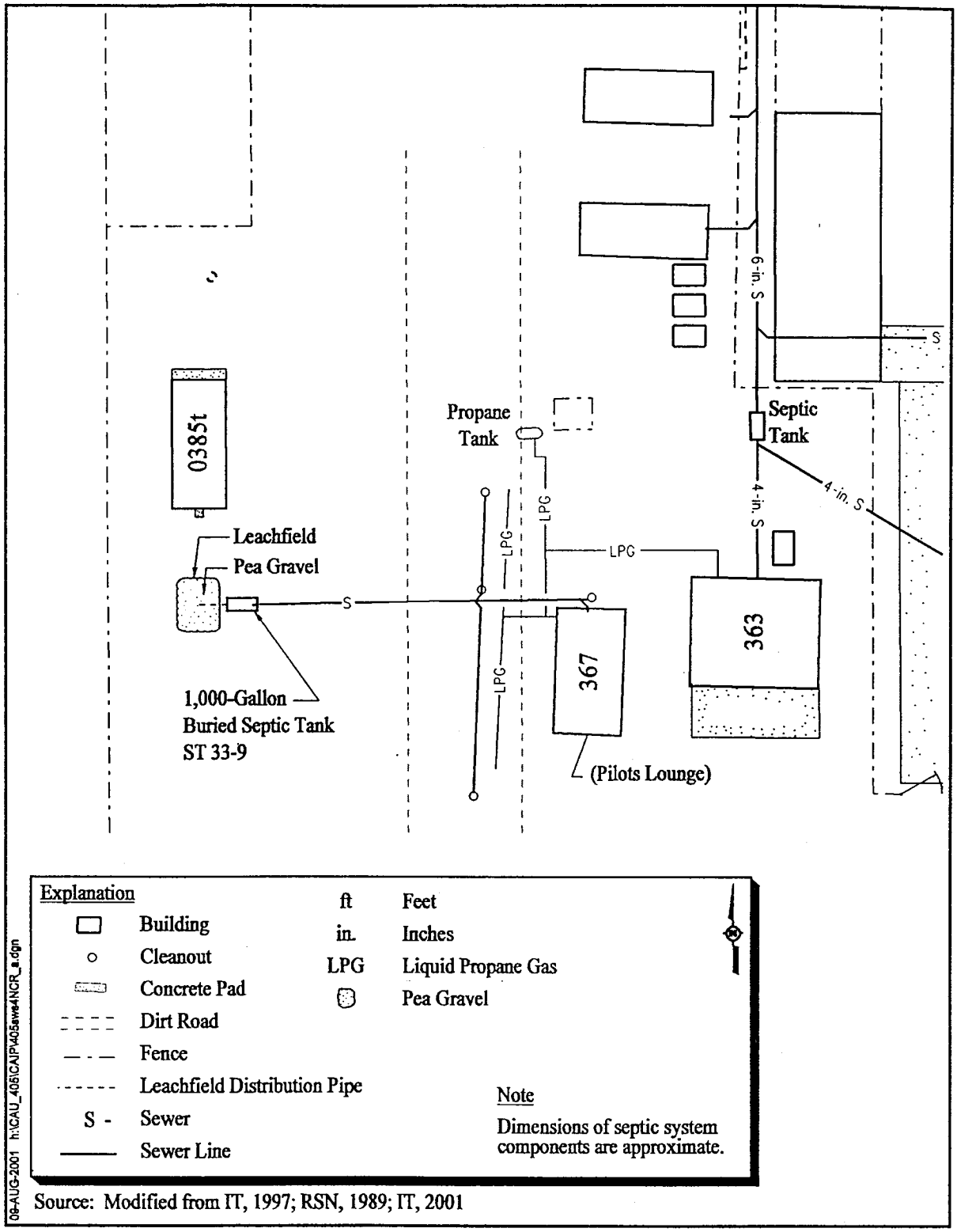
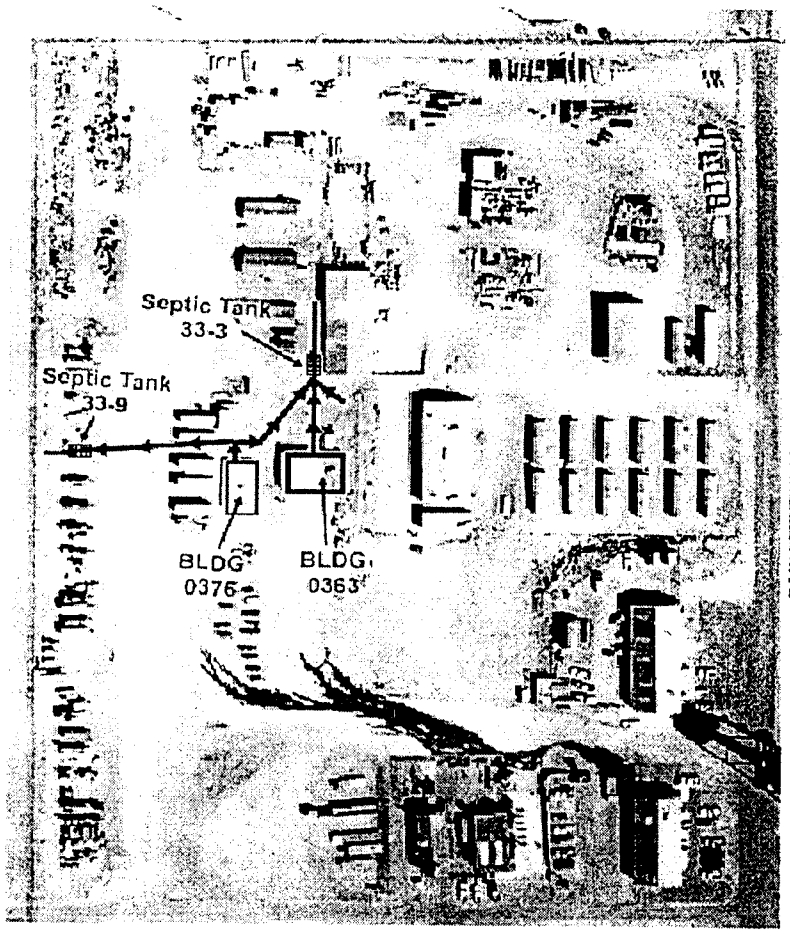
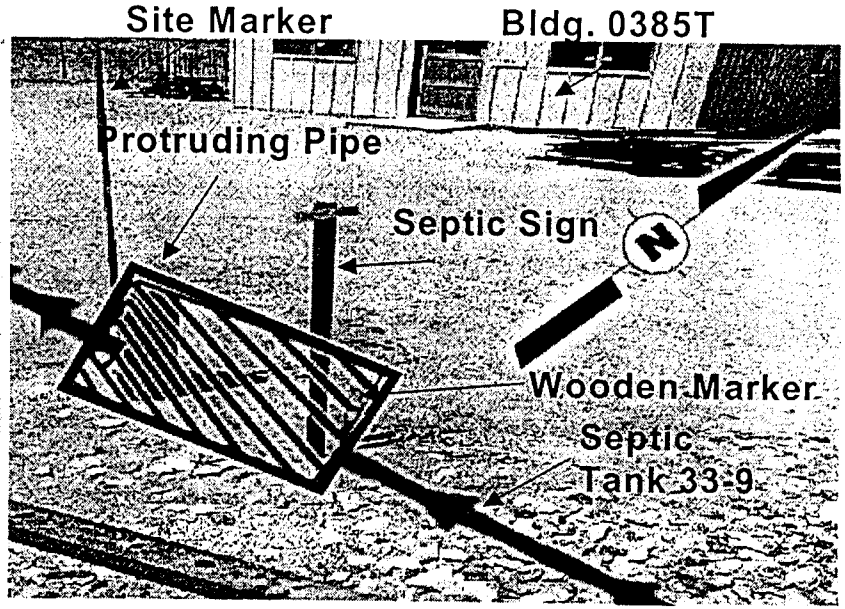


Figure 2-3
Septic Waste System 4:
Northwest Section of Area 3, Tonopah Test Range, Nevada

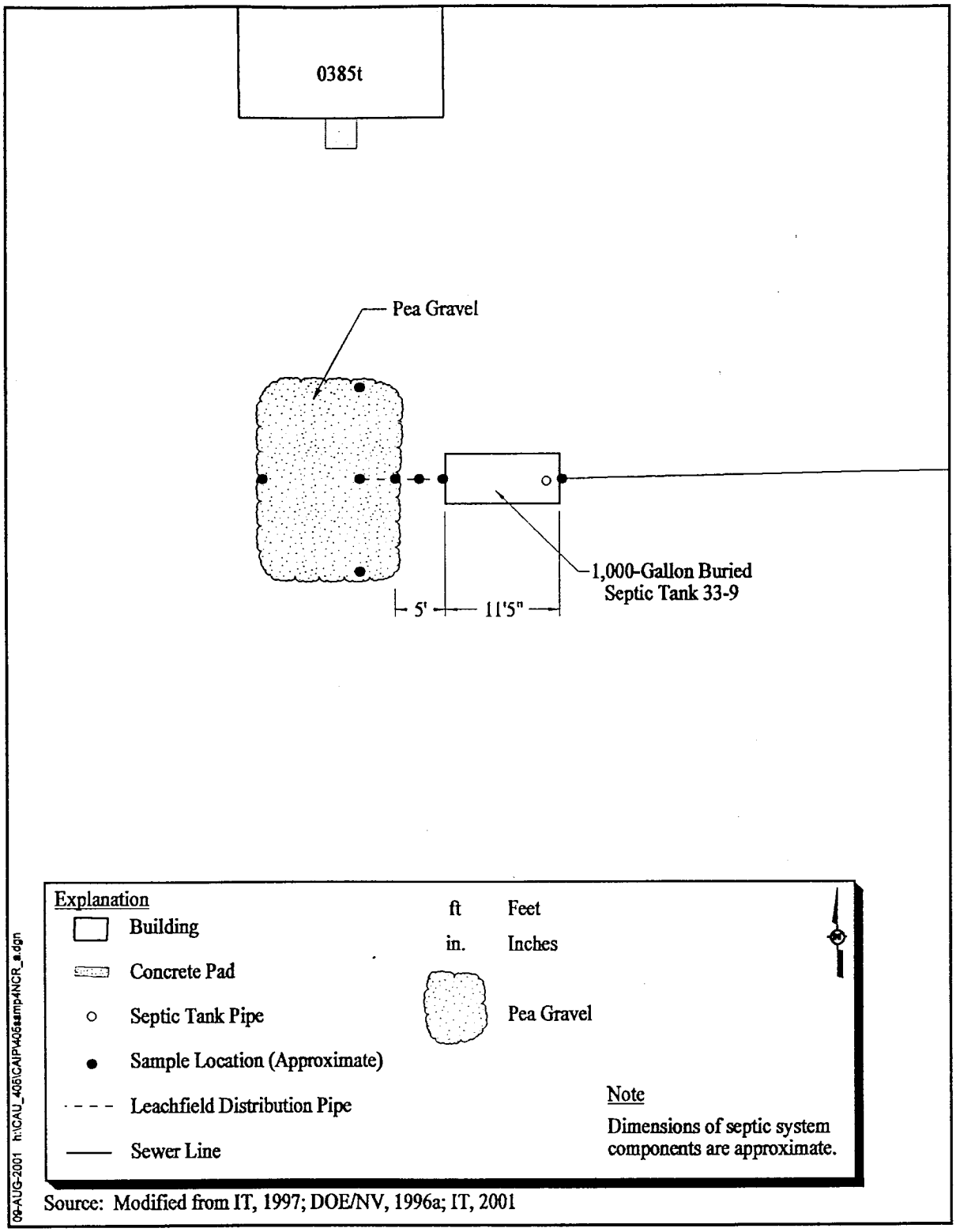


Aerial photograph taken on August 1, 1985, with added SWS 4 components and associated piping.
(Modified from EG&G/EM, 1988a; DOE/NV, 1996a; IT, 2001)



Photograph taken on May 19, 1998, shows the approximate location of buried Septic Tank 33-9, as it appears today. There is a steel post with a septic sign, the IT Corporation site marker, an unknown wooden marker, and a pipe protruding from the ground. Building 0385-T is in the background. Photograph taken facing northwest. (IT,1998b)

Figure 2-4
Photographs of Septic Waste System 4 in Area 3
Tonopah Test Range, Nevada



Source: Modified from IT, 1997; DOE/NV, 1996a; IT, 2001

Figure 4-2
Septic Waste System 4
Proposed Sample Locations

Available for public sale, in paper, from:

U.S. Department of Commerce
National Technology Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800.553.6847
Fax: 703.605.6900
Email: orders@ntis.fedworld.gov
Online ordering: *http://www.ntis.gov/ordering.htm*

Available electronically at *http://www.doe.gov/bridge*

Available for a processing fee to U.S. Department of Energy and its contractors, in paper, from:

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
Phone: 865.576.8401
Fax: 865.576.5728
Email: reports@adonis.osti.gov

DOE/NV--721

CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 405: AREA 3 SEPTIC SYSTEMS, TONOPAH TEST RANGE, NEVADA

DOE Nevada Operations Office
Las Vegas, Nevada

Controlled Copy No.: ___

Revision No.: 0

April 2001

CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 405:
AREA 3 SEPTIC SYSTEMS,
TONOPAH TEST RANGE, NEVADA

Approved by: Signature Approved Date: 04/26/2001

Janet Appenzeller-Wing, Project Manager
Industrial Sites Project

Approved by: Signature Approved Date: 04/26/2001

Runore C. Wycoff, Division Director
Environmental Restoration Division

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List of Acronyms and Abbreviations

bgs	Below ground surface
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
CR	Closure Report
CWA	*Clean Water Act*
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DQO	Data Quality Objective(s)
DRO	Diesel-Range Organics
FFACO	*Federal Facility Agreement and Consent Order*
FSL	Field-screening level(s)
FSR	Field-screening result(s)
ft	Foot (feet)
gal	Gallon(s)
GRO	Gasoline-Range Organic(s)
IDW	Investigation-derived waste
ITLV	IT Corporation, Las Vegas
in.	Inch(es)
K	Potassium
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per liter
mi	Mile(s)

List of Acronyms and Abbreviations (Continued)

NAC	*Nevada Administrative Code*
NDEP	Nevada Division of Environmental Protection
NEPA	*National Environmental Policy Act*
PAL	Preliminary action level(s)
pCi/L	Picocurie(s) per liter
ppm	Part(s) per million
PRG	Preliminary Remediation Goal
QA/QC	Quality assurance and quality control
QAPP	*Quality Assurance Project Plan*
Ra	Radium
RCRA	*Resource Conservation and Recovery Act*
REECo	Reynolds Electrical & Engineering Co., Inc.
ROTC	Record of Technical Change
SNL	Sandia National Laboratories
SVOC	Semivolatile organic compound(s)
SWS	Septic Waste System
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total petroleum hydrocarbon(s)
TTR	Tonopah Test Range
U	Uranium
VOC	Volatile organic compound(s)

Executive Summary

The Corrective Action Investigation Plan for Corrective Action Unit 405, Area 3 Septic Systems, Tonopah Test Range, 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 405 consists of Corrective Action Sites 03-05-002-SW03, 03-05-002-SW04, and 03-05-002-SW07, respectively known for the purpose of this corrective action investigation as Septic Waste Systems 3, 4, and 7.

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*, Rev. 1, hereafter referred to as the Leachfield Work Plan. 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. This Corrective Action Investigation Plan provides investigative details specific to Corrective Action Unit 405.

Septic Waste Systems 3, 4, and 7 were used for wastewater disposal in and near Area 3 of the Tonopah Test Range. In 1990, a consolidated sewer system was installed to replace these septic waste systems. Operations within various buildings in and near Area 3 generated sanitary and industrial wastewaters potentially contaminated with contaminants of potential concern and disposed of in related septic tanks and leachfields. Septic Waste Systems 3, 4, and 7 were constructed to receive sanitary sewage, but may have inadvertently received effluent containing potentially hazardous and radiological constituents.

Based on site history collected to support the Data Quality Objectives process and the results from a previous septic tank sampling effort, contaminants of potential concern identified for Corrective Action Unit 405 include acetone, benzene, ethylbenzene, 4-methyl-2-pentanone, toluene, xylenes, volatile organic compound constituents associated with potential chemical uses, phenols, arsenic, barium, lead, mercury, hydrocarbons of oil and grease, and uranium-234, -235, and -238.

Additional samples will be collected and may be analyzed for geotechnical and hydrological properties. Bioassessments will be conducted if field observations indicate a potential for hydrocarbon contamination. Total and fecal coliform analyses will be conducted on sediment, sludge, and liquid collected. The Leachfield Work Plan provides for the potential of corrective action unit-specific deviations to the conceptual site model; however, none were identified during the Data Quality Objectives process for Corrective Action Unit 405.

The technical approach for investigating Corrective Action Unit 405 consists of the following activities:

- Conduct exploratory trenching and excavations of particular subsurface components for visual inspection and to access sampling horizons.
- Conduct discrete field screening on soil samples.
- Inspect septic tanks and distribution boxes for sludge, sediment, and liquid.
  - If liquid is present, collect samples to analyze for total volatile organic compounds, total semivolatile organic compounds, total *Resource Conservation and Recovery Act* metals, total petroleum hydrocarbons (diesel- and gasoline-range organics), gamma-emitting radionuclides, and total and fecal coliform analyses (septic tank only).
  - If sludge or sediment is present, collect samples to analyze for total and Toxicity Characteristic Leaching Procedure volatile organic compounds, total and Toxicity Characteristic Leaching Procedure semivolatile organic compounds, total and Toxicity Characteristic Leaching Procedure *Resource Conservation and Recovery Act* metals, total petroleum hydrocarbons (diesel- and gasoline-range organics), gamma-emitting radionuclides, and total and fecal coliform analyses (septic tank only).
  - If any septic tank sample results show total or fecal coliform, the contents of the distribution box (if any) will also be analyzed for total and fecal coliform.
- Inspect collection system piping for sediment. If present, collect sample to analyze for total volatile organic compounds, total semivolatile organic compounds, total *Resource Conservation and Recovery Act* metals, total petroleum hydrocarbons (diesel- and gasoline-range organics), and gamma-emitting radionuclides.
  - If any septic tank sample results show total or fecal coliform, the contents of the collection system piping (if any) will also be analyzed for total and fecal coliform.

- Analyze environmental soil samples for total volatile organic compounds, total semivolatile organic compounds, total *Resource Conservation and Recovery Act* metals, and total petroleum hydrocarbons (diesel- and gasoline-range organics), and gamma-emitting radionuclides (25 percent) for waste management purposes.

- Analyze all samples collected from Septic Waste System 4 for isotopic uranium.

- Conduct subsurface sampling from soil borings, if necessary, to define the vertical extent of contamination.

- Collect samples for bioassessment based on field observations.

- Collect samples from native soil beneath the leachfields and analyze for geotechnical and hydrological properties, if contaminants of concern are present in samples sent for off-site analysis.

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

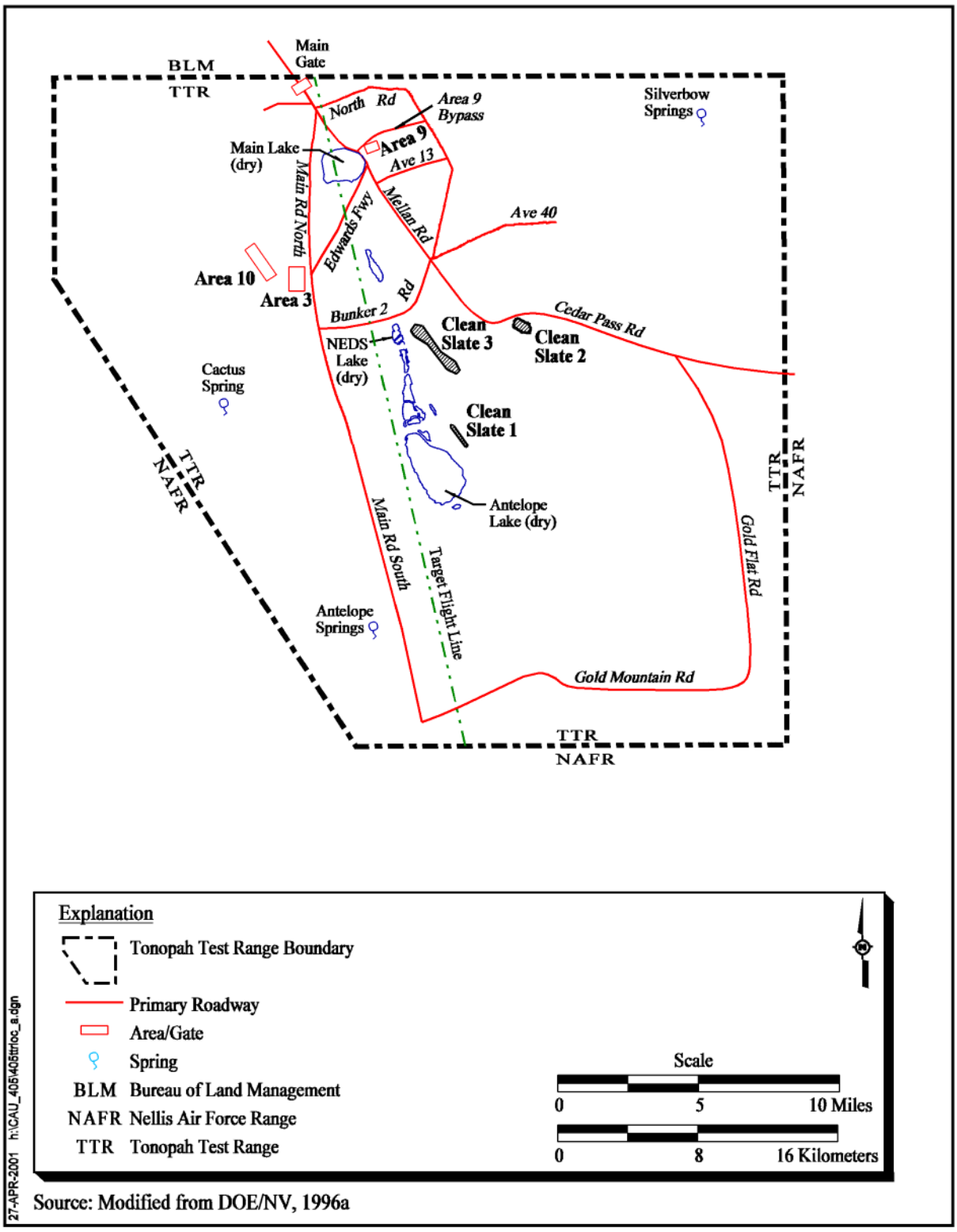
Under the *Federal Facility Agreement and Consent Order*, the Corrective Action Investigation Plan will be submitted to the Nevada Division of Environmental Protection for approval. Field work will be conducted following approval of the plan. The results of the field investigation will support a defensible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

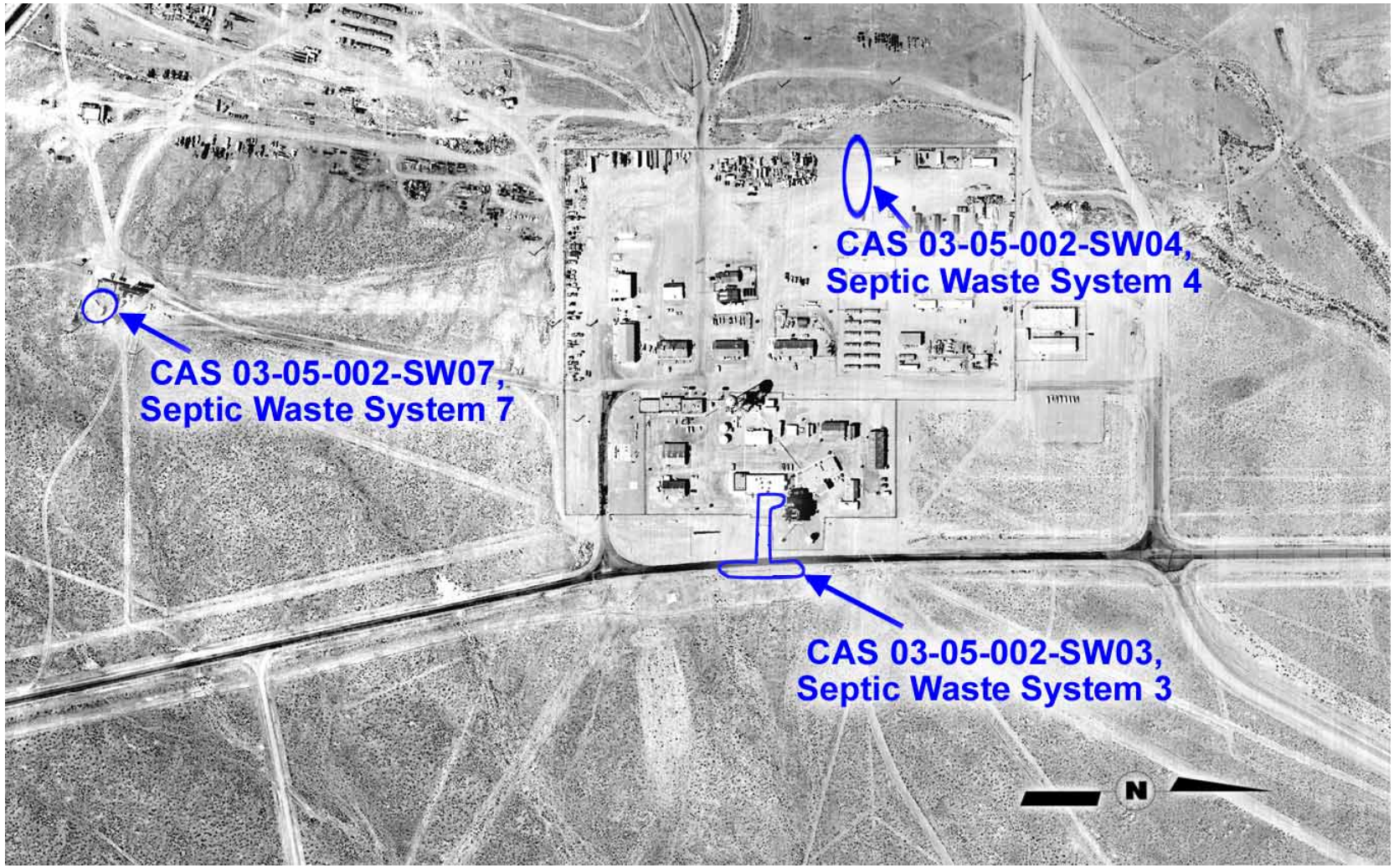
This CAIP will be used in conjunction with the *Work Plan for Leachfield Corrective Action Units: Nevada Test Site and Tonopah Test Range, Nevada*, Rev. 1 (DOE/NV, 1998), hereafter referred to as the Leachfield Work Plan. Under the FFACO, a work plan is an optional planning document that provides information 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 405: Area 3 Septic Waste Systems, Tonopah Test Range (TTR), Nevada.

This CAIP addresses three septic waste systems located in or near Area 3 of the TTR. The TTR is approximately 140 miles (mi) northwest of Las Vegas, Nevada (see Leachfield Work Plan, Figure 1-1). Area 3 is located in the northwest section of TTR, as depicted in Figure 1-1. Corrective Action Unit 405 is comprised of CAS 03-05-002-SW03 (Septic Waste System [SWS]), CAS 03-05-002-SW04 (Septic Waste System), and CAS 03-05-002-SW07 (Septic Waste System) (FFACO, 1996) as shown in Figure 1-2. Each CAS will hereafter be referred to as SWS 3, SWS 4, and SWS 7, respectively.



Source: Modified from DOE/NV, 1996a

Figure 1-1
Area 3 Location Map
Tonopah Test Range, Nevada



Modified from EG&G/EM, 1987b; DOE/NV, 1996a
Photo taken in 1987

Figure 1-2
Corrective Action Site Locations

1.1 Purpose

This CAIP describes the investigation of the nature and extent of contaminants of potential concern (COPCs) at CAU 405. The general purpose of corrective action investigations for leachfield CAUs is described in the Leachfield Work Plan. This CAIP was developed using the Data Quality Objective (DQO) process as presented in Appendix A.

Each SWS within CAU 405 has an independent group of associated septic tanks and leachfields that received sanitary sewage as the primary effluent from source buildings. These SWSs were abandoned once the Area 3 consolidated sewer system was operational in 1990. The septic tank contents of SWSs 3, 4, and 7 were sampled and analyzed as part of a 1991 sampling effort conducted by Sandia National Laboratories (SNL) in Area 3. Analytical results indicate that potentially contaminated effluent may have been discharged to the leachfields.

1.2 Scope

The scope of this CAIP is to resolve the problem statement identified in the DQO process provided in Appendix A. The problem statement is that effluent with potentially hazardous and radiological constituents was discharged to the septic waste systems that comprise CAU 405, and that existing information is insufficient to support the development and evaluation of corrective action alternatives 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:

- Inspect collection system piping for sediment and sample if the quantity is adequate to conduct analyses.
- Sample the contents of the septic tanks and distribution boxes, if any.
- Conduct discrete field screening.
- Conduct exploratory trenching and excavations of particular subsurface components for visual inspection and to access sampling horizons.
- Collect environmental samples for laboratory analyses of COPCs, and for geotechnical and hydrological analyses.

- Collect additional samples for waste management purposes (e.g., total and fecal coliform analysis, gamma spectrometry).

- Conduct subsurface sampling from soil borings, if necessary to define the vertical extent of COPCs.

1.3 Corrective Action Investigation Plan 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 NDEP 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), the DOE/NV *Project Execution Plan* (DOE/NV, 2000), 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 (see Section 3.0, Section 4.0, and Section 5.0) of this document, and in the DQO summary presented in Appendix A. Field sampling activities are discussed in the Leachfield Work Plan and in Section 4.0 of this CAIP. 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 are discussed in Section 6.0 of this CAIP. Section 7.0 provides a list of references. General field and laboratory quality assurance and quality control issues, including collection of quality control samples, are presented in the *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 1996c). The health and safety aspects of this project are documented in the ITLV *Health and Safety Plan* (IT, 2000) and will be supplemented with a site-specific health and safety plan written prior to the start of field work.

Appendix V of the FFACO (1996) contains an overview of the approved Public Involvement Plan for DOE/NV activities conducted on the Nevada Test Site. As part of the Public Involvement Plan, the

Community Advisory Board for Nevada Test Site Programs provides public announcements of all proposed activities at the Nevada Test Site and other locations within the state of Nevada which are under the purview of DOE/NV. At this time, DOE/NV does not plan on conducting additional CAU-specific public involvement activities.

2.0 Facility Description

General background information pertaining to the history of the TTR and Area 3, a geologic assessment, and an overview of the area hydrogeology including depths to groundwater are provided in the *Corrective Action Unit Work Plan, Tonopah Test Range, Nevada* (DOE/NV, 1996a). The TTR facility is operated by the SNL for the U.S. Department of Energy (DOE). Historically, the TTR has been a research facility with the mission to perform defense-related projects. Industrial operations, experiments, and site maintenance operations that may have resulted in impacts to the environment were associated with these projects. Operations within various buildings in and near Area 3 of the TTR generated sanitary and industrial wastewaters potentially contaminated with COPCs and disposed of in septic tanks and leachfields (DOE/NV, 1996a). Septic Waste Systems 3, 4, and 7 were constructed to receive sanitary sewage, but may have inadvertently received effluent containing potentially hazardous and radiological constituents.

2.1 Physical Setting

Surface materials around the site consist of pavement, sand, gravel, and cobbles with little to no vegetation. The topography around Area 3 slopes gently in all directions with surface drainage flowing northwest. The immediate topography slopes to the northwest at SWSs 4 and 7 and to the east at SWS 3. Depth to groundwater beneath Area 3 is estimated at 361 to 394 feet (ft) below ground surface (bgs). The groundwater flow direction is generally to the north-northwest. (DOE/NV, 1996a)

2.2 Operational History

A system of leachfields and associated collection systems was used for wastewater disposal at Area 3 until a consolidated sewer system was installed in 1990. Effluent is currently discharged to a flocculating sewage lagoon maintained by the U.S. Air Force. The Area 3 septic systems were documented in *Corrective Action Unit Work Plan, Tonopah Test Range, Nevada* (DOE/NV, 1996a), as being included in the septic tank abandonment program conducted by SNL in 1993. The abandonment program consisted of pumping out the septic tank contents, and air drying and filling them with sand or cement. However, this program was not completed and the possibility exists that some of the Area 3 septic tanks may not have been abandoned. All SWSs addressed in this CAIP are inactive.

2.2.1 Septic Waste System 3

Septic Waste System 3 consists of Septic Tank 33-7, a leachfield divided by a distribution box, and associated piping (see Figure 2-1 and Figure 2-2). Septic Tank 33-7 is located approximately 114 ft east of Building 0351 and has a capacity of 5,000 gallons (gal). The leachfield is located east of Main Road and 224 ft east of Building 0351. The distribution box is located east of the septic tank and measures 5 by 3 ft. (Holmes & Narver, 1962 and 1964)

The leachfield configuration includes two separate drainage systems. The two drainage systems are connected at the center and drain in opposite directions; one to the north and the other to the south. The dimensions of each drainage system are approximately 100 by 14 ft. Each drainage system has three, 2-ft trenches with 4-inch (in.) diameter drainage tiles. (Holmes & Narver, 1962 and 1964)

Septic Waste System 3 began receiving sanitary sewage from Building 0351 (Administration Building) in 1962. In 1980, Building 0357 (Operations and Control) was constructed and sanitary sewage from this building was also directed to this SWS. Buildings 0357 and 0351 functioned primarily as administrative offices for TTR personnel. In addition, Building 0357 was used to perform electronic, computer, and telemetry operations. Although sanitary sewage was the primary effluent from Building 0357, janitorial products (e.g., cleaners, lubricants, adhesives, and solutions) may have also been discharged (SNL, 1994).

2.2.2 Septic Waste System 4

Septic Waste System 4 consists of Septic Tank 33-9, a leachfield, and associated piping (see Figure 2-3 and Figure 2-4). The septic tank is located east of the leachfield and has a capacity of 1,000 gal. The leachfield dimensions measure approximately 35 by 10 ft. The leachfield consists of three parallel pipes draining to the west. The total length of piping from the source buildings to the leachfield is unknown. (DOE/NV, 1996a)

From 1980 to 1987, SWS 4 received effluent intermittently from trailers belonging to the U.S. Air Force, Reynolds Electrical & Engineering Co., Inc. (REECo), and Advanced Security, Inc. The actual number of trailers connected to SWS 4 at any one time is unknown. Activities conducted in the U.S. Air Force trailers and the REECo trailers are unknown. In 1987, trailers belonging to Advanced Security, Inc., were present and provided sleeping quarters and bathroom facilities. The

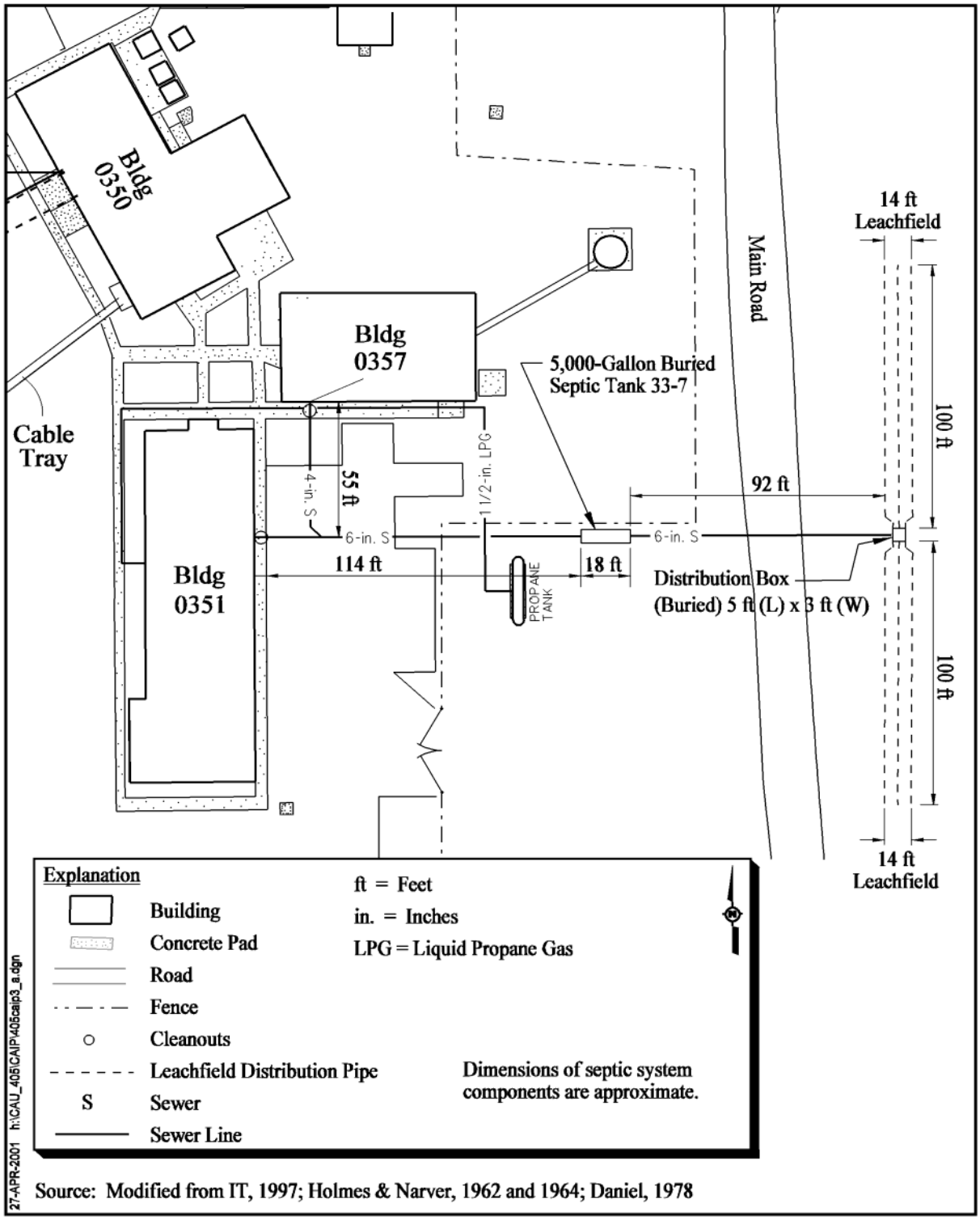
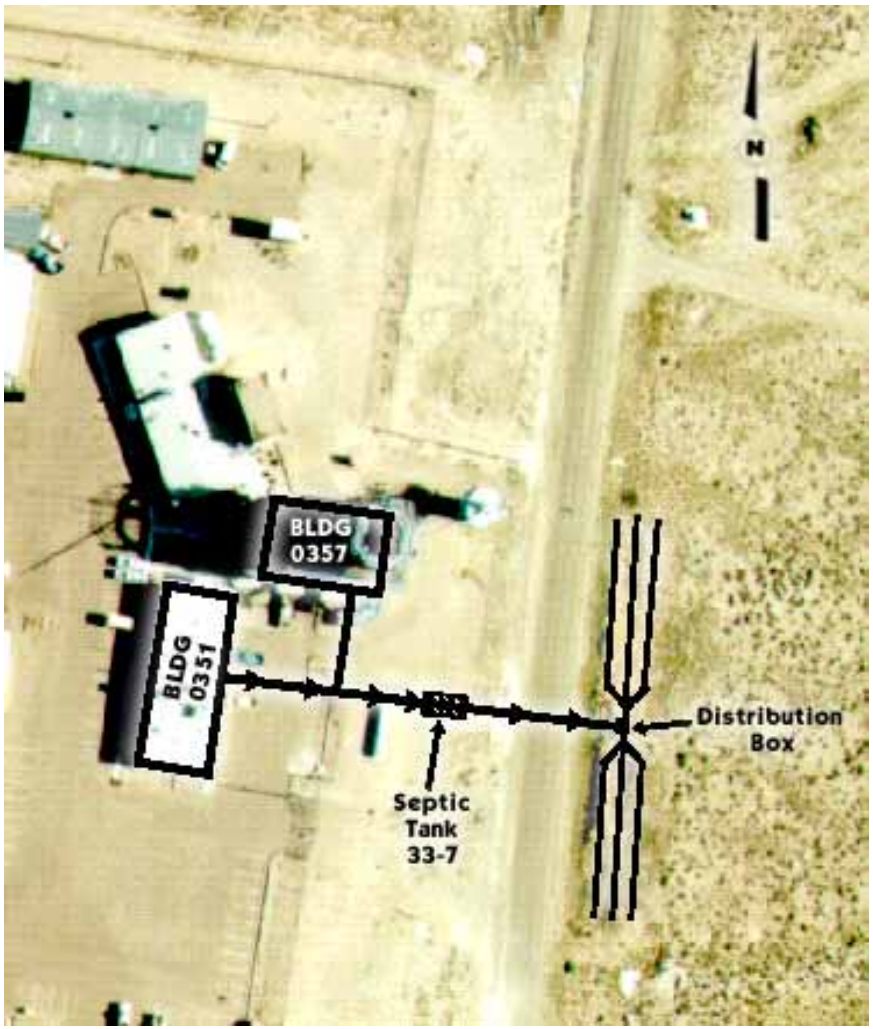
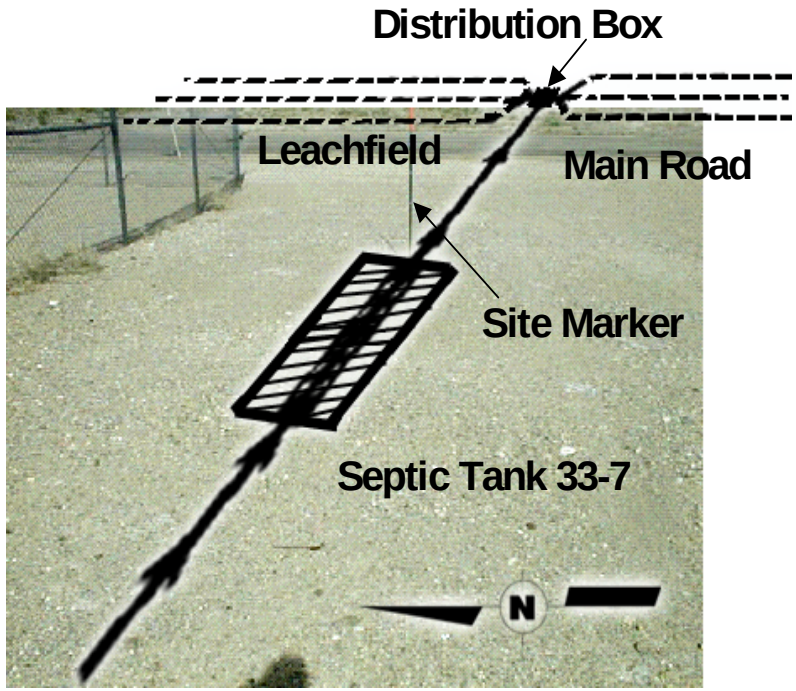


Figure 2-1
Septic Waste System 3:
East Section of Area 3, Tonopah Test Range, Nevada



Aerial photograph taken in 1987 with added SWS 3 components and associated piping. (Modified from EG&G/EM, 1987b; DOE/NV, 1996a)



Photograph taken on May 20, 1998, shows approximate location of buried Septic Tank 33-7, as it appears today; the IT Corporation site marker; and the Area 3 fence. The leachfield begins east of Main Road. Photograph taken facing east. (IT,1998a)

Figure 2-2
Photographs of Septic Waste System 3 in Area 3
Tonopah Test Range, Nevada

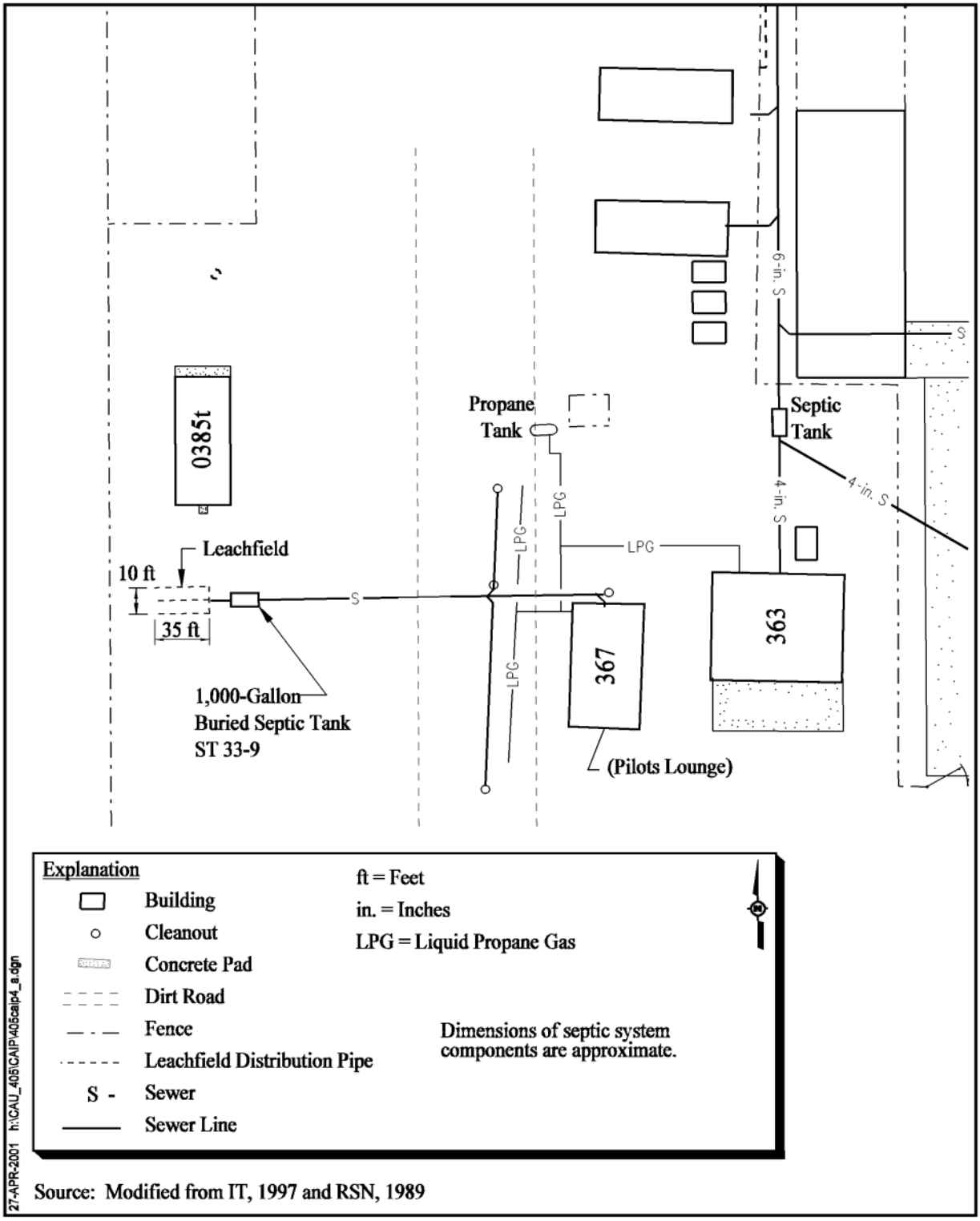
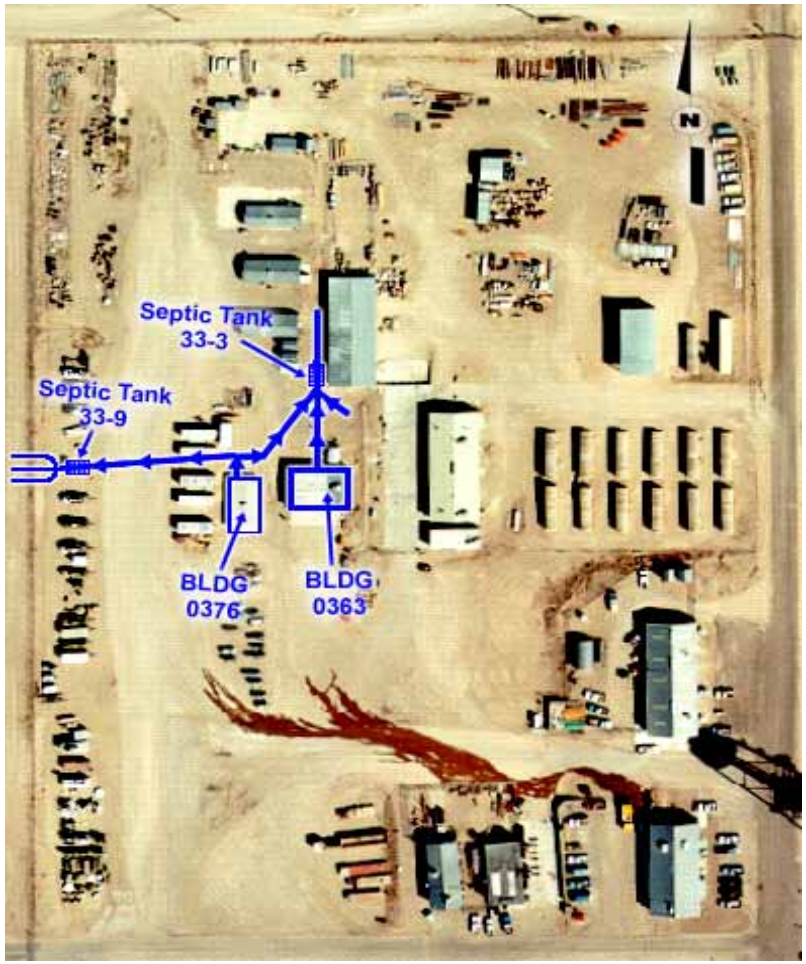
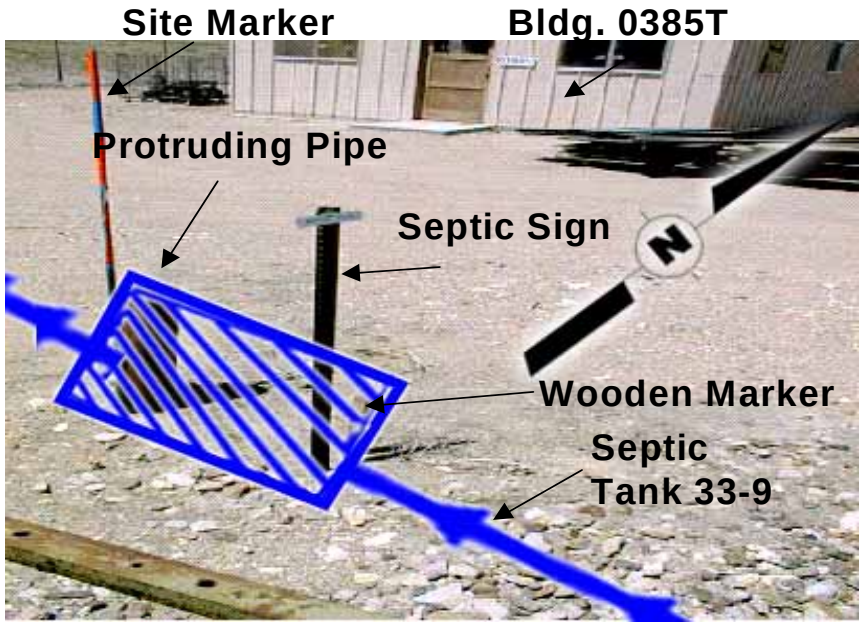


Figure 2-3
Septic Waste System 4:
Northwest Section of Area 3, Tonopah Test Range, Nevada



Aerial photograph taken on August 1, 1985, with added SWS 4 components and associated piping.
(Modified from EG&G/EM, 1988a; DOE/NV, 1996a)



Photograph taken on May 19, 1998, shows the approximate location of buried Septic Tank 33-9, as it appears today. There is a steel post with a septic sign, the IT Corporation site marker, an unknown wooden marker, and a pipe protruding from the ground. Building 0385-T is in the background. Photograph taken facing northwest. (IT,1998b)

Figure 2-4
Photographs of Septic Waste System 4 in Area 3
Tonopah Test Range, Nevada

Pilots Lounge (Building 0376) is the only remaining trailer and was connected to SWS 4. (Blackburn, 1999a and b; and Quas, 1999)

2.2.3 Septic Waste System 7

Septic Waste System 7 consists of a leachfield, Septic Tank 33-13, a diversion box, and associated piping (see Figure 2-5 and Figure 2-6). Septic Tank 33-13 has a capacity of 1,500 gal and is located approximately 40 ft southeast of Building 0365 (Radio Shop). The leachfield is approximately 20 by 50 ft. Building 0365 was constructed in 1960 and was used for small radio maintenance and repair. The leachfield consists of three parallel pipes that drain to the southeast. (DOE/NV, 1994 and 1996a)

2.3 Waste Inventory

Interviews with former TTR personnel, previous analytical results, and chemical inventories indicate that, in addition to sanitary waste, industrial wastewaters may have been discharged to the SWSs. Records of wastewater volumes discharged to the septic systems are not available. Septic tanks at the TTR were usually pumped out every few years and the resulting sludge was buried on the TTR (DOE/NV, 1996a). Septic Waste Systems 3, 4, and 7 have not received additional effluent since the installation of the consolidated sewer system in 1990. During the DQO process, available information including the historical sampling results provided in Appendix C and the 1993 chemical inventory were evaluated. As a result, the list of potential contaminants of concern provided in Section 3.2 was developed.

2.4 Release Information

The source of potential contamination related to the CAU 405 leachfield system was wastewater routed through drain lines from the source buildings. The effluent was released to the leachfield after it passed through leachfield system components such as septic tanks and distribution boxes. The leachfields were designed for liquid to be dispersed over an area just above the leachfield base (leachrock/native soil interface), and to percolate through the leachrock and into the underlying soil. The driving force for downward migration of the contamination was the discharge from the septic tanks. The leachfield systems are now inactive.

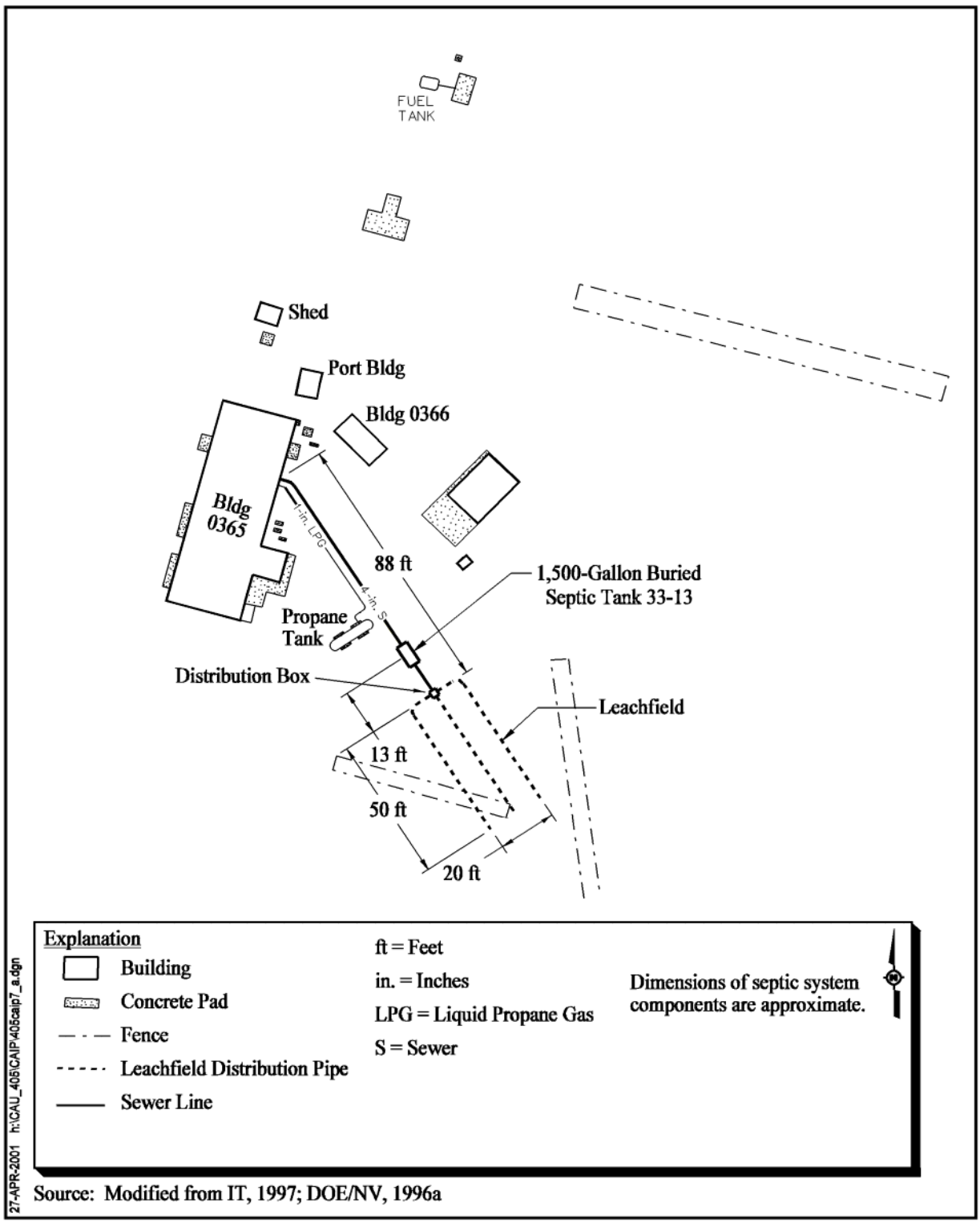
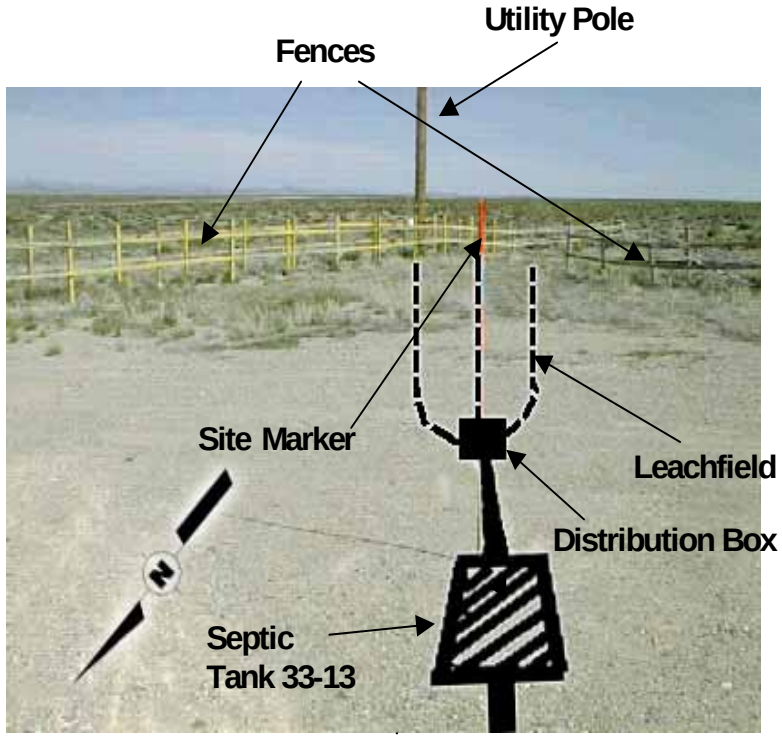


Figure 2-5
Septic Waste System 7,
South of Area 3, Tonopah Test Range, Nevada

Aerial photograph taken in 1988 with added SWS 7 components and associated piping. (Modified from EG&G/EM, 1988a; DOE/NV, 1996a)



Photograph taken on May 20, 1998, shows the approximate location of buried Septic Tank 33-13 as it appears today. There is an IT Corporation site marker, a utility pole, and fences. Photograph taken facing southeast. (IT, 1998c)

Figure 2-6
Photographs of Septic Waste System 7 in Area 3
Tonopah Test Range, Nevada

2.5 Investigative Background

General site investigation activities are described in Section 2.0 of the Leachfield Work Plan. Site investigation activities associated with CAU 405 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) and the *Renewal of the Nellis Air Force Range Land Withdrawal* (DOI, 1999).

Geophysical surveys conducted in 1993 attempted to locate several SWS 3, 4, and 7 features (IT, 1997). The geophysical surveys were generally inconclusive and did not provide data useful for this investigation.

The septic tank contents associated with SWSs 3, 4, and 7 were sampled in 1991 by SNL (SNL, 1991). The sampling effort was conducted to allow disposal of the septic tank contents in a publicly owned treatment works facility, and provide concentrations of COPCs present in effluent discharged to the system. The analytical results of the sampling effort are discussed in Section 2.6 and summarized in Table C-1.1 of Appendix C.

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 405. 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.

2.6 1991 Sampling Effort

The contents of thirteen TTR septic tanks were sampled and analyzed for *Clean Water Act* (CWA) target metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), inorganic chemistry parameters, and selected radiological parameters as part of a 1991 sampling effort conducted to support closure of the septic tanks (SNL, 1991). Septic Tanks 33-7 (SWS 3), 33-9 (SWS 4), and 33-13 (SWS 7) were all sampled and a new, unique number was assigned to each tank. The sampling results for the contents of these septic tanks are summarized in Table C-1.1 of

Appendix C. The 1991 report indicates that the following hazardous and radioactive constituents were present in the septic tanks within this CAU.

2.6.1 Summary of Analytical Results

The 1991 septic tank sampling effort suggests that hazardous and radiological contamination may be associated with SWS 3, 4, and 7. The results indicate the presence of VOCs, SVOCs, petroleum hydrocarbons, metals, and radionuclide constituents. Radioanalysis of samples collected from Septic Tank 33-9 reported Uranium (U)-234, U-235, and U-238 concentrations that were elevated above background. Additionally, this radioanalysis also identified Radium (Ra)-226, and Potassium (K)-40 at concentrations within their respective normal background ranges. Radioanalysis of samples collected from Septic Tanks 33-7 (SWS 3) and 33-13 (SWS 7) reported K-40 concentrations that were significantly higher than background. However, upon further data review, the method blank for these samples was identified to contain 480 $\pm$ 70 picocuries per liter (pCi/L) of K-40. Discounting the added contamination due to the method blank, the sample concentrations are within the normal background range for K-40. The concentration of oil and grease found in Septic Tank 33-9 (SWS 4) was 130 milligrams per kilogram (mg/kg). Arsenic was found approaching its Preliminary Remediation Goal (PRG) of 2.7 mg/kg (EPA, 2000) in Septic Tank 33-9 (SWS 4) at a concentration of 2.0 (mg/kg). Mercury matched the PRG for tap water with a concentration of 0.0036 milligrams per liter (mg/L) (EPA, 2000) reported for Septic Tank 33-13 (SWS 7).

The following is a summary of the detected analytes for SWSs 3, 4, and 7 from the 1991 septic tank sampling described above:

- SWS 3
  - Acetone, ethylbenzene, 2-hexanone, 4-methyl-2-pentanone, toluene, and xylene
  - Phenolics
  - Arsenic, barium, manganese, and zinc
  - Oil and grease
  - K-40 and gross beta activity

- SWS 4

  - Acetone and methylene chloride
  - Arsenic, barium, chromium, copper, lead, manganese, and zinc
  - Oil and grease
  - Gross alpha and beta activity; Ra-226; U-234, U-235, and U-238; and K-40

- SWS 7

  - Phenolics
  - Barium, copper, mercury, manganese, and zinc
  - Oil and grease
  - Gross alpha and beta activity, and K-40

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 405 are equivalent to those developed in Section 3.0 of the Leachfield Work Plan.

3.1 Conceptual Site Model

The conceptual model for CAU 405 is analogous to the general leachfield conceptual model presented in Section 3.1 of the Leachfield Work Plan and is outlined in detail in Appendix A. 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 405 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. The investigation will be rescoped if the conceptual model fails.

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. Laboratory analysis of liquid, soil, sediment, and sludge samples will provide the means for a quantitative measurement of the COPCs. The following are SWS-specific COPCs and associated analyses that will be performed to determine the nature of potential contamination at CAU 405:

- SWS 3
  - Total VOCs including acetone, ethylbenzene, 4-methyl-2-pentanone, toluene, and xylene
  - Total SVOCs including phenols
  - Total *Resource Conservation and Recovery Act (*RCRA) metals including arsenic and barium
  - Total Petroleum Hydrocarbons (TPH) (Diesel-Range Organics [DRO] and Gasoline-Range Organics [GRO]) including oil and grease hydrocarbons

- SWS 4

  - Total VOCs including benzene, toluene, ethylbenzene, and xylene
  - Total SVOC including phenols
  - Total RCRA metals including arsenic and lead
  - TPH (DRO/GRO) including oil and grease hydrocarbons
  - Isotopic Uranium: U-234, -235, and -238

- SWS 7

  - Total VOCs including identifying constituents associated with potential chemical uses (e.g., trichloroethylene)
  - Total SVOCs including phenols
  - Total RCRA metals including barium and mercury
  - TPH (DRO/GRO) including oil and grease hydrocarbons

Samples submitted for off-site laboratory analysis will be analyzed for each parameter in accordance with the analytical methods and minimum reporting limits provided in Table 3-1 of the Leachfield Work Plan. The minimum reporting limits for isotopic uranium are provided in Table 3-1 of this CAIP.

3.3 Preliminary Action Levels

Field-screening levels (FSLs) for comparison to on-site field-screening results (FSRs) and preliminary action levels (PALs) for comparison to off-site analytical results will be used to determine the presence of contamination. Specific FSLs, PALs, and methods used to determine FSLs are provided in Section 3.3 of the Leachfield Work Plan, and were agreed upon during the CAU-specific DQO process. The PALs established for U-234, U-235, and U-238 are included in Table 3-1 of this CAIP.

Industrial PRGs (EPA, 2000) will be applied to this CAU. Although the use of industrial standards restricts future use of this site to industrial purposes (DOE/NV, 2000), analytical results from this investigation will be compared to both residential and industrial standards.

3.4 DQO Process Discussion

The CAU will be investigated based on the DQO developed by representatives of NDEP and DOE/NV. This investigation will determine if COPCs are present and if concentrations exceed PALs

Table 3-1
Minimum Reporting Limits for Radionuclide COPCs in Soil, Sediment, Sludge, and Liquids for Samples Collected at CAU 405

Analyte	Medium	Analytical Method	MDC	MRL[a]	PALs[b]
Uranium-234	Sediment/Soil/Sludge	HASL-300[c]	0.08 pCi/g	0.38 pCi/g	1.56 pCi/g
	Liquid	HASL-300[c] or EPA 908.0[d]	0.07 pCi/L	0.37 pCi/L	8.92 pCi/L
Uranium-235	Sediment/Soil/Sludge	HASL-300[c]	0.27 pCi/g	0.27 pCi/g	0.07 pCi/g
	Liquid	HASL-300[c] or EPA 908.0[d]	0.06 pCi/L	0.32 pCi/L	0.36 pCi/L
Uranium-238	Sediment/Soil/Sludge	HASL-300[c]	0.06 pCi/g	0.29 pCi/g	3.2 pCi/g
	Liquid	HASL-300[c] or EPA 908.0[d]	0.07 pCi/L	0.33 pCi/L	9.39 pCi/L

[a]Source: Adams, 2000
[b]PAL is the preliminary action level and is defined as the maximum concentration listed in the literature for a sample taken from an undisturbed background location (McArthur and Miller, 1989; Atlan-Tech, 1992; and DOE/NV, 1999). The PAL is equal to the MDC for isotopes not reported in soil samples from undisturbed background locations or if the PAL is less than the MDC.
[c]Source: DOE, 1992
[d]Source: EPA, 1980

MDC = Minimum Detectable Concentration
MRL = Minimum Reporting Limits
PAL = Preliminary Action Levels
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter

in soils underlying the leachfields and surrounding the leachfield system components. The DQO results for CAU 405 indicate the need for a biased sampling approach. Due to potential subsurface migration of COPCs, an investigation consisting of subsurface sampling was identified. If COPCs are detected, the lateral and vertical extent of contamination will be determined. The septic tank contents, if any, will be characterized for waste management purposes. Data adequate to close the site under NDEP, RCRA, and DOE requirements will be collected. Details of the DQO process are presented in Appendix A.

The applicable COPCs and analytical methods agreed upon during the DQO process are provided in Section 3.2 of this CAIP.

4.0 Field Investigation

The investigation activities to be performed at CAU 405 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 405 consists of the following activities:

- Conduct exploratory excavation to inspect discrete portions of the collection system piping for residual sediment.
- Field screen all soil samples for VOCs and radiological activity in accordance with Section 4.4 to guide the field investigation and sample selection.
  - If VOC FSRs exceed FSLs and/or there is no potential for mixed waste, field screen for TPH at the discretion of the Site Supervisor.
- Inspect septic tanks for liquid, sludge, and sediment indicative of system use. If these matrices are present:
  - Collect samples of each matrix and analyze for COPCs identified in Section 3.2 of this CAIP. Additional samples will be collected and analyzed in accordance with Section 4.8 and the results used for waste management purposes.

    Note: Septic tank closure material (e.g., concrete and sand) will not be sampled.
- Collect samples of residual sediments from collection system piping, if present, to characterize residual contents.
- Collect biased subsurface soil samples using excavation in areas of the collection system including the septic tanks and the outfall end of the distribution boxes to confirm collection system integrity.
- Collect biased subsurface samples via trenching from the soil horizon underlying the base of the leachfield distribution pipes.
- Analyze soil samples for COPCs identified in Section 3.2 and Section 4.8.
- Collect biased soil samples using drilling, if necessary to define the vertical extent of potential contamination.

- Collect bioassessment samples, if VOC or TPH FSRs exceed FSLs or at the discretion of the Site Supervisor.

- Collect biased samples from native soils beneath the distribution system and analyze for geotechnical and hydrological parameters if analytical results indicate contamination.

This investigation strategy will allow the nature and extent of contamination associated with the leachfield systems to be established. In general, the contents of the leachfields and the underlying soil will be investigated until soil samples are collected from two consecutive intervals with contaminant concentrations below appropriate FSLs, as described in Section 3.3 of the Leachfield Work Plan. If contamination is more extensive than anticipated, the maximum investigation depth will be limited by the capabilities of the excavator or drill rig. If this occurs, the investigation will be rescoped.

Modifications to the investigation strategy provided in this document may be required in the unlikely event a different leachfield configuration or orientation is discovered. Significant modifications will be justified in a Record of Technical Change (ROTC). Written NDEP concurrence with ROTC modifications is required prior to proceeding with investigation activities that differ significantly from those described in this document.

4.2 Field Activities

Excavation will be the primary investigation method for these leachfield systems, but may be limited by existing facilities and utilities. Damage to roads, concrete pads, and utilities will be minimized. Excavation locations will be based on an 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. Upon completion of the investigation activities, excavated soil will be returned to the excavation nearest its original location as practical.

All sampling activities and laboratory analyses will be conducted in compliance with the Industrial Sites QAPP (DOE/NV, 1996c) and the Leachfield Work Plan.

4.3 Limited Collection System Pipe Inspections

The collection system piping will be visually inspected for sediment. Entry points may be accessed by excavating collection system pipes, as necessary. If appropriate, accessible, and adequate sediment is present at the inspection locations, samples will be collected and analyzed for the SWS-specific COPCs in accordance with Section 3.2 and Section 4.8.

These inspections may be supplemented with limited video surveys. A video survey may not be possible for some lines because of small pipe diameters (i.e., less than 4-inch [in.] diameter) or limited access.

4.4 Field Screening

Field screening for VOCs, TPH (if applicable), and radiological activity will be performed to guide the investigation and sample selection, and to assist with health and safety and waste management decisions. Field screening will be conducted for the following analytical parameters:

- VOCs - using a headspace method
- TPH - using either the Hanby hydrocarbon screening kit, the siteLab® ultraviolet fluorescence kit, or equivalent. Field screening for TPH will only be conducted on samples that exceed headspace screening levels or at the Site Supervisor's discretion. At SWS 4, TPH field screening may be conducted based on the TPH field-screening method used, field observations, headspace results, and waste management implications (i.e., mixed waste).
- Radiological activity - using an alpha and beta scintillator

Field-screening and preliminary action levels are provided in Section 3.3 of the Leachfield Work Plan. The field-screening process is described in Section 4.1.3 of the Leachfield Work Plan.

4.5 Collection System Sampling Activities

Samples will be collected in three general areas to investigate possible release points associated with collection system components. Samples will be collected from the following locations:

- Inside the septic tanks and distribution boxes, if necessary
- Both ends of the septic tanks - from the soil horizon underlying the base of the septic tank
- Outfall end of distribution boxes - from the soil horizon underlying the base of the distribution box

These locations are presented in Figure 4-1, Figure 4-2, and Figure 4-3. Most samples will be collected directly from excavations or the backhoe bucket; however, some subsurface samples may be collected using hand tools. If results show that contaminant concentrations exceed field-screening levels and/or PALs, additional samples will be collected as step-outs or at greater depths below the initial samples, as described in Section 4.7.

Two integrity samples for each septic tank and one integrity sample for each distribution box will be collected. Septic tank integrity samples will be collected from soil below the base of the proximal and distal ends of the septic tanks. Distribution box integrity samples will be collected from the soil below the base of the distribution boxes. These integrity samples will be representative of soil most likely to have been impacted if leachfield system leakage occurred.

Septic tank contents will be sampled and analyzed if appropriate, adequate, and accessible media is present to determine the contents and 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. Septic tanks associated with SWSs 3, 4, and 7 were reported as being pumped in 1993 during SNL's Septic Tank Abandonment Program. Due to a reduction in funding, the program may have ended before Septic Tank 33-9 (SWS 4) was pumped; therefore, it is unknown if the contents of the septic tank have been removed. Septage present in distribution boxes and piping will be sampled if appropriate, adequate, and accessible media is present.

4.6 Leachfield Sampling Activities

The leachfields were designed for disposal of effluent after it passed through the septic tanks. The leachfields will be investigated using a backhoe (or similar equipment) to excavate linear trenches perpendicular to the lengths of the distribution pipes. The SWS 4 and SWS 7 leachfields are expected

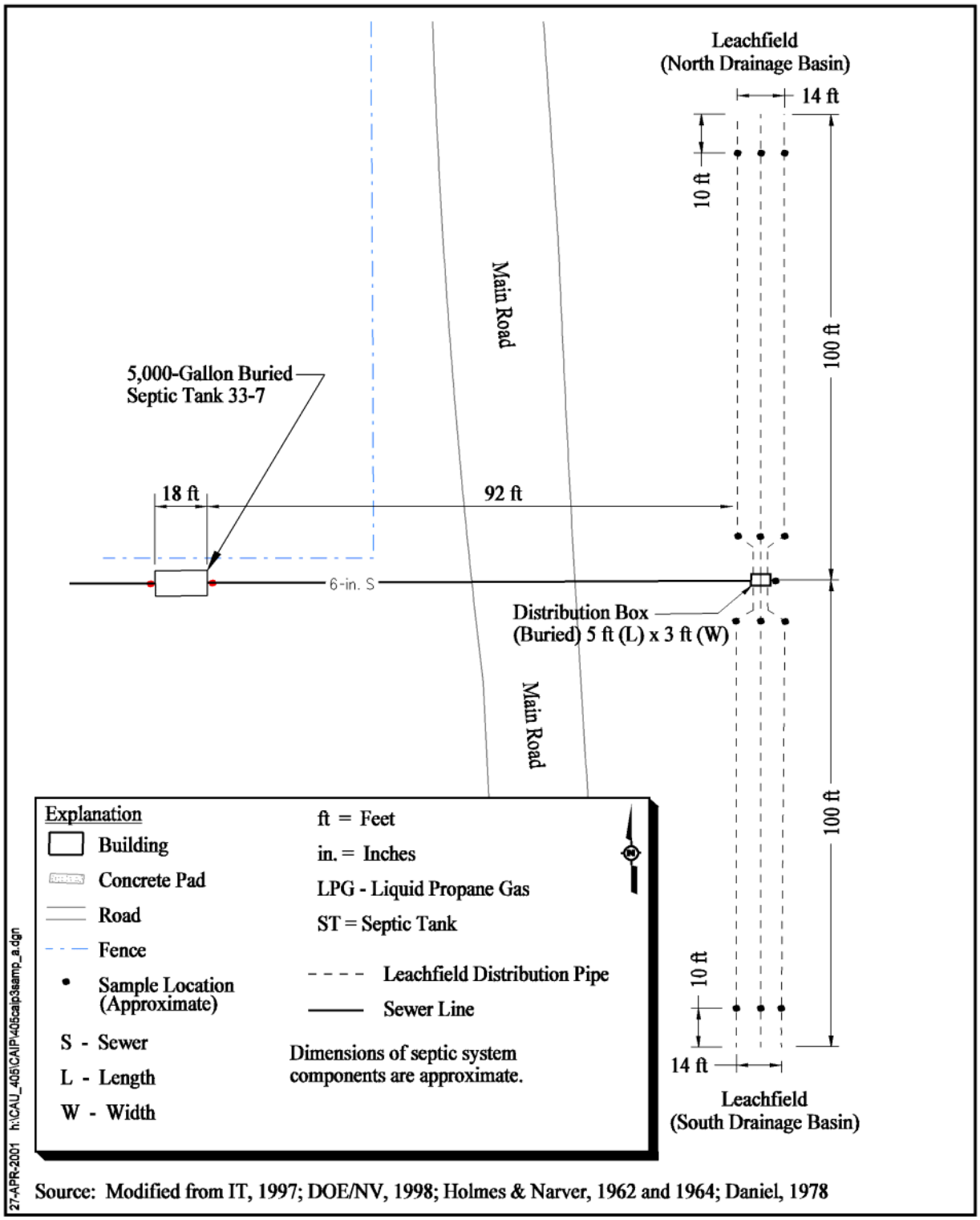


Figure 4-1
Septic Waste System 3
Proposed Sample Locations

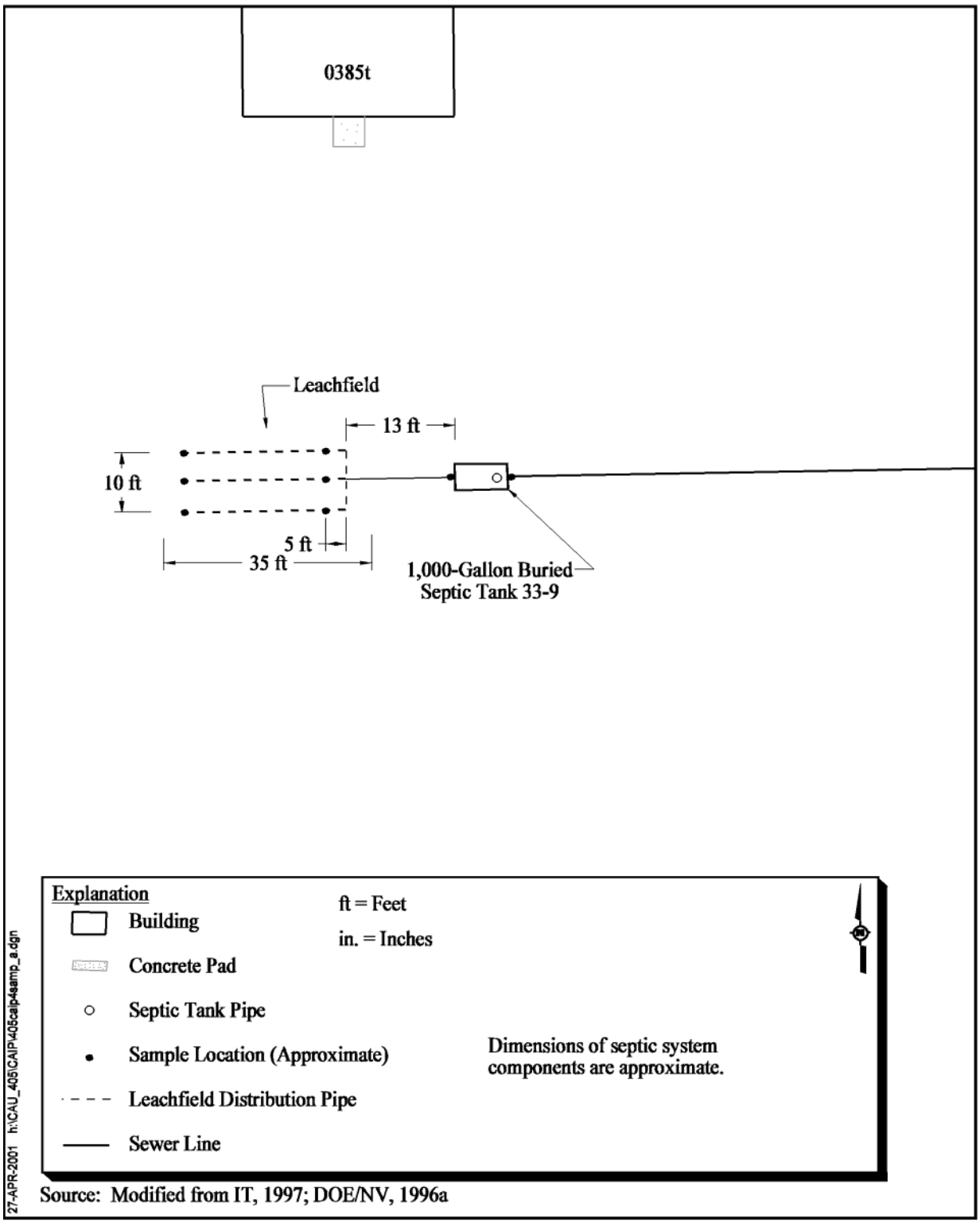
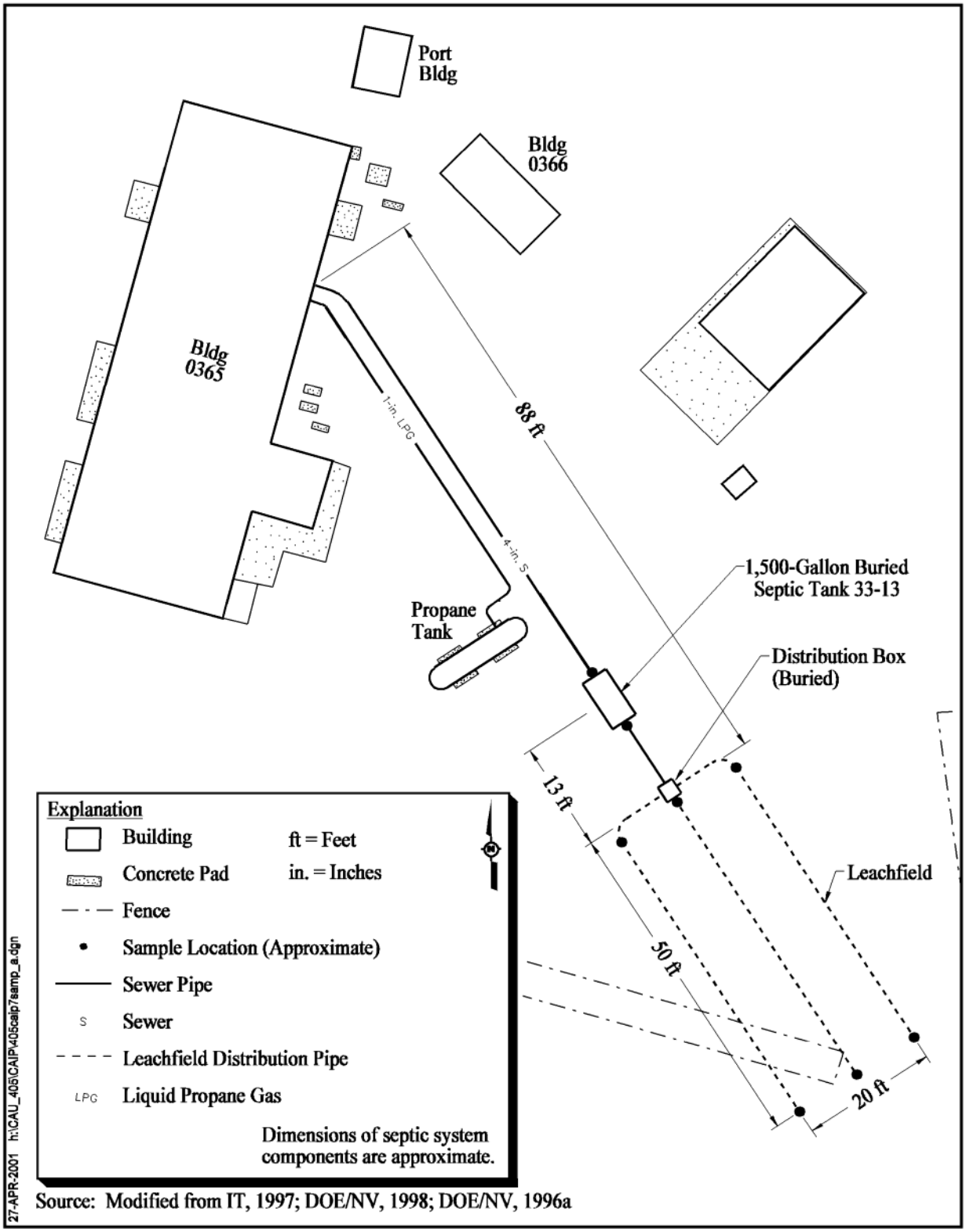


Figure 4-2
Septic Waste System 4
Proposed Sample Locations



Source: Modified from IT, 1997; DOE/NV, 1998; DOE/NV, 1996a

Figure 4-3
Septic Waste System 7
Proposed Sample Locations

to be parallel, three-pipe systems similar to the upper system shown on Figure 4-1 of the Leachfield Work Plan. Modifications to the investigation strategy described will be required if a different configuration is identified. Any modifications to the investigation strategy provided in this document will be consistent with the Leachfield Work Plan. The north and south drainage basins comprising the SWS 3 leachfield will be investigated as individual leachfields in the same manner as SWS 4 and SWS 7. Limited excavations may be used to verify the location of the distribution pipe ends and establish pipe orientation and location if this cannot be reasonably estimated based on surface features and engineering drawings.

The actual depth to the leachfield base for each SWS is unknown. The interval 0 to 1 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 2.5 ft to 3.5 ft beneath the leachfield base will be exposed within the same excavation. If samples from a particular sampling location exceed FSLs, a third 1-ft sampling interval 7.5 ft below the leachfield base may be sampled, if accessible by the backhoe.

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 distribution pipes. Soil will be collected out of the backhoe bucket immediately upon retrieval. Only material (soil) suitable for analysis will be submitted to the laboratory. Leachrock will not be sampled. If extra volume for a given sampling event is required, sample collection will be extended laterally at the same depth.

While all of the samples will be field screened, a limited number of these samples will be submitted to the off-site laboratory as follows:

- The sample collected at the leachrock and native soil interface will be submitted for analysis regardless of FSRs.
- At least one confirmatory sample from each sample location will be submitted to confirm COPCs are less than PALs.
- If contamination is detected by field screening, the sample with the highest contamination concentration will be submitted.

Samples to be analyzed will be selected based on the FSRs and minimum sampling requirements. The actual number of samples analyzed will depend on decisions made in the field.

A sample of the soil underlying each leachfield/soil interface will be collected and submitted for analysis, if necessary, to assess its geotechnical and hydrologic characteristics. If VOCs or TPH are detected above FSLs, bioassessment samples may be collected at the Site Supervisor's discretion. These bioassessment 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.

4.7 Additional Activities

The sample field-screening results from the leachfield trenches will be used to determine if additional samples are required. The analytical results from the leachfield trench samples will be considered if they are available; however, further investigation may be initiated based on field-screening results. If field-screening or analytical results indicate contamination extent is not defined because concentrations exceed specified FSLs or PALs, additional sampling locations or depths will be selected to determine the contamination extent. If additional investigation is necessary, adjustment to the established FFACO milestones may be required.

Additional investigation activities may consist of boreholes drilled within or outside the leachfield to determine the vertical and lateral extent of contamination required for a successful site investigation. Boreholes will be advanced to depths adequate to determine the vertical extent of contamination at initial sample locations. Samples from these boreholes will be collected at 5-ft intervals beginning at the greatest depth where contamination exceeds FSLs or PALs. To determine lateral extent, initial step-out locations will be drilled approximately 15 ft horizontally from the initial sample locations where FSLs or PALs were exceeded, with sample collection beginning at the established leachfield base depth.

Should certain site conditions be encountered, alternative approaches outlining borehole placement strategies addressed in Section 4.1.2.1 of the Leachfield Work Plan will be applied.

4.8 Additional Sample Collection and Analysis

In addition to the analysis for COPCs listed in Section 3.2, select samples will be collected and analyzed to obtain data for waste management purposes. These samples will be analyzed as follows:

- Gamma spectrometry on 25 percent of the collected soil samples
- Gross alpha and beta on rinsate samples only (at the discretion of the Waste Management representative)
- Tritium on rinsate samples only (at the discretion of the Waste Management Representative)
- Toxicity Characteristic Leaching Procedure (TCLP) RCRA Metals, TCLP VOCs, TCLP SVOCs, gamma spectrometry, and total and fecal coliform (septic tank only) on sludge and sediment samples collected from septic tanks and distribution boxes
- Total and fecal coliform analysis on sediment from collection system piping and sludge from distribution boxes only if septic tank sample results show total or fecal coliform

Samples submitted for laboratory analysis will be analyzed for these parameters in accordance with the analytical methods and minimum reporting limits provided in Table 3-1 of the Leachfield Work Plan. On-site analysis for total and fecal coliform will be conducted using Method 9221, Standard Methods for the Examination of Water and Wastewater (APHA, 1995).

If analytical results identify contaminants of concern, geotechnical and hydrological analysis will be performed according to the requirements of Section 3.2.1 of the Leachfield Work Plan. Bioassessment samples may be collected and analyzed according to the requirements of the Leachfield Work Plan, if field screening detects TPH or VOC concentrations greater than FSLs or at the discretion of the Site Supervisor. Bioassessment analysis indicates the susceptibility for a hydrocarbon plume or significant hydrocarbon contamination to naturally attenuate.

5.0 Waste Management

Waste management activities to be performed for CAU 405 are addressed in Section 5.0 of the Leachfield Work Plan.

5.1 Waste Minimization

Waste minimization activities to be performed for CAU 405 are addressed in Section 5.1 of the Leachfield Work Plan.

5.2 Potential Waste Streams

Potential waste types and waste streams associated with the leachfield CAUs are covered in Section 5.2 of the Leachfield Work Plan. Based on process knowledge, hazardous waste may be present at this site. Historical knowledge compiled thus far does not indicate that a specific listed hazardous waste was discharged to the leachfield systems. Radiological contamination may be present at SWS 4. Previous sampling results indicated U-234, U-235, and U-238 concentrations exceeded Performance Objective Criteria (BN, 1995) for samples collected from Septic Tank 33-9. Action levels for investigation-derived waste (IDW) contaminants are stated in Table 5-1 of the Leachfield Work Plan.

5.3 Investigation-Derived Waste Management

Based on potential waste types and waste streams identified for this CAU, hazardous, radioactive, or mixed IDW may be generated. Any IDW will be evaluated against characteristic criteria unless contrary information is discovered during the investigation. Investigation-derived waste will be handled, segregated by waste stream, placed in U.S. Department of Transportation-compliant packages appropriate for the type and amount of waste generated, and managed according to IDW requirements in Section 5.3 of the Leachfield Work Plan.

6.0 Duration and Records Availability

6.1 Duration

After submittal of the Final CAIP for CAU 405 to NDEP (FFACO milestone deadline of July 2, 2001), the following is a tentative schedule of activities (in calendar days):

- Day 0: Preparation for field work will begin.
- Day 85: Field work, including field sampling and screening, will begin. Samples will be shipped to meet laboratory holding times.
- Day 110: Field work will be completed.
- Day 155: Quality-assured, analytical data will be available for NDEP review.
- The FFACO date for the submission of the Corrective Action Decision Document (CADD) to NDEP is April 30, 2002.

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 DOE public reading rooms located in Las Vegas and Carson City, Nevada, or by contacting the DOE/NV 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 Worksheets

A.1.0 Introduction

A.1.1 Problem Statement

Effluent potentially contaminated with hazardous and radiological constituents was discharged to the SWSs that comprise CAU 405. Existing information is insufficient to support the development and evaluation of potential corrective actions and selection of a preferred corrective action for the CAU.

Corrective Action Unit 405, Area 3 Septic Systems, is located at TTR, Nevada, and is comprised of three CASs: SWS 3 (CAS 03-05-002-SW03), SWS 4 (CAS 03-05-002-SW04), and SWS 7 (CAS 03-05-002-SW07). For easier reference, each CAS will be referred to as SWS 3, SWS 4, and SWS 7, respectively. Each SWS has an independent group of associated septic tanks and leachfields that received sanitary sewage as the primary effluent from source buildings. In the case of SWS 3, there are two leachfields with a central distribution box. For the purpose of the investigation, the leachfields will be referred to as one leachfield with north and south drainage basins. These SWSs were abandoned once the Area 3 consolidated sewer system was put into operation in 1990. The septic tank contents of SWSs 3, 4, and 7 were sampled and analyzed as part of a 1991 sampling effort conducted by SNL in Area 3. Analytical results indicate that potentially contaminated effluent may have been discharged to the leachfields. The analytical results are provided in Table C-1.1 in Appendix C.

The CAU will be investigated based on the DQO developed by representatives of NDEP and DOE/NV. This investigation will determine if COPCs are present and if concentrations exceed regulatory levels in soils underlying the leachfields and surrounding the leachfield system components. If COPCs are detected, the lateral and vertical extent of contamination will be determined. The septic tank contents, if any, will be characterized for waste management purposes. 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 for the FFACO-required DQO Kickoff Meeting. The goal of the DQO process is to establish the quantity and quality of environmental data required to support corrective action decisions for the CAU. The process ensures that the information collected will provide sufficient and reliable information to identify, evaluate, and technically defend the chosen corrective action. Unless otherwise required by the results of this DQO and stated in the CAIP, this investigation will adhere to the Industrial Sites QAPP (DOE/NV, 1996c) and be used in conjunction with the Leachfield Work Plan (DOE/NV, 1998).

Table A.1-1
DQO Kickoff Meeting Participants

Participant	Affiliation	Meeting Date
		Kickoff Meeting January 16, 2001
Stacey Alderson	ITLV	X
Betty Bordelois	ITLV	X
Kevin Cabble	DOE/NV	X
Wolf Exner	ITLV	X
Joe Hutchinson	ITLV	X
Boyd Imai	ITLV	X
Dan Jensen	ITLV	X
Linda Linden	ITLV	X
Bill Nicosia	ITLV	X
Brian Perkins	ITLV	X
Allison Urbon	BN	X
Milinka Watson-Garrett	ITLV	X
Jeanne Wightman	ITLV	X
Lowell Wille	ITLV	X
Dustin Wilson	ITLV	X
Ted Zaferatos	NDEP	X

BN - Bechtel Nevada
DOE/NV - U.S. Department of Energy, Nevada Operations Office
ITLV - IT Corporation, Las Vegas
NDEP - Nevada Division of Environmental Protection

A.2.0 Conceptual Model

Before 1990, leachfield systems were used to dispose of liquid waste related to several operations at TTR. The SWSs associated with CAU 405 were constructed to receive sanitary effluent; however, potentially hazardous and radiological constituents may have discharged into the SWSs.

The SWSs comprising CAU 405 are currently abandoned. For each SWS, effluent was discharged from source building(s) and transferred through a network of discharge lines to a septic tank. Upon exiting the septic tank, the effluent traveled to a distribution box (if present) via outfall lines where the effluent was routed into the various distribution pipes of the leachfield. Once in the leachfield, the effluent percolated downward through the leachfield material into the underlying native soil for disposal.

This conceptual model is consistent with the general conceptual model for leachfield CAUs provided in Section 3.1 of the Leachfield Work Plan. Section 2.0 of the CAIP provides site-specific operational histories, waste inventories, release information, and investigative backgrounds for this CAU. An outline of site-specific elements of the conceptual model for CAU 405 is provided in Table A.2-1.

Table A.2-1
Conceptual Model for the CAU 405, Area 3 Septic Systems
(Page 1 of 4)

Conceptual Model Element	Assumptions	Source
System dynamics	SWS 3 (CAS 03-05-002-SW03) (dimensions are approximate) - Septic Tank 33-7: 5,000 gallons, 18 ft in length (l), width and depth unknown - Leachfield, each drainage basin is 14 ft width (w) x 100 ft (l) and has three 2-ft trenches with 4-in. diameter drainage tiles; depth is approximately 3 ft bgs - Distribution box, 5 ft (l) x 3 ft (w) x 3 ft deep - Total piping from sources to distribution box is 262 ft	*CAU Work Plan, TTR, NV* (DOE/NV, 1996a) Engineering drawing (Daniel, 1980) Engineering drawing (Holmes & Narver, 1962) Engineering drawing (Holmes & Narver, 1964)
	SWS 4 (CAS 03-05-002-SW04) (dimensions are approximate) - Septic Tank 33-9: 1,000 gallons, dimensions unknown - Leachfield, 35 ft (l) x 10 ft (w), depth unknown; consists of three parallel distribution pipes - No distribution box - Total piping from source to the leachfield is unknown	*CAU Work Plan, TTR, NV* (DOE/NV, 1996a)
	SWS 7 (CAS 03-05-002-SW07) (dimensions are approximate) - Septic Tank 33-13: 1,500 gallons, dimensions unknown - Leachfield, 50 ft (l) x 20 ft (w), depth unknown; consists of three parallel distribution pipes - Distribution box, dimensions unknown - Total piping from source to the leachfield is 88 ft	*CAU Work Plan, TTR, NV* (DOE/NV, 1996a) RCRA Facility Investigation Work Plan (DOE/NV, 1994)
	Infiltration and concentration of contaminants in the form of liquid waste into the soil directly below (surrounding) the distribution pipes and within the leachfield may have occurred	Process knowledge of similar sites
	Groundwater contamination is unlikely due to environmental conditions at the site, such as an arid climate, low permeabilities, and depth to groundwater between approximately 361 ft to 394 ft bgs	*CAU Work Plan, TTR, NV* (DOE/NV, 1996a)
	No driving forces other than infiltration of limited precipitation by gravity; liquid disposal through the leachfields has not occurred since the consolidated sewer system was installed in 1990	Process knowledge of similar sites *CAU Work Plan, TTR, NV* (DOE/NV, 1996a)

Table A.2-1
Conceptual Model for the CAU 405, Area 3 Septic Systems
(Page 2 of 4)

Conceptual Model Element	Assumptions	Source
System dynamics (continued)	- Septic tank abandonment program conducted in 1993; consisted of septic tanks being pumped, air dried, and filled with sand or concrete - The three septic tanks were abandoned according to the CAU Work Plan; however, conflicting documentation indicates that SWS 4, Septic Tank 33-9, may not have been filled-in	
Source location	SWS 3 (CAS 03-05-002-SW03): Building 0351, Administration Building - Administrative offices - Five toilets, five sinks, and two urinals - Sanitary effluent contributed from 1962 to 1990 Building 0357, Operations and Control Building - Engineering drawing shows telemeter room, microwave room, mechanical room, computer lab, computer room, offices, plotting room, visitor room, rest rooms, janitorial closet, and operations room - Chemical inventory conducted in 1993 indicated small, limited quantities were present - Plumbing configuration unknown - Sanitary effluent contributed from 1980 to 1990	Engineering drawing (Daniel, 1980) Engineering drawing (Holmes & Narver, 1981) Mulkey interview (Mulkey, 1999) Site visits *TTR Septic Tank Sampling and Analysis Final Report* (SNL, 1991) *TTR CY93 Chemical Inventory Report* (SNL, 1994)
	SWS 4(CAS 03-05-002-SW04): Sanitary effluent contributions by sources are estimated to have been from approximately 1980 to 1990 Building 0376, Pilots Lounge - A former REECo trailer - One restroom, one kitchen, two sleeping areas, a lounge, and an eating area - REECo trailers: approximately five trailers - Bldg. 0376 originally connected to Septic Tank 33-3 - Activities unknown U.S. Air Force trailers: approximately three trailers - Activities unknown (possibly due to security issues) - An interviewee stated that Septic Tank 33-9 was constructed because of the lack of gradient to run an additional septic line from the trailer sources to Septic Tank 33-3 Advanced Security, Inc. trailers: approximately five trailers were connected to SWS 4 - Four used as sleeping quarters, one used for linen	Blackburn interviews (Blackburn, 1999a,b,c,e, and f) *CAU Work Plan, TTR, NV* (DOE/NV, 1996a) Engineering drawing (DOE/NV, 1982) Quas interview (Quas, 1999) Site visits *TTR Septic Tank Sampling and Analysis Final Report* (SNL, 1991) *TTR CY93 Chemical Inventory Report* (SNL, 1994)

Table A.2-1
Conceptual Model for the CAU 405, Area 3 Septic Systems
(Page 3 of 4)

Conceptual Model Element	Assumptions	Source
Source location (continued)	SWS 7(CAS 03-05-002-SW07): Building 0365, Radio Shop - Formerly known as CAS 03-05-008-SW08 - Radio repair and maintenance performed - One restroom - Chemical inventory conducted in 1993 indicates small, limited quantities present - Interviewee mentioned use of trichloroethylene in an aerosol form and that the restroom floor drain was covered with plastic so nothing except normal sewage was discharged - Possibility that Septic Tank 33-13 has not been abandoned - Sanitary effluent contributed from approximately 1960 to 1990	Blackburn interviews (Blackburn, 1999c and d) *CAU Work Plan, TTR, NV* (DOE/NV, 1996a) Mulkey interview (Mulkey, 1999) Quas interview (Quas, 1994) Site visits *TTR Septic Tank Sampling and Analysis Final Report* (SNL, 1991) *TTR CY93 Chemical Inventory Report* (SNL, 1994) FFACO, 1996
Contaminants of potential concern	CAS 03-05-002-SW03 (SWS 3): - Acetone, ethylbenzene, 4-methyl-2-pentanone, toluene, and xylene - Phenolic and barium - Oil and grease CAS 03-05-002-SW04 (SWS 4): - Petroleum hydrocarbon constituents - Phenolics - Arsenic and lead - Oil and grease - U-234, U-235, and U-238 CAS 03-05-002-SW07 (SWS 7): - Constituents associated with potential chemical use (e.g., trichloroethylene) - Phenolics - Barium and mercury - Oil and grease	*TTR Septic Tank Sampling and Analysis Final Report* (SNL, 1991)

Table A.2-1
Conceptual Model for the CAU 405, Area 3 Septic Systems
(Page 4 of 4)

Conceptual Model Element	Assumptions	Source
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 within the boundaries of the leachfields	Process knowledge
Vertical extent of potential contaminants	The vertical extent of potential contamination is unknown, but if present, should be around and below the distribution lines; potential contamination is probably concentrated at the leachfield material and native soil interface; vertical extent should be limited by low contaminant concentrations and volumes, lack of driving force, and relatively low mobility of COPCs	Process knowledge Process knowledge of similar site investigations of CAUs (i.e., 423, 402, 427, 424, 428)
Physical and practical constraints	Hand excavation may be required at sampling locations near utilities, buildings and security fencing, and for specific types of sampling; adverse weather conditions; restricted access; heavy equipment and resource availability; health and safety concerns; and approval of the CAIP	Process knowledge of previous sites Site visits
Future use	Similar to current industrial, administrative, and research-related activities	Assumptions are defined in the *Final Environmental Impact Statement for the NTS and Off-Site Locations in the State of Nevada* (DOE/NV, 1996b) *Renewal of the Nellis Air Force Range Land Withdrawal*: *Legislative Environmental Impact Statement U.S. Air Force* (DOI, 1999)
Potential exposures	Oral ingestion, inhalation, or dermal contact (absorption) of COPCs in the soil due to inadvertent exposure during excavation	Process knowledge
Waste management	No evidence of listed waste has been found; waste will be considered characteristic unless contrary information is discovered during the investigation	Process knowledge

A.3.0 Potential Contaminants

Information on potential contaminants for CAU 405, including PAL and quality assurance and quality control (QA/QC) requirements, are provided in Section 3.0 of the Leachfield Work Plan and in Section 3.0 of this CAIP.

The 1991 septic tank sampling effort of SWSs 3, 4, and 7 identified the following:

- SWS 3
  - Acetone, ethylbenzene, 2-hexanone, 4-methyl-2-pentanone, toluene, and xylene
  - Phenolics
  - Arsenic, barium, manganese, and zinc
  - Oil and grease
  - K-40 and gross beta activity
- SWS 4
  - Acetone and methylene chloride
  - Arsenic, barium, chromium, copper, lead, manganese, and zinc
  - Oil and grease
  - Gross alpha and beta activity; Ra-226; U-234, U-235, U-238; and K-40
- SWS 7
  - Phenolics
  - Barium, copper, mercury, manganese, and zinc
  - Oil and grease
  - Gross alpha and beta activity, and K-40

The following SWS-specific COPCs and associated analyses are based on the identification of these constituents and review of process knowledge:

- SWS 3
  - Total VOCs including acetone, ethylbenzene, 4-methyl-2-pentanone, toluene, and xylene
  - Total SVOCs including phenols
  - Total RCRA metals including arsenic and barium
  - TPH (DRO and GRO) including oil and grease hydrocarbons

- SWS 4

  - Total VOCs including benzene toluene, ethylbenzene, and xylene
  - Total SVOCs including phenols
  - Total RCRA metals including arsenic and lead
  - TPH (DRO/GRO) including oil and grease hydrocarbons
  - Isotopic Uranium including U-234, U-235, and U-238

- SWS 7

  - Total VOCs including identifying constituents associated with potential chemical uses (e.g., trichloroethylene)
  - Total SVOCs including phenols
  - Total RCRA metals including barium and mercury
  - TPH (DRO/GRO) including oil and grease hydrocarbons

Samples submitted for off-site laboratory analysis will be analyzed in accordance with the Leachfield Work Plan (DOE/NV, 1998) and Section 3.2 and Section 4.8 of this CAIP.

A.4.0 Decisions and Inputs

A.4.1 Decisions

Decisions to be resolved by the investigation include:

- Determine if COPCs are present at the site.
- Determine if COPC concentrations exceed FSLs.
- 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.

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	Septic tank sampling efforts (SNL, 1991)	Exact COPCs	Collect laboratory samples; analyze for COPCs
	Potential contaminant concentration	Septic tank sampling efforts (SNL, 1991)	COPC concentrations detected by the U.S. Environmental Protection Agency (EPA) SW 846 methods; unsampled components; do concentrations exceed PALs?	Collect samples from septic tanks and soil; perform SWS-specific field screening for VOC, TPH (if applicable), and alpha- and beta-emitting radionuclides; submit samples for laboratory analysis from biased locations that represent worst case for contamination and confirmatory clean locations; compare results to field-screening levels or to PALs
	Potential contaminant distribution	Locations of septic tanks are known or generally known with some degree of certainty; vertical and lateral extent limited by removal of driving force, mobility of COPCs	Exact vertical and lateral extent of COPCs. Exact location of several system components including some septic tanks and leachfields	Video surveys and excavation to investigate leachfield systems as needed; collect samples at and in septic tanks; collect samples from leachfields. Collect samples from step-out locations as required to determine lateral extent if COPCs are detected; collect laboratory samples to confirm extent

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

Decision	Input	Existing Data	Data Gap	Strategy
Are potential contaminants migrating?	Meteorologic data	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 logs
	Geologic/hydrologic data	General geologic and hydrologic characteristics of the site; specific geologic conditions of nearby sites (i.e., CAUs 423, 403, 427, 424, 428)	Existence and characteristics of differing permeability zones	Collect and analyze geotechnical samples, if necessary; record general sample descriptions on sample collection logs
	Biological degradation factors	Potential hydrocarbons release	Biological parameters to evaluate natural biological process	May collect bioassessment samples depending on TPH and VOC FSRs
	Radioactive decay	Radionuclides exceeding PALs are not expected at CAU 405 CASs; however, the 1991 septic tank sampling effort identified U-234, U-235, and U-238 concentrations exceeding PALs in Septic Tank 33-9 for SWS 4; sampling results are discussed in Section A.3.0 and listed in Table C-1.1 in Appendix C	Presence and type of radionuclides	Establish background radiation levels; field screen for alpha and beta radiation using an Electra (or equivalent) instrument

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 chemical and radiological constituents may have been 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 (CR)
	Closure in place	Potential for radiological, petroleum hydrocarbons, and RCRA constituents; PALs are isotope-specific maximum background radioactivity levels, Industrial PRGs (EPA, 2000), and 100 parts per million (ppm) TPH per NAC 445A *Nevada Administrative Code* (NAC, 2000); assume use restrictions	Presence, concentration, and extent of COPCs	Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/CR; otherwise, prepare CADD
	In situ bioremediation	Potential for radiological, petroleum hydrocarbons, and RCRA constituents; PALs are isotope-specific maximum background radioactivity levels, Industrial PRGs (EPA, 2000), and 100 ppm TPH per NAC 445A (NAC, 2000); assume use restrictions	Presence, concentration, and extent of COPCs; biodegradation parameters	
	Clean closure by contaminant removal	Potential for radiological, petroleum hydrocarbons, and RCRA constituents; PALs are isotope-specific maximum background radioactivity levels, Industrial PRGs (EPA, 2000), and 100 ppm TPH per NAC 445A (NAC, 2000)	Presence, concentration, and extent of COPCs; volume of contaminated material above PALs	

A.5.0 Investigation Strategy

The primary investigation techniques will be video surveys and exploratory excavation and trenching; however, drilling may be required depending on the extent of potential contamination. If drilling is required, it will be conducted in a second phase of the investigation based on field observations or laboratory analysis of samples generated by the initial phase of investigation.

A.5.1 Excavation and Trenching

Intrusive investigation will be used to determine the extent of contamination associated with the SWSs. Trenching allows for the inspection of pipe connections, SWS components and their relative placement, and allows for sampling from within and around the components. Within the leachfield, trenching will be utilized to perform an assessment of soil horizons, define the leachfield base, determine the leachfield boundaries, and verify the configuration of distribution pipes where the majority of sampling will occur.

A.5.2 Sampling

Biased sampling will be conducted during the field investigation to assess the extent of COPCs and determine if COPC concentrations exceed PALs for the site.

Samples will be collected from the SWS components using the basic technical approach for leachfield system investigation provided in the Leachfield Work Plan. Contrary to the Leachfield Work Plan, integrity samples will be collected from the soil horizon underlying the proximal and distal ends of the septic tanks and the distal end of the distribution boxes. The parameters to be analyzed are listed in Section A.3.0.

A.5.3 Additional Sampling

Additional samples may be collected at the discretion of the Site Supervisor based on field observation or quantitative information derived during the field investigation. Additional samples may include:

- Fecal Coliform Analysis - If septic tank contents are present, a minimum of one sample will be collected at each SWS for on-site fecal coliform analysis for waste management and sample handling purposes.

- Bioassessment - Samples may be collected based on TPH field-screening results to determine the appropriateness of biodegradation as a remediation technique.

- Geotechnical and Hydrologic Analysis - A minimum of one geotechnical sample will be collected from below each leachfield identified by the investigation according to Section 3.2.1 of the Leachfield Work Plan. Geotechnical and hydrologic samples will be submitted for off-site analysis if field-screening or analytical results indicate contamination. The methods used to measure the following geotechnical and hydrologic parameters are listed in Table 3-2 of the Leachfield Work Plan.

A.5.4 Limited Collection System Pipe Investigations

The collection system piping will be inspected for sediment by excavation. These inspections may be supplemented with limited video surveys. If sediment is present at the inspection locations, samples will be collected and analyzed for the SWS-specific COPCs.

A.5.5 Field Screening

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. Field screening for TPH will only be conducted on samples exceeding headspace screening levels or at the Site Supervisor's discretion. Field screening for TPH will not be performed at SWS 4 if the field-screening method has the potential to create mixed waste. Field-screening requirements are discussed in Section 3.3 and Section 4.1.2 of the Leachfield Work Plan and will be described in Section 4.0 of the CAIP.

A.6.0 Decision Rules

The following decision rules will be used to guide the investigation and subsequent data evaluation for CAU 405:

- If, in the course of the investigation, either of the following occur, the investigation will be halted and rescoped as necessary:
  - The conceptual model fails to such a degree that rescoping is required
  - Sufficient data are collected to support evaluation of corrective actions
- If field screening indicates no COPCs above FSLs, a sample at the next prescribed subsurface location will be field screened. If no COPCs are indicated, a confirmatory laboratory sample will be submitted for each sampling location.
- If field screening indicates the presence of COPCs above FSLs, the investigation will continue to determine the extent of COPCs until two consecutive samples with FSRs below FSLs are obtained. Of the two samples with FSRs below FSLs, the sample collected from the upper interval will be submitted for off-site laboratory analysis for confirmation. Samples will also be submitted for laboratory analysis from the subsurface interval that represents the highest FSRs and at the discretion of the Site Supervisor. Additional samples may be required for waste management purposes.
- If laboratory results indicate the presence of contaminants of concern above PALs, a CADD will be prepared.
- If no COPCs are identified above PALs, a CADD/CR 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.

Table A.6-1
Activity-Specific Decision Points and Rules

Investigation Activity	Decision Point	Decision Result	Decision Rule
Collection System Pipe Investigation	Is significant sediment present in pipes?	Yes	Collect sediment samples.
		No	Do not collect sediment samples.
	Is sediment sample collection practical?	Yes	Collect sediment samples.
		No	If sediment is present, COPCs detected in the septic tank, distribution box, or leachfield will be attributed to the piping.
	Unexpected branches, offshoots, or tie-ins discovered during investigation?	Yes	Attempt to determine source or outlet of unexpected pipe. Conduct exploratory excavation, if required. Rescoping may be required.
		No	No additional exploration required.
Leachfield Investigation	Can system components be located using video survey or exploratory excavation?	Yes	Collect samples using excavation.
		In Part	Configuration or dimensions are not as anticipated. Sample soil underlying known leachfield. Also conduct excavations at known or assumed leachfield perimeter to visually confirm absence/presence of installed leachfield material.
		No	Revise conceptual model. Conduct additional research and attempt to locate features with alternative methods.
Sampling	Can samples be recovered from and around septic tanks, distribution boxes, and soil underlying leachfields?	Yes	Collect samples using appropriate collection method (i.e., hand augering, excavation, scooping).
		No	Samples that cannot be collected will be replaced or eliminated at the Site Supervisor's discretion. Justification for such omissions will be provided to the DOE/NV Task Manager and in the CADD.
	Are FSRs above field-screening levels?	Yes	Submit sample with the highest FSRs for laboratory analysis. Collect additional samples from greater depths or from stepouts, as required.
		No	Submit at least one sample from each location for confirmation, as required.
	Do COPCs exceed PALs?	Yes	Prepare CADD. Additional sampling may be required. Potential corrective actions may be SWS-specific.
		No	Prepare CADD/Closure Report. Recommendation of no further action may be SWS-specific.

A.7.0 Decision Error

Biased sampling will be conducted at the CAU 405 site as identified in Section A.5.0. Biased sampling is appropriate because the system component locations are either known or will be located through exploratory surveys.

The sampling strategy targets the worst-case contamination by sampling the leachfield system at points with the highest potential for contamination. This sampling strategy will ensure that the extent of the contamination has been adequately located, identified, and quantified. A minimum of two samples will be collected from each sample location and field screened. Planned sample intervals may be substituted with intervals that exhibit a higher possibility for contamination for that sample location based on visual observations or other field-screening techniques. A minimum of one sample collected at the leachfield material and native soil interface will be collected, field screened, and submitted for laboratory analysis for confirmation. A minimum of one sample with FSRs below FSLs will be obtained from each sample location to define the lower limit of soil contamination (if any). The FSRs will be confirmed by laboratory analysis.

A.8.0 References

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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 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

Summary of Analytical Results
From 1991 Septic Tank Sampling Event

Table C-1.1
Summary of Analytical Results for Detected Parameters in Septic Tanks 33-7[1], 33-9[2], and 33-13[3]
1991 Sampling Event[4]
(Page 1 of 3)

Parameter	Units	ST 33-7(1) (SWS 3) SN 5615/5616	ST 33-7(1) (SWS 3) SN 5617/5618	ST 33-9(2) (SWS 4) SN 5678/5679	ST 33-13(3) (SWS 7) SN 5609/5610	Comparison Levels
Volatile Organics						
Acetone	µg/L	46	--	NR	--	610(6)
	µg/kg	NA	NA	13(5)	NA	6,200,000(7)
Ethylbenzene	µg/L	7.5	--	NR	--	1,300(6)
2-Hexanone	µg/L	30	--	NR	--	None Identified
4-Methyl-2-pentanone (MIBK)	µg/L	65	--	NR	--	160(6)
Methylene chloride	µg/kg	--	NA	5.8	NA	21,000(7)
Toluene	µg/L	100	--	NR	--	720(6)
Xylenes	µg/L	43	--	NR	--	1,400(6)
General Inorganics						
Phenolics	mg/L	0.018	0.011	NR	0.095	22.0(6)
Oil and Grease	mg/L	3.9	--	NR	5.6	100(8)
	mg/kg	NA	NA	130	NA	100(8)
Metals						
Arsenic	mg/L	0.0060	0.0084	NR	--	0.000045(6)
	mg/kg	NA	NA	2.0	NA	2.7(7)
Barium	mg/L	0.054	0.050	NR	0.15	2.6(6)
	mg/kg	NA	NA	45.7	NA	100,000(7)
Chromium	mg/kg	NA	NA	1.1(9)	NA	64(7) (Cr VI)

Table C-1.1
Summary of Analytical Results for Detected Parameters in Septic Tanks 33-7[1], 33-9[2], and 33-13[3]
1991 Sampling Event[4]
(Page 2 of 3)

Parameter	Units	ST 33-7(1) (SWS 3) SN 5615/5616	ST 33-7(1) (SWS 3) SN 5617/5618	ST 33-9(2) (SWS 4) SN 5678/5679	ST 33-13(3) (SWS 7) SN 5609/5610	Comparison Levels
Metals (Continued)						
Copper	mg/L	--	--	NR	0.13	1.4(6)
	mg/kg	NA	NA	5.2	NA	76,000(7)
Lead	mg/kg	NA	NA	5.6	NA	750(7)
Manganese	mg/L	0.073	0.073	NR	0.20	0.88(6)
	mg/kg	NA	NA	148	NA	32,000(7)
Mercury	mg/L	--	--	NR	0.0036	0.0036(6)
Zinc	mg/L	0.051	0.045	NR	0.80	11.0(6)
	mg/kg	NA	NA	25.9	NA	100,000(7)
Radionuclides						
Radium - 226	pCi/g	NA	NA	1.5 ± 0.2	NA	3.21(13)
Uranium - 234	pCi/g	NA	NA	33 ± 6(10, 11, 12)	--	1.56(13)
Uranium - 235	pCi/g	NA	NA	3.2 ± 1.7(10, 11, 12)	--	0.07(13)
Uranium - 238	pCi/g	NA	NA	6.4 ± 2.4(10, 11, 12)	--	3.2(13)
Potassium - 40	pCi/L	650 ± 70(14)	480 ± 60(14)	NA	390 ± 70(14)	None Identified
	pCi/g	NA	NA	48 ± 5	NA	34.2(13)
Gross Alpha	pCi/L	--	--	NA	--	15(15)
	pCi/g	NA	NA	10 ± 5(16)	NA	None Identified
Gross Beta	pCi/L	30 ± 7(16)	42 ± 8(16)	NA	60 ± 10	50(15)
	pCi/g	NA	NA	36 ± 6(16)	NA	None Identified

Table C-1.1
Summary of Analytical Results for Detected Parameters in Septic Tanks 33-7[1], 33-9[2], and 33-13[3]
1991 Sampling Event[4]
(Page 3 of 3)

Footnotes:
[1]CAU 405, CAS 03-05-002-SW03, Septic Waste System 3, Sample Numbers 5615 (Liquid) and 5616 (Liquid) and 5617 (Liquid) and 5618 (Liquid) (Duplicate) (SNL, 1991)
[2]CAU 405, CAS 03-05-002-SW04, Septic Waste System 4, Sample Numbers 5678 (Sludge) and 5679 (Sludge) (SNL, 1991)
[3]CAU 405, CAS 03-05-002-SW07, Septic Waste System 7, Sample Numbers 5609 (Liquid) and 5610 (Liquid) (SNL, 1991)
[4]Analytical results reported in the 1991 sampling effort entitled *Tonopah Test Range Septic Tank Sampling and Analysis Final Report* (SNL, 1991).
[5]Method blank contained 24 µg/kg acetone (SNL, 1991).
[6]*Region IX Preliminary Remediation Goals* (Tap Water) (EPA, 2000)
[7]*Region IX Preliminary Remediation Goals* (Industrial Soils) (EPA, 2000)
[8]NAC445A.2272 (NAC, 2000)
[9]Method blank contained 1.2 mg/L chromium (SNL, 1991).
[10]Due to matrix interference, an ion exchange separation was used rather than a TIOA extraction for this sample (SNL, 1991).
[11]Due to matrix interference, low chemical yields were encountered for the sample (SNL, 1991).
[12]The large duplicate relative percent difference is due to a low chemical yield because of the matrix interference for the sample (SNL, 1991).
[13]Memo from S. Adams to D.R. Wilson regarding revision to PALs and MRLs for the CAU 262 Corrective Action Investigation (Adams, 2000).
[14]Method blank contained 480 ± 70 pCi/L potassium-40 (SNL, 1991).
[15]*National Primary Drinking Water Standards,* 40 CFR Part 141 (EPA, 1999)
[16]Recounted at alpha-only voltage (SNL, 1991).

Notes:
1. Radiological analytical results from 1991 sampling effort reported with a ± 2 sigma error (SNL, 1991).
2. MIBK is the same as 4-methyl-2-pentanone.

Acronyms:
-- = Not detected
MDC = Minimum detectable concentration
NA = Not analyzed
pCi/g = Picocuries per gram
µg/L = Micrograms per liter
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
MIBK = Methyl isobutyl ketone
NR = Not reported
pCi/L = Picocuries per liter
µg/kg = Micrograms per kilogram
SN = Sample number
ST = Septic tank
SWS = Septic waste system

C.1.0 References

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Appendix D

NDEP Document Review Sheet

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number: Draft Corrective Action Investigation Plan for Corrective Action Unit 405: Area 3 Septic Systems, Tonopah Test Range, Nevada	2. Document Date: February 2001
3. Revision Number: 0	4. Originator/Organization: IT Corporation
5. Responsible DOE/NV ERP Project Manager.: Janet Appenzeller-Wing	6. Date Comments Due: March 23, 2001
7. Review Criteria: Full	
8. Reviewer/Organization/Phone No.: Ted Zaferatos and Paul Liebendorfer (775-687-4670)/Nevada Division of Environmental Protection	9. Reviewer's Signature:

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
1. Section 1.3, CAIP, Page 5, Mid-Page		The draft CAIP makes reference to the *Industrial Sites Quality Assurance Project Plan (QAPP)*. As the submittal of the final CAIP is scheduled for July 2, 2001, approximately four months from this date, please be aware that NDEP will require satisfactory evidence that the sampling program is adequate to meet the predetermined DQOs. (See letter Liebendorfer: Wycoff, dated February 8, 2001.)	The combination of the Industrial Sites QAPP (Rev. 1), this CAIP, the Leachfield Work Plan, and the CAU 405 Field Instructions provides satisfactory evidence that the sampling program is adequate to meet the predetermined DQOs.	Yes
2. Section 2.5, Investigative Background, Page 15, 3rd Para		"...The analytical results of the sampling effort are discussed in Section 2.9 and summarized in Table C-1.1 of Appendix C...". The reference to Section 2.9 should be to Section 2.6.	Section 2.5, third paragraph, last sentence: Replaced "Section 2.9" with "Section 2.6."	Yes
3. Section 4.5 Collection System Sampling Activities, Page 24, 1st Para.		"...If results show the contaminant concentrations exceed field-screening levels and/or PALs, a second stage of samples, described in figure 4.7, will be collected as step-outs or at greater depths below the first stage of samples...". The reference to Figure 4.7 should be to Section 4.7.	Section 4.5, second paragraph, last sentence: Replaced "Figure 4.7" with "Section 4.7."	Yes

Distribution

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