Nevada Environmental Restoration Project

DOE/NV--704

Corrective Action Investigation Plan for Corrective Action Unit 271: Areas 25, 26, and 27 Septic Systems, Nevada Test Site, Nevada

Controlled Copy No.: ___

Revision No.: 0

April 2001

Environmental Restoration Division

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CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 271: AREAS 25, 26, AND 27 SEPTIC SYSTEMS, NEVADA TEST SITE, NEVADA

DOE Nevada Operations Office
Las Vegas, Nevada

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CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 271:
AREAS 25, 26, AND 27 SEPTIC SYSTEMS,
NEVADA TEST SITE, NEVADA

Approved by: Signature Approved Date: 4/9/01

Janet Appenzeller-Wing, Project Manager
Industrial Sites Project

Approved by: Signature Approved Date: 4/9/01

Runore C. Wycoff, Division Director
Environmental Restoration Division

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List of Acronyms and Abbreviations

AEC	U.S. Atomic Energy Commission
amsl	Above mean sea level
bgs	Below ground surface
BREN	Bare Reactor Experiment-Nevada
CADD	Corrective Action Decision Document
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site(s)
CAU	Corrective Action Unit(s)
CFR	*Code of Federal Regulations*
COPC	Contaminant(s) of potential concern
CPT	Cone penetrometer technology
Cs-137	Cesium-137
CV	Coefficient of variation
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
EPA	U.S. Environmental Protection Agency
ETS-1	Engine Test Stand - 1
FFACO	*Federal Facility Agreement and Consent Order*
FSL	Field-screening level(s)
ft	Foot (feet)
gal	Gallon(s)
GRO	Gasoline-range organics
Hg-197	Mercury-197

List of Acronyms and Abbreviations *(Continued)*

IDW	Investigation-derived waste
in.	Inch(es)
ITLV	IT Corporation, Las Vegas Office
LASL	Los Alamos Scientific Laboratory
LRL	Lawrence Radiation Laboratory
MDA	Minimum detectable activities
MDC	Minimum detectable concentration(s)
mi	Mile(s)
mil	One thousandth of an inch
MRL	Minimum reporting limit(s)
NASA	U.S. National Aeronautics and Space Administration
NDEP	Nevada Division of Environmental Protection
NEPA	*National Environmental Policy Act*
NERVA	Nuclear Engine for Rocket Vehicle Application
NRDS	Nuclear Rocket Development Station
NSHD	Nevada State Health Division
NTS	Nevada Test Site
NUWAX	Nuclear Weapons Accident Exercise
PAL	Preliminary action level(s)
Pan Am	Pan American Airways, Inc.
PCB	Polychlorinated biphenyl(s)
pCi/g	Picocurie(s) per gram
PRG	Preliminary Remediation Goal(s)
QAPP	Quality Assurance Project Plan
Ra-223	Radium-223
Rad-Safe	Radiological-Safety

List of Acronyms and Abbreviations *(Continued)*

RCP	Reactor Control Point
RCRA	*Resource Conservation and Recovery Act*
REECo	Reynolds Electrical & Engineering Co., Inc.
ROTC	Record of Technical Change
SNPO	Space Nuclear Propulsion Office
SVOC	Semivolatile organic compound(s)
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total petroleum hydrocarbon(s)
U-235	Uranium-235
VCP	Vitrified clay pipe
VOC	Volatile organic compound(s)
WSI	Wackenhut Services, Inc.

Executive Summary

The Corrective Action Investigation Plan (CAIP) for Corrective Action Unit (CAU) 271, Areas 25, 26, and 27 Septic Systems 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. Corrective Action Unit 271 is comprised of the following Corrective Action Sites (CASs):

- Septic System (25-04-01)
- Septic System (25-04-03)
- Septic System (25-04-04)
- Septic System (25-04-08)
- Septic System (25-04-09)
- Septic System (25-04-10)
- Septic System (25-04-11)
- Contaminated Water Reservoir (26-03-01)
- Septic System (26-04-01)
- Septic System (26-04-02)
- Radioactive Leachfield (26-05-01)
- Septic System (26-05-03)
- Septic System (26-05-04)
- Septic System (26-05-05)
- Leachfield (27-05-02)

The description given to CAS 27-05-02 in the FFACO is “leachfield”; however, through a preliminary assessment, it has been identified as a septic system.

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, 1998b). The Leachfield Work Plan was developed to streamline investigations at leachfield CAUs by incorporating technical, quality assurance, field sampling, and waste management information common to a set of CAUs with similar site histories and characteristics into a single document that can be referenced. This CAIP provides investigative details specific to CAU 271. Managerial aspects of this project are discussed in the DOE/NV *Project Management Plan* (DOE/NV, 1994). General field and laboratory quality assurance and quality control issues are presented in the *Industrial Sites Quality Assurance Project Plan* (DOE/NV, 1996b). The health and safety aspects of this project are documented in the

IT Corporation, Las Vegas Office, *Health and Safety Plan* (IT, 2000a) and will be supplemented with a site-specific health and safety plan written prior to the start of field work.

The CASs addressed by CAU 271 are located at Guard Station 500, the Reactor Control Point (RCP), Bare Reactor Experiment - Nevada Tower, and Engine Test Stand-1 (ETS-1) facilities in Area 25; the Port Gaston and Project Pluto facilities in Area 26; and the Baker Site in Area 27 of the Nevada Test Site. The RCP and ETS-1 facilities supported the development and testing of nuclear reactors for space propulsion as part of the Nuclear Rocket Development Station. Activities associated with the testing program were conducted between 1958 and 1973. Subsequent to 1973, various other projects utilized these facilities for operations consistent with previous activities. The Project Pluto facilities supported nuclear reactor testing for use as a ramjet propulsion system; testing was conducted between 1961 and 1964. Various other projects utilized these facilities after 1964, including the Nuclear Weapons Accident Exercise (NUWAX) Program's use of the Pluto control area for radiological emergency response training exercises during the early 1980s. The Baker Site facilities were constructed in the 1960s to support the assembly, disassembly, and modification of nuclear explosives, nonnuclear explosives, and assemblies containing special nuclear material. It served as the staging point for the manufactured components of the nuclear devices.

At each CAU 271 CAS, except for the CAS 26-03-01 water reservoir, effluents generated within facilities were routed through collection systems and disposed of using distribution systems (i.e., leachfields). Thirteen septic systems included in CAU 271 were designed to receive sanitary and process effluent associated with building maintenance and personal hygiene. Effluent discharged to the septic systems was most likely uncontaminated sanitary effluent; however, based on activities associated with the facilities, hazardous or radioactive effluents cannot be ruled out.

Only one CAS (26-05-01), the Project Pluto radioactive leachfield, was designed to receive radioactive effluent. The leachfield and collection system for this CAS are radiologically posted. In addition, although CAS 26-05-03 is a sanitary system, the leachfield is also radiologically posted. The CAS 26-03-01 water reservoir was intentionally contaminated with short-lived radionuclides as part of a NUWAX training exercise. In general, any of the CASs addressed by this CAU may have been used to dispose of material considered to be hazardous or radioactive waste by current standards.

Based on site history and existing characterization data obtained to support the Data Quality Objectives process, contaminants of potential concern (COPCs) for CAU 271 include volatile organic compounds (VOCs), fecal coliform bacteria, semivolatile organic compounds, petroleum hydrocarbons, *Resource Conservation and Recovery Act* metals, gamma-emitting radionuclides, isotopic uranium, isotopic plutonium, strontium-90, and tritium (in aqueous samples). In addition, some locations may include beryllium and polychlorinated biphenyls. The CAS 26-03-01 water reservoir COPCs include pesticides and herbicides.

Media sampled during the field investigation will include septic tank contents, soil (primarily from leachfields), and possibly material associated with collection system piping. At CASs where evidence of radionuclide contamination has not been documented by process knowledge, at least 25 percent of soil samples will be analyzed for gamma-emitting radionuclides, isotopic uranium, isotopic plutonium, and strontium-90 to document levels of radiological constituents. At CASs where site history or existing data indicate the need, 100 percent of soil samples will undergo analysis for radiological COPCs. This includes the two radiologically posted CASs, 26-05-01 and 26-05-03. Additional samples may be collected from the native soils beneath the leachfield and analyzed for geotechnical and hydrological properties. Bioassessment samples may be collected and analyzed at the discretion of the Site Supervisor if VOCs exceeding field-screening levels are detected in a spatial pattern that suggests a contaminant plume may be present.

The technical approach to be used for investigation of each CAU 271 septic/leachfield system is dependent on the COPCs associated with the site and the known characteristics of the leachfield. Overall, the investigation strategy follows the strategy presented in the Leachfield Work Plan. The CAS 26-03-01 contaminated water reservoir will be investigated using a site-specific approach. In brief, the investigation strategy is as follows:

- Complex systems with radiologically posted leachfields will be investigated using an initial phase of *in situ* radiation measurement followed by biased and random sample collection using excavation. Drilling, rather than excavation, may be required, depending on observed levels of radiological contamination.

- Complex systems without radiologically posted leachfields will be investigated by biased and random sampling using excavation.

- Simple systems will be investigated by biased sampling using excavation.

- Drilling may be used to augment excavation throughout the investigation if required to determine the vertical extent of potential contamination.
- CAS 26-03-01, the contaminated water reservoir, will be investigated by a combination of biased sediment sampling above a plastic liner and shallow subsurface sample collection using excavation, drilling, or direct-push technology to collect soil samples below the liner.

Contingencies have been developed to address the possibility of leachfield configurations differing from the configurations shown on engineering drawings.

Typically, the investigation will proceed as follows:

- Collect samples of each distinct phase of septic tank contents (i.e., liquid, sludge, or residue).
- Record the dimensions of the septic tank and the composition (e.g., steel or concrete).
- Perform on-site fecal coliform analysis of septic tank content samples.
- Analyze septic tank samples for COPCs identified in Section 3.2. Submit samples for Toxicity Characteristic Leaching Procedure analysis where appropriate (e.g., sludge samples).
- Collect samples of soil underlying both ends of septic tanks and the outfall end of distribution structures.
- Perform an *in situ* shallow subsurface radiation survey using cone penetrometer technology at soil sampling locations (CASs 26-05-01 and 26-05-03 only).
- Collect samples of soil underlying the leachfields.
- Collect samples of soil from above and below the liner at the CAS 26-03-01 contaminated water reservoir.
- Field screen samples for VOCs, radiological activity, and possibly total petroleum hydrocarbons (only if mixed waste will not be generated).
- Select soil samples for laboratory analysis; analyze selected samples for COPCs identified in Section 3.2.
- Inspect and sample collection systems, as required and where possible.
- Conduct *in situ* radiation measurements of collection system pipes at CASs 26-05-01 and 26-05-03, if necessary and where possible.

- Collect samples from native soils beneath the leachfields and the CAS 26-03-01 water reservoir and analyze for geotechnical/hydrologic parameters.

- Collect and analyze bioassessment samples at the discretion of the Site Supervisor if field screening detects extensive VOC contamination.

- Stake or flag sample locations and record coordinates.

Additional sampling and analytical details are presented in Section 4.0 of the CAIP and in the Leachfield Work Plan. Details of the waste management strategy for the CAU are included in Section 5.0 of the CAIP and in the Leachfield Work Plan.

Under the FFACO, the CAIP will be submitted to the NDEP for approval. Field work will be conducted following approval of the plan. The results of the field investigation will support a defensible evaluation of corrective action alternatives in the Corrective Action Decision Document.

1.0 Introduction

This Corrective Action Investigation Plan (CAIP) has been developed in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the U.S. Department of Energy, Nevada Operations Office (DOE/NV); the State of Nevada Division of Environmental Protection (NDEP); and the U.S. Department of Defense (DoD) (FFACO, 1996).

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, 1998b), hereafter referred to as the Leachfield Work Plan. Under the FFACO, a work plan is an optional planning document that provides information for a Corrective Action Unit (CAU) or group of CAUs where significant commonality exists. This CAIP contains CAU-specific information including facility descriptions, environmental sample collection objectives, and the criteria for conducting site investigation activities at CAU 271: Areas 25, 26, and 27 Septic Systems, Nevada Test Site (NTS), Nevada. The NTS is approximately 65 miles (mi) northwest of Las Vegas, Nevada (see Leachfield Work Plan, Figure 1-1).

This CAIP addresses septic and leachfield systems associated with various facilities in Areas 25, 26, and 27 of the NTS. This CAIP also addresses an inactive water reservoir in Area 26. Table 1-1 lists the fifteen Corrective Action Sites (CASs) that comprise CAU 271 and their facility associations. Twelve of the CASs are categorized as septic systems. Although CAS 27-05-02 is categorized as a leachfield, it has been identified as a septic system (Table 1-1).

The terms “septic system” and “leachfield system” are not interchangable as used in this CAIP. Both systems have in common collection system piping, leachfields and, in most cases, distribution structures (Leachfield Work Plan, Section 3.1). However, a system must include a septic tank to be classified as a septic system.

Effluents generated within the source facilities were routed through collection systems and disposed of using distribution systems (i.e., leachfields). Collection systems are designed to channel effluent generated by various sources and transport it to a central disposal location. Within this document, the term “collection system” includes the piping and any septic tanks and distribution or diversion

Table 1-1
CAU 271 Corrective Action Sites

NTS Area	CAS Number	CAS Description[a]	Facility Association[b]
Area 25	25-04-01	Septic System	Security Checkpoint
	25-04-03	Septic System	PAN-AM Trailers
	25-04-04	Septic System	Reactor Control Point
	25-04-08	Septic System	BREN Tower
	25-04-09	Septic System	Engine Test Stand No. 1
	25-04-10	Septic System	Rad-Safe Trailers
	25-04-11	Septic System	South of LASL Trailers
Area 26	26-03-01	Contaminated Water Reservoir	Port Gaston Training Area
	26-04-01	Septic System	Area 26 Check Station (Bldg. 2105)
	26-04-02	Septic System	Hot Critical Facility (Bldg. 2103)
	26-05-01	Radioactive Leachfield	Buildings 2201 and 2202
	26-05-03	Septic System	Building 2203
	26-05-04	Septic System	Building 2201
	26-05-05	Septic System	Buildings 2101, 2102, and 2107
Area 27	27-05-02	Leachfield[c]	Building 5200

[a] Functional categories from the FFACO (1996)
[b] General location from the FFACO (1996)
[c] Site initially identified as a leachfield but actually consists of a septic tank, distribution structure, leachfield system, and associated collection system pipes.

structures between the edge of the source building foundation and the distribution system. Within this document, the term “distribution system” refers to the distribution manifolds, stems, and pipes (“lines”) or other leachfield features required to dispose of effluent supplied by the associated collection system. See Section 3.0 of the Leachfield Work Plan for an additional explanation of leachfield system terminology.

Within this document, “effluent” is generally applied to all liquid waste disposed of in leachfield systems without regard to toxic, hazardous, or radioactive properties. Effluent discharged to the CAU 271 systems is considered potentially contaminated with various constituents, but the probabilities of actual contamination are highly variable. “Sanitary effluent” is considered equivalent to domestic sewage, “process effluent” is considered potentially hazardous, and “radioactive effluent” is considered potentially radioactive and hazardous.

Thirteen septic systems included in CAU 271 were designed to receive sanitary and process effluent associated with building maintenance and personal hygiene. Effluent discharged to the septic systems was most likely uncontaminated sanitary effluent; however, based on activities associated with the facilities, hazardous or radioactive effluents cannot be ruled out.

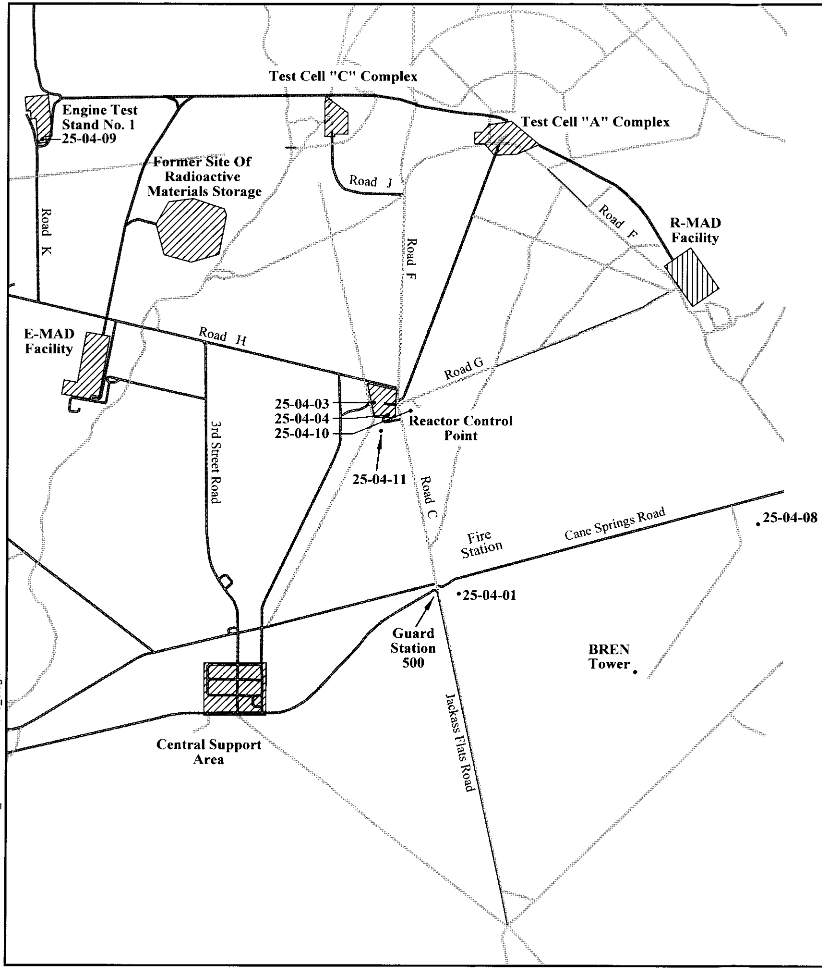
Only one CAS (26-05-01), the Project Pluto radioactive leachfield, was designed to receive radioactive effluent. The leachfield and collection system for this CAS are radiologically posted. In addition, although CAS 26-05-03 is a sanitary system, the leachfield is also radiologically posted. The CAS 26-03-01 water reservoir was intentionally contaminated with short-lived radionuclides as part of a Nuclear Weapons Accident Exercise (NUWAX) training exercise. In general, any of the CASs addressed by this CAU may have been used to dispose of material considered to be hazardous or radioactive waste by current standards.

All of the septic and leachfield systems included in CAU 271 are currently inactive or abandoned; only one of the systems (CAS 27-05-02) is discussed in a 1992 NTS active septic tank inspection report (Bingham, 1992). A preliminary assessment of CAS 27-05-02 indicates that the septic system is currently inactive. The CAS 26-03-01 water reservoir is abandoned. Some of the CAU 271 systems may still receive passive effluent such as rainwater from sources including open pad drains, floor drains, and equipment drains.

Figure 1-1 shows the locations of the seven CASs in Area 25. Six of these CASs are associated with the Nuclear Rocket Development Station (NRDS) that operated in Area 25 from 1958 to 1973:

- Four CASs (25-04-03, 25-04-04, 25-04-10, and 25-04-11) are associated with the Reactor Control Point (RCP) Area.
- CAS 25-04-01 is located at Guard Station 500.
- CAS 25-04-09 is associated with Engine Test Stand No. 1 (ETS-1).

The CAS 25-04-08 septic system is located near the intersection of the Bare Reactor Experiment-Nevada (BREN) Tower access road and Cane Springs Road (Figure 1-1). This CAS was associated with activities at the BREN Tower Trailer Park and was not part of the NRDS.



FFACO Corrective Action Site	Site Location
25-04-01	Guard Station 500
25-04-03	Reactor Control Point - Pan Am Trailers
25-04-04	Reactor Control Point
25-04-08	BREN Tower
25-04-09	Engine Test Stand No. 1
25-04-10	Reactor Control Point - Rad-Safe Building
25-04-11	Reactor Control Point - Former Trailer Park

Explanation

Various Areas or Compounds
Railtrack
Road
Primary Road
Corrective Action Site

Scale
0 2000 4000 Feet
0 .5 2 Kilometers

Source: Modified from Leachfield Work Plan Figure A.1-1 (DOE/NV, 1998b)

Figure 1-1
CAU 271: Area 25 Corrective Action Sites
Nevada Test Site, Nye County, Nevada

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Figure 1-2 shows the location of the six CASs associated with Project Pluto in Area 26. Facilities in Area 26 were constructed for Project Pluto, a series of nuclear reactor tests conducted to develop a nuclear-powered ramjet engine. The project was active for a relatively limited duration from 1961 to 1964 (ERDA, 1977b). For operational reasons, the Project Pluto facilities were separated into three functional areas - control, testing, and disassembly:

- Three CASs (26-04-01, 26-04-02, and 26-05-05) are associated with buildings in the control point area.
- CAS 26-05-03 is associated with the Pluto Test Bunker.
- Two CASs (26-05-04 and 26-05-01) are associated with the reactor disassembly building.

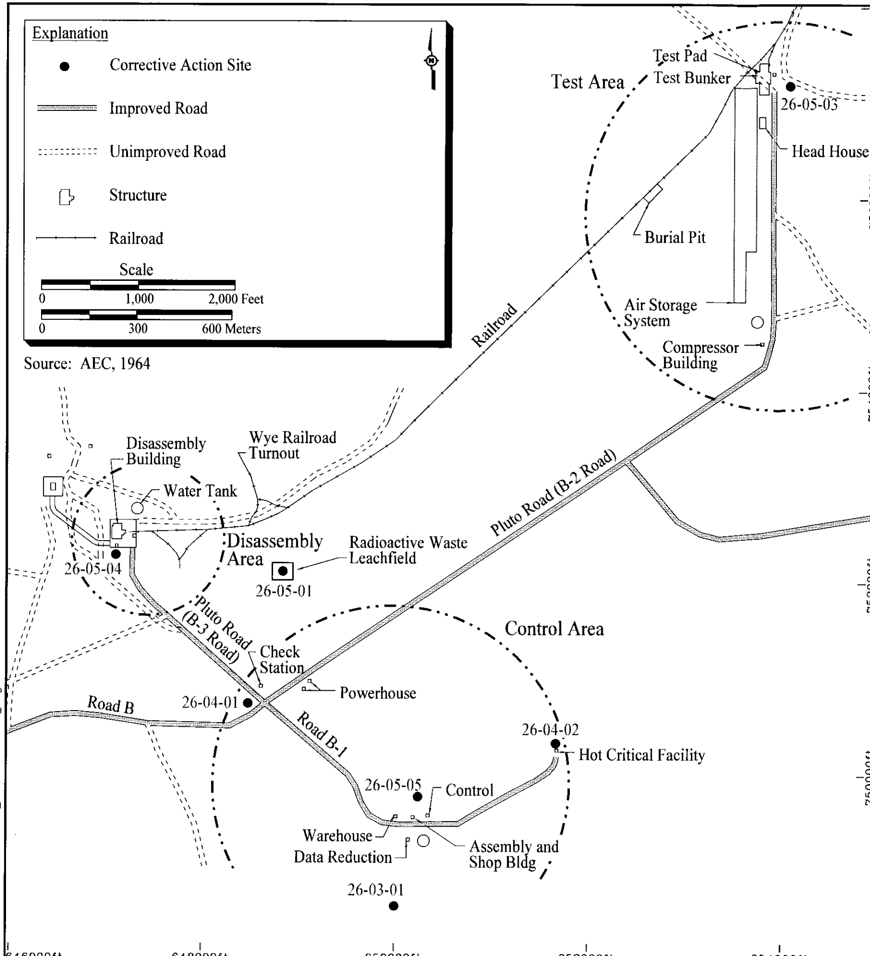
Figure 1-2 also shows the CAS 26-03-01 contaminated water reservoir. The area, including the reservoir, was given the name "Port Gaston" during NUWAX activities conducted there in the early 1980s. Though Figure 1-2 shows CAS 26-03-01 is located within the Project Pluto control area, it was not associated with Pluto operations.

Figure 1-3 shows the location of septic system CAS 27-05-02 in Area 27. This area, previously known as Area 410, includes the Super Kukla reactor facility and the "Able" and "Baker" sites. Corrective Action Site 27-05-02 is located outside of the Baker site but may have been associated with it (Figure 1-3).

1.1 Purpose

This CAIP describes the investigation of the nature and extent of contaminants of potential concern (COPCs) at CAU 271. The sites will be investigated based on Data Quality Objectives (DQOs) developed by representatives of NDEP and DOE/NV. The general purpose of the investigation is to:

- Determine if COPCs are present within the septic/leachfield system components and/or soils associated with the components.
- Determine if COPCs are present in soil at the CAS 26-03-01 contaminated water reservoir.
- Determine whether COPCs exceed regulatory levels.
- Define the lateral and vertical extent of contamination, if COPCs are detected.



FFACO Corrective Action Site	Site Location
26-03-01	Port Gaston Training Area
26-04-01	Check Station
26-04-02	Hot Critical Facility
26-05-01	Disassembly Facility
26-05-03	Test Bunker
26-05-04	Disassembly Facility
26-05-05	Control Area

Figure 1-2
CAU 271: Area 26 Corrective Action Sites
Nevada Test Site, Nye County, Nevada

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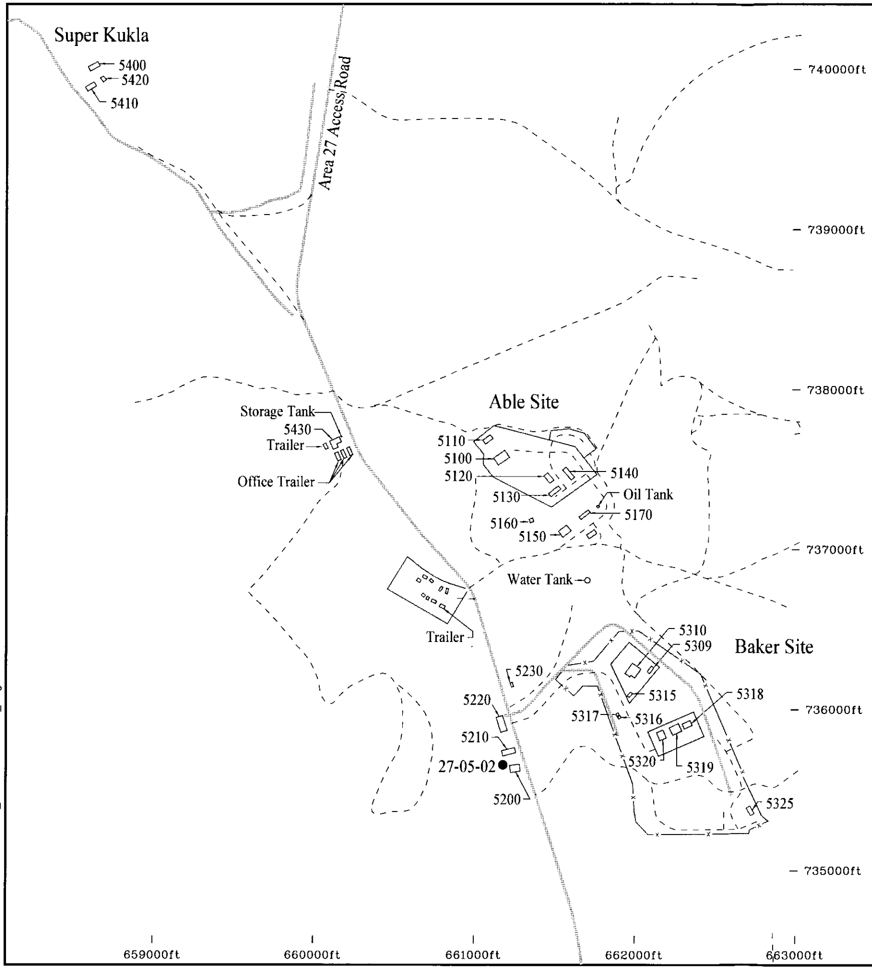
FFACO Corrective Action Site	Site Location
27-05-02	West Boundary of Baker Site



Source: ERDA, 1977b

Figure 1-3
CAU 271: Area 27 Corrective Action Sites
Nevada Test Site, Nye County, Nevada

- Ensure adequate data have been collected to close the sites under NDEP, *Resource Conservation and Recovery Act* (RCRA), and U.S. Department of Energy (DOE) requirements.

1.2 Scope

The scope of this CAIP is to resolve the problem statement identified in the DQO process summarized in Section 3.4 (see Appendix A for DQO Worksheets). This statement is that potentially hazardous and radioactive wastes were discharged to thirteen septic systems, one contaminated water reservoir, and one radioactive leachfield in NTS Areas 25, 26, and 27, and existing information about the nature and extent of contamination is insufficient to evaluate and select preferred corrective actions for these sites. The scope of the corrective action investigation for CAU 271 includes the following activities to answer the problem statement:

- Sample contents of septic tanks and possibly other collection system features.
- Collect samples of soil underlying the base of proximal and distal ends of septic tanks and distal ends of distribution structures.
- Collect soil samples from biased or a combination of biased and random locations within the boundaries of the leachfields.
- Collect soil samples at stepout locations, as necessary, to further define the lateral and vertical extent of contamination.
- Collect soil samples from biased and random locations, both above and below a liner at the CAS 26-03-01 contaminated water reservoir.
- Conduct discrete field screening.
- Inspect portions of the collection system lines, where necessary.
- Submit soil samples for laboratory and/or geotechnical/hydrological analyses.

1.3 CAIP Contents

The organization and content of this CAIP follows the NDEP-approved CAIP outline (Liebendorfer, 1997). Section 1.0 provides an introduction to this project, including the purpose and scope for this corrective action investigation. Section 2.0 provides facility descriptions, operational history, and a summary of previous investigations. The remainder of the document details the investigation strategy. The FFACO (1996) requires that CAIPs address the following elements:

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

The managerial aspects of this project are discussed in the DOE/NV *Project Management Plan* (DOE/NV, 1994) and the site-specific Field Management Plan that will be developed prior to field activities. The technical aspects of this CAIP are contained in the Leachfield Work Plan; Section 3.0, Section 4.0, and Section 5.0 of this document; and in the DQO summary presented in Appendix A. 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, 1996b). The health and safety aspects of this project are documented in the IT Corporation, Las Vegas Office (ITLV), *Health and Safety Plan* (IT, 2000a), and will be supplemented with a site-specific health and safety plan written prior to the start of field work. No CAU-specific public involvement activities are planned at this time; however, an overview of public involvement is documented in the “Public Involvement Plan” in Appendix V of the FFACO (1996). Field sampling activities are discussed in the Leachfield Work Plan and in Section 4.0 of this document. Waste management issues are discussed in the Leachfield Work Plan and in Section 5.0 of this document. The project schedule and records availability information for this document are discussed in Section 6.0. Section 7.0 provides a list of references. Appendix B contains information on the project organization, and Appendix C presents the facility engineering drawings referenced in this CAIP.

2.0 Facility Description

The CASs grouped into CAU 271 were selected based on their geographical location, technical similarities, and agency responsibility. With the exception of two CASs, all of the CASs in CAU 271 are septic systems. The exceptions are a radioactive leachfield (Section 2.2.2.3.1) and a contaminated water reservoir (Section 2.2.2.4).

2.1 Physical Setting

The following sections describe the general physical setting for Areas 25, 26, and 27. General background information pertaining to climatology, geology, and hydrogeology are provided for these areas or the NTS region in the *Geologic Map of the Nevada Test Site, Southern Nevada*; USGS Map I-2046 (Frizzell and Shulters, 1990); *CERCLA Preliminary Assessment of DOE's Nevada Operations Office Nuclear Weapons Testing Area*s (DRI, 1988); the *Nevada Test Site Final Environmental Impact Statement* (ERDA, 1977b); and the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996a).

2.1.1 Area 25

A summary of the physical setting of Area 25 is provided in Section A.1.1 of the Leachfield Work Plan. Depths to groundwater for the three water supply wells located within the area are approximately 1,041; 740; and 928 feet (ft) below ground surface (bgs) (USGS, 1995).

General background information pertaining to the history, geological assessment, climate, and hydrogeology is provided for Area 25 in the Yucca Mountain Site Characterization Plan (DOE, 1988a) and Appendix A of the Leachfield Work Plan. Facility-specific infrastructure information is provided for Area 25 in the NRDS Master Plan (SNPO, 1970).

2.1.2 Area 26

Geographically, Area 26 is generally bounded on the southwest by the low drainage divide between Wahmonie Flat and Jackass Flats, on the northwest by Lookout Peak, on the north and northeast by small rugged hills that are unnamed, and on the south by Skull Mountain. Area 26 is located midway between Jackass Flats and Frenchman Flat (Johnson and Ege, 1964).

Topographically, Area 26 is intermontane valley bordered by highlands on all sides except for a large drainage outlet to the southwest. Area 26 is located in the transition zone between the northern edge of the Mojave Desert and the southern portion of the Great Basin Desert. Elevations where Project Pluto facilities are present range from 4,200 to 4,400 ft above mean sea level (amsl). (AEC, 1961)

The Skull Mountain region is underlain by alluvium and colluvium, which ranges in age from Miocene to Holocene (Frizzel and Shulters, 1990). The alluvium and colluvium consist of unconsolidated to moderately cemented, locally deformed, alluvial fan, flood plain, streambed, talus, slope wash, and eolian deposits. The thickness is variable and, in some cases, is as much as 1,968 ft thick (DRI, 1988). Nearby hills consist of Miocene-age Wahmonie and Salyer Formations, which are rhyodactic and dacitic volcanic deposits (DRI, 1988).

The portion of Area 26 used for Project Pluto is covered by thin gravels capping a pediment that dips 3 to 6 degrees to the southeast. The pediment gravels merge with valley alluvium along Cane Springs wash to the south. Where exposed, bedrock consists mostly of extrusive igneous rocks with some associated breccias of limited areal extent. A few thin beds of consolidated sedimentary rock are present between some of the extrusive rocks. A perched water table occurs in a zone of the highly fractured rock. The perched water may extend to depths exceeding 261 ft before encountering rocks with a low-fracture permeability. Static-perched water levels range from 81 to 167 ft below the land surface (Johnson and Ege, 1964). The regional water table is thought to be at a depth of about 1,700 ft below the surface. (DRI, 1988)

Facility-specific infrastructure information is provided for Area 26 in the *Environmental Survey Preliminary Report* (DOE, 1988b), *Background Information Project Pluto - Tory II-A* (Author Unknown, 1960), and the *Tory IIC Reactor Test Report* (AEC, 1964).

2.1.3 Area 27

Geographically, Area 27 is located in the southern part of the NTS, southeast of Area 26, approximately midway between Jackass Flats and Frenchman Flat.

Topographically, Area 27 facilities are located in a saddle between Skull Mountain to the west and rugged terrain to the east. The saddle is a drainage divide between Wahmonie Flat to the north and

Rock Valley to the south. Elevations of the Area 27 facilities range from 4,200 to 4,500 ft amsl (USGS, 1986). Area 27 is located in the transition zone between the northern edge of the Mojave Desert and the southern portion of the Great Basin Desert.

The geology of Area 27 consists of predominantly Tertiary tuffs and tuffaceous sediments and Tertiary or younger basalts, alluvium, and colluvium. The Wahmonie Formation occurs over much of the area. A dominant structural feature of the area is a series of northeast-striking faults, of which the Cane Springs Fault is predominant (Hannon and McKague, 1975). Information on the depth to groundwater beneath Area 27 could not be located.

Facility-specific infrastructure information is provided for the Super Kukla, Baker, and Able sites in the *Nevada Test Site Final Environmental Impact Statement* (ERDA, 1977b), and the *Nevada Test Site Resource Management Plan* (DOE/NV, 1998a).

2.2 Operational History

As discussed in Section 1.0, 13 septic system sites in CAU 271 were designed to receive sanitary effluent; the CAS 26-05-01 leachfield system was designed to receive radioactive effluent; and the CAS 26-03-01 water reservoir was intentionally contaminated with short-lived radionuclides. The following subsections provide a description of the use and history of each of the CAU 271 CASs, beginning with a general discussion of each area, narrowing the discussion to a facility (e.g., RCP), and finally focusing on an individual CAS. The CAS-specific summaries are designed to illustrate the significant effluent-generating activities. Detailed descriptions of potential sources of contamination are provided in CAS-specific detail in Table A.2-2 of Appendix A.

2.2.1 History of Area 25

From 1959 through 1973, the U.S. Atomic Energy Commission (AEC) participated jointly with the U.S. National Aeronautics and Space Administration (NASA) in the development of nuclear rocket engines. The AEC and NASA formed the Space Nuclear Propulsion Office (SNPO) to oversee the project. The nuclear rocket engines were tested at the NRDS, now known as the Nevada Research and Development Area, located in Area 25 of the NTS. Area 25 was previously known as Area 400.

Several facilities were built to support the testing program including the Guard Station, RCP, and ETS-1 facilities. Though significant quantities of radioactive material were produced during the rocket engine testing program, it is unlikely that radioactive material was disposed of in septic systems at each of these facilities. These facilities were used primarily for administrative and other support functions. Process knowledge indicates that these septic systems were created to receive primarily sanitary effluents. In general, engineering controls were in place to separate radioactive effluent from other effluents, but the assumption that sanitary leachfields are not radiologically contaminated cannot safely be made because of different standards, criteria, and characterization information used in the past.

Unknown additional activities may have been conducted at any of these facilities after NRDS operations were terminated in 1973, but continued discharge to the leachfields was unlikely or was assumed to be similar to effluents discharged prior to 1973. No additional COPCs associated with post-Nuclear Engine for Rocket Vehicle Application (NERVA) activities have been identified.

2.2.1.1 Guard Station 500 - Security Checkpoint Septic System (CAS 25-04-01)

The guard station is located at Gate 500, the Jackass Flats Road entrance to the NRDS. It was constructed in 1961 as a temporary structure (SNPO, 1970). The guard station was used by security personnel to restrict access to Area 25 during the NRDS activities. In 1961, a temporary trailer area with four trailers was constructed to provide offices for Wackenhut Services, Inc. (WSI) and Sheriff's Department security personnel (SNPO, 1970). At some point, these trailers were removed and access to Area 25 became unrestricted. An engineering drawing showing the "Security Checkpoint Trailer Layout" for the guard station is provided in Appendix C (Pan Am, 1969). Note that all engineering drawings referenced in this CAIP are included in Appendix C.

The security checkpoint septic system (CAS 25-04-01) received sanitary effluent generated by activities in the four temporary trailers. The septic system is located approximately 50 ft east of Jackass Flats Road, just south of the guard station at Gate 500. The specific use for these trailers is not known but was most likely administrative.

Engineering drawing AUX-PAA-0009 (Pan Am, 1969) shows that approximately 120 ft of collection line is associated with this septic system. The line may have been connected to as many as four WSI trailers. The AUX-PAA-0009 drawing lacks detail; it is not known if access points to the line exist.

The septic tank is a cylindrical concrete structure with a 400-gallon (gal) capacity (REECo, 1995). It is accessed by a manhole with a 3-ft diameter loop-handled concrete cover. The cover is exposed at the ground surface.

Based on drawing AUX-PAA-0009 (Pan Am, 1969), the leachfield is approximately 4 ft wide by 50 ft long. There is gravel fill in the leachfield; however, the depth of the gravel is unknown. There is one influent line to the septic tank and one effluent line from the septic tank into the leachfield. The diameter and type of piping is unknown. There is no distribution structure associated with this CAS.

Previous sampling of the septic tank contents, soil underlying the leachfield, and background soil for this septic system was conducted by the Reynolds Electrical and Engineering Company, Inc. (REECo) in 1994 and 1995 (REECo, 1995). REECo recommended that closure of the site be conducted under NDEP guidelines due to the presence of cesium-137 (Cs-137) and 1,4-dichlorobenzene in the septic tank content sample. REECo identified the tank contents as nondomestic waste, due to the presence of 1,4-dichlorobenzene in excess of NDEP guidance levels (REECo, 1995). During the REECo effort, personnel noted approximately 50 gal of clear liquid and 1 ft of brown, viscous sludge in the tank. The sampling results are presented in the 1995 REECo report summarized in Section 2.5.3.

2.2.1.2 BREN Tower Septic System (CAS 25-04-08)

The BREN Tower is a guyed, open-framed steel tower, 1,527 ft in height, that was used to position a radiation source for studies performed for the AEC Division of Biology and Medicine (ERDA, 1977a; ERDA, 1977b). From 1962 to 1968, the tower was used to conduct neutron and gamma ray interactions over a variety of geometric configurations in air, ground, shielding materials, shielded vehicles; and with tissue equivalent simulations, electronic components, and live organisms (ERDA, 1977b; Butler and Haywood, 1971). The tower has also been used to support meteorological experiments, laser scintillation experiments, small missile launch tests, and a complex series of sonic boom experiments (ERDA, 1977b).

The BREN Tower was moved to Area 25 in 1966 from its previous location in Area 4 (Center for Land Use Interpretation, 1996). The 14-mega-electron-volt neutron generator that was originally mounted on the side of the tower for the radiation dose testing has since been removed, and radioactive contaminants were cleaned from the tower (ERDA, 1977a).

As part of the move to Area 25, a trailer park was constructed to provide support facilities for personnel working on projects at the BREN Tower (Holmes & Narver, 1966). An associated septic system (CAS 25-04-08) was constructed to receive effluent generated from a restroom trailer at approximately the same time (Holmes & Narver, 1966). Engineering drawing 25-WJ11-C1 (REECo, 1983d) shows that the trailers had been removed as of 1983, but the date the system was taken out of service is unknown. The septic system is located approximately 100 ft south of Cane Spring Road, at the entrance to BREN Tower, and east of the BREN Tower access road in Area 25.

Engineering drawing JS-028-T28a-C7.2-M4.2 (Holmes & Narver, 1966) shows that the collection line for this septic system consists of approximately 40 ft of 4-inch (in.) cast iron pipe. The line was connected to the restroom trailer, and no access points are present along the line.

The septic tank is concrete with one separation chamber and a 760-gal capacity (REECo, 1995). Dimensions of the tank are approximately 6 ft wide by 9 ft long by 5 ft deep (Holmes & Narver, 1966). The septic tank cover is not exposed at the ground surface. A distribution structure is located south of the septic tank. It is also not exposed at the surface, and the dimensions of the structure are unknown. Approximately 15 ft of 4-in. clay piping connects the septic tank and distribution structure (Holmes & Narver, 1966).

Based on engineering drawing JS-028-T28-C7.2-M4.2 (Holmes & Narver, 1966), the leachfield is 15 ft wide by 60 ft long. Three parallel perforated “Orangeburg” distribution lines extend 60 ft from the distribution structure. The pipes were placed in a single excavation (as opposed to individual trenches), approximately 6 ft from one another. The pipes were installed on a 6-in. bed of leachrock, and the total thickness of leachrock is approximately 12 in. Approximately 36 in. of earth backfill was placed above the leachrock; thus, the base of the leachrock is approximately 4 ft bgs (Holmes and Narver, 1966).

Previous sampling of the septic tank contents, soil underlying the leachfield, and background soil for this septic system was conducted by REECo in 1994 and 1995. Concentrations in samples of the leachfield soil and septic tank contents were less than federal action levels for the toxicity characteristic and polychlorinated biphenyls (PCBs). Concentrations were also below NDEP guidance levels. Based on this information, REECo recommended that the system be classified as nonhazardous and closed as a domestic sewage system under Nevada State Health Division (NSHD) guidelines (REECo, 1995). During that effort, personnel noted approximately 500 gal of medium brown colored liquid and an insignificant amount of sludge remaining in the tank. The sampling results are presented in the 1995 REECo report summarized in Section 2.5.3.

2.2.1.3 ETS-1 Septic System (CAS 25-04-09)

The ETS-1 facility was designed for testing of a downward-firing nuclear engine in a flight-simulated environment (ERDA, 1977a). Construction of the entire facility was completed in 1966, and operations were performed at ETS-1 until 1973 (SNPO, 1970; REECo, 1984a). Approximately 14 ground developmental tests of downward-firing NERVA-type engines were run from 1968 to 1969 (RSN, 1995). The facility includes a test stand connected to a control point building by a 1,150 ft underground tunnel, with associated offices and buildings, and the necessary electrical, water, heating, ventilation, air conditioning, and other support systems.

Aerial photograph 643-17-11 indicates construction of the ETS-1 septic system (CAS 25-04-09) was completed prior to March 3, 1964 (EG&G/EM, 1964a). The septic system is located approximately 10 ft south of the southernmost fence of the ETS-1 complex. Several source buildings were originally connected to the septic system. The 1984 engineering drawing 25-ETS-1-C1 indicates the septic system was abandoned, the collection pipe was plugged at a manhole approximately 20 ft upstream of the septic tank, and effluent from ETS-1 was diverted to two oxidation ponds located southwest of the leachfield (REECo, 1984b).

The oxidation ponds are permitted and currently in standby status. They are approved as a dewatering site to receive only septage and portable toilet waste in accordance with the NTS Water Pollution Control Permit, GNEV 93001 (Rosse, 1999). The ETS-1 facilities are also in a standby status (BN, 2000).

The ETS-1 source buildings that generated effluent prior to 1984 include Building 3340 (Test Cell Building), Building 3330 (Fill Station/Tank Farm and Forward Control Area), Building 3320 (Utility Equipment Building/Substation Area), Building 3319 (Maintenance and Supply Building/Welding and Machine Shop), and Building 3310 (Control Point Building). These source buildings maintained toilets, sinks, floor drains, sumps, and floor cleanouts that were connected via drains into the septic system.

As many as 22 trailers (no longer present) at two locations were also connected to the ETS-1 septic system via a separate pipeline prior to 1984. The collection lines from these trailers also appear to have been rerouted to the sewage lagoon (REECo, 1984b). A recent site visit indicates that some of the collection lines, consisting of vitrified clay pipe (VCP), are present in the shallow subsurface in an area immediately northeast of the ETS-1 septic system.

This CAS includes a steel 2,600-gal, two-chamber septic tank (SNPO, Date Unknown) and a small concrete diversion box located approximately 25 ft northeast of the septic tank. Recent site visits indicate that two manholes providing access to the tank are present at the ground surface. The small diversion box was apparently used to tie the trailer sewage hookups discussed above into the ETS-1 oxidation pond system. A distribution structure is apparently not associated with the septic system.

Engineering drawing 620-3300-C-001 (SNPO, Date Unknown) indicates that approximately 10 ft of piping connects the septic tank to the first distribution lines. The leachfield lines are present in an area approximately 60 ft long by 120 ft wide. Ten open-joint, VCP, 60-ft long distribution lines extend from each side of the single distribution manifold. The distribution lines are spaced approximately 6 ft apart; set in trenches that are a minimum of 18 in. wide. Plans specified a minimum thickness of 12 in. of crushed stone leachrock, covered with a 3-in. layer of straw, and the remaining trench backfilled with soil. The total depth to the leachrock/soil interface cannot be determined from available engineering drawings.

Previous sampling of the septic tank contents, soil underlying the leachfield, and background soil for this septic system was conducted by REECo in 1994 and 1995. During the sampling effort, personnel noted the septic tank contents were dry and cake like and had a moderate septage odor. Concrete debris and piping were noted at the bottom of the tank. The REECo personnel also noted that the capacity of the tank was approximately 7,500-gal. These dimensions differ from those presented on engineering drawing 620-3300-C-001 (SNPO, Date Unknown).

Concentrations of constituents in the tank contents, leachfield soil sample, and background soil sample did not exceed NDEP guidance levels, or federal action levels for the toxicity characteristic or PCBs. However, REECo recommended that the system be closed as a nondomestic sewage system under NDEP guidelines due to the presence of PCBs in the septic tank contents (REECo, 1995). The sampling results from this effort are summarized in Section 2.5.3.

2.2.1.4 RCP

The RCP Complex was constructed to provide support facilities for the NRDS Project. Control of all reactor test operations from the RCP eliminated direct radiation hazards to control personnel during testing. Control signals were transmitted from the RCP to reactors via an underground cable network (SNPO, 1963). The RCP consists of a control point building, technical operations building, cafeteria, warehouse, powerhouse, and three to four additional smaller support buildings. Construction for the NRDS Project, including the RCP Complex began in 1958. Government funding for the project ended in 1973, and the site was closed (ERDA, 1977b). The current status of the RCP is listed as active (BN, 2000). Four septic systems included in CAU 271 are associated with the RCP; each is discussed in the following subsections.

2.2.1.4.1 Pan Am Trailer Septic System (CAS 25-04-03)

Engineering drawing NRDS-SF-M/C-7 (SNPO, 1970) indicates that the Pan American Airways, Inc. (Pan Am) trailer septic system (CAS 25-04-03) was constructed by 1965. The system is located approximately 350 ft west of the RCP Complex. It received waste generated by construction workers in 17 housing trailers and one recreational trailer that were located in an area known as the “Craft Housing” site (SNPO, 1970). Engineering drawing 25-CP-C3 (REECo, 1983c) shows that the trailers had been removed and the septic system had been abandoned prior to 1983.

Based on engineering drawings 25-CP-C1.1, 25-CP-C2, and 25-CP-C3 (REECo, 1983a, 1983b, and 1983c, respectively), the Pan Am trailer septic system was bypassed sometime prior to 1983, and effluent was rerouted to two active oxidation ponds located southeast of the RCP. The bypass occurred at a manhole just upstream of the septic tank.

Abandoned collection lines include approximately 360 ft of 6-in. VCP associated with the original septic system and approximately 660 ft of 6-in. line associated with the bypass to the oxidation ponds. Potential access locations include three manholes (REECo, 1983a and 1983c).

The septic tank is concrete and single-chambered with a 750-gal capacity (REECo, 1995). A distribution structure is apparently not associated with this system. The access to the septic tank is buried; it was not observed during a recent site visit. There should be approximately 15 ft of piping between the septic tank and the first distribution line in the leachfield (REECo, 1983c). However, REECo observed a gap in the connection during preliminary sampling conducted in 1995 (REECo, 1995). It is not known if this gap indicates the pipe had been plugged at the time the system was bypassed or if the pipe had been accidently broken.

An engineering drawing was not available to show the subsurface configuration of the CAS 25-04-03 leachfield. Drawing 25-CP-C3 (REECo, 1983c) indicates the leachfield is chevron-shaped, with each half measuring approximately 50 ft by 70 ft. The depth of the leachfield base is not known.

Previous sampling of the septic tank contents, soil underlying the leachfield, and background soil for this septic system was conducted by REECo in 1994 and 1995. Both a total petroleum hydrocarbon (TPH) action level and a sewage lagoon allowable oil and grease concentration were exceeded in the septic tank sludge sample. Based on the analytical data, REECo recommended that the septic tank be closed as a “hydrocarbon containing tank” under NDEP guidelines (REECo, 1995). During the sampling effort, REECo personnel noted that the tank contained approximately 375 gal of liquid with a yellow color and an oily sheen on the surface. The sludge was brown to black in color and appeared to contain gravelly soils. A slight septage odor was noted.

2.2.1.4.2 RCP Septic System (CAS 25-04-04)

Engineering drawing 3101-SW1.2 indicates that the RCP septic system (CAS 25-04-04) was constructed in 1958 (BMEC, 1958a). The system is located just south of the RCP Complex fenceline. The length of time the septic system was active is not known. Engineering drawings 25-CP-C1.1, 25-CP-C2, and 25-CP-C3 (REECo, 1983a, 1983b, and 1983c, respectively) indicate that prior to 1983, the septic system piping was plugged at the manhole approximately 20 ft upstream of the septic tank, and effluent was rerouted to two active oxidation ponds located southeast of the RCP. The oxidation ponds are permitted and currently in active status. The RCP facilities are also in an active status (BN, 2000).

Several source buildings were originally connected to the CAS 25-04-04 septic system. These include Building 3101 (Control Point), Building 3102 (Power House), Building 3103 (Los Alamos Scientific Laboratory Warehouse), Building 3106 (Storage Building), Building 3104 (Administration Building), Building 3105 (Former Medical/Cafeteria), Building 3107 (Service Station), and Building 3123 (Technical Services) (REECo, 1983a). These source buildings contained urinals, water closets, hand sinks, floor drains, service sinks, drinking fountains, a dishwasher, shower drains, developer sinks, a print washer, and a dip tank that were connected via drains to the septic system.

Approximately 20 ft of abandoned 8-in. VCP collection system line is connected to the septic tank (REECo, 1983a). Engineering drawing 3101-SW5 (BMEC, 1958b) shows the septic tank is steel, with one separation chamber and a 7,500-gal capacity. The tank is accessible at the ground surface by three covers. Although the leachfield is located outside of the RCP, the septic tank access locations are inside of the RCP, just inside the fence line. A concrete distribution structure is located approximately 10 ft south of the outlet end of the septic tank. The distribution structure is 3 ft long by 2 ft wide, and approximately 4 ft deep. Twin steel lids provides access to the structure (BMEC, 1958c).

Engineering drawing 3101-SW6.1 (BMEC, 1958c) shows that the leachfield is approximately 112 ft long by 203 ft wide. The leachfield configuration is similar to the center system shown in Figure 3-1 of the Leachfield Work Plan, with two distribution manifolds and 15 distribution lines per manifold. The distribution lines are 100 ft long, spaced 8 ft apart on center. Distribution lines were placed in an 18-in. wide trench. The leachfield base is between 24 and 33 in. bgs, and the thickness of leachrock gravel in each trench is approximately 12 in. The remaining trench is backfilled with soil to the finished grade.

Previous sampling of the septic tank contents, soil underlying the leachfield, and background soil for this septic system was conducted by REECo in 1994 and 1995. An action level for TPH and an

NDEP guidance level for 1,4-dichlorobenzene were exceeded in the septic tank sludge sample. The oil and grease limit for discharge to a sewage lagoon was also exceeded for both the liquid and sludge samples from the septic tank. Based on the analytical data, REECo recommended that the septic tank contents be closed as a nondomestic and hydrocarbon waste under NDEP guidelines (REECo, 1995). During the REECo effort, personnel noted that the tank contained approximately 3,500 gal of liquid and sludge. The liquid had a slightly clouded appearance and a "floating oily phase" on the surface of the liquid. A moderate septage odor was noted.

2.2.1.4.3 Rad-Safe Trailers Septic System (CAS 25-04-10)

The radiological-safety (Rad-Safe) trailers septic system (CAS 25-04-10) is located approximately 0.10 mi south of the intersection of C and G Roads in Area 25. Minimal information regarding the construction, operation, and use of the septic system was identified during the preliminary assessment. Engineering drawing 25-CP-C2 (REECo, 1983b) indicates the septic system served either one or two Rad-Safe trailers, since removed, that were located approximately 50 ft north of the septic system. Aerial photograph 648-26-25 (EG&G/EM, 1964b) shows two trailers in the approximate location where the Rad-Safe trailers were located on engineering drawing 25-CP-C2. This information indicates that the septic system could have been operational prior to 1964 and up to 1983.

Engineering drawing 25-CP-C2 shows that the collection system line consisted of approximately 70 ft of 4-in. VCP. This line connected the former Rad-Safe trailer(s) to the CAS 25-04-10 septic tank. There are no access points along the line. The 650-gal capacity septic tank is steel, with one separation chamber (REECo, 1995). A recent site visit indicates the access points to the tank are buried. A concrete distribution structure is present; however, it is filled with gravel.

An engineering drawing was not available to show the subsurface configuration of the CAS 25-04-10 leachfield. Drawing 25-CP-C2 indicates that the leachfield is a rectangular-shaped area, measuring approximately 60 ft by 70 ft. The depth of the leachfield base is also not known.

Previous sampling of the septic tank contents, soil underlying the leachfield, and background soil for this septic system was conducted by REECo in 1994 and 1995. During the effort, REECo personnel noted that the tank contents were dry, brittle, and reddish brown in color. The tank contained numerous skeletal remains of rodents and snakes. REECo (1995) recommended that closure authority for the site be conducted under NDEP guidelines due to the detection of plutonium-239 and 1,4-dichlorobenzene in the septic tank sludge sample. REECo (1995) identified the tank contents as nondomestic waste, due to the presence of 1,4-dichlorobenzene in excess of NDEP guidance levels.

2.2.1.4.4 LASL Trailers Septic System (CAS 25-04-11)

Aerial photograph 643-17-15 (EG&G/EM, 1964c) suggests that the Los Alamos Scientific Laboratory (LASL) trailers septic system (CAS 25-04-11) was constructed after March 1964. The system is located approximately 530 ft south of the RCP Complex fenceline. Several source buildings were originally connected to the septic system. However, engineering drawings 25-CP-C1.1, 25-CP-C2, and 25-CP-C3 indicate that sometime prior to 1983, the septic system piping was plugged at a manhole located a few feet upstream of the septic tank, and effluent was diverted to the two active oxidation ponds located southeast of the leachfield (REECo, 1983a; REECo, 1983b; and REECo, 1983c). The oxidation ponds are permitted and currently in active status. The RCP facilities are also in an active status (BN, 2000).

The source buildings that may have discharged effluent to the septic system prior to 1983 include Building 3127 (Cafeteria), Building 3129 (Technical Operations Building), and approximately 48 LASL sleeping trailers (REECo, 1983a; REECo, 1983b). The individual source points from these buildings and trailers have not been identified, but most likely include sources associated with personal hygiene (e.g., restrooms and shower facilities) and kitchen and building maintenance (e.g., dishwashers and janitorial facilities).

As discussed above, much of the collection system line that had connected source buildings to the LASL trailers septic system is currently active and connected to the permitted oxidation ponds. However, drawing 25-CP-C2 (REECo, 1983b) shows that two parallel 6-in. VCP lines are present in the former LASL trailer area. Together, these lines comprise approximately 380 ft of abandoned collection system piping.

The septic tank is constructed of steel, with one separation chamber and a 7,500-gal capacity (REECo, 1995). Two manways with steel lids provide access to the tank. The manways are approximately 2 ft bgs; corrugated metal tubes allow below grade access. A concrete distribution structure is located approximately 5 ft south of the septic tank. This structure has a damaged metal lid and is partially filled with soil and/or gravel.

An engineering drawing was not available to show the subsurface configuration of the CAS 25-04-11 leachfield. Drawing 25-CP-C2 indicates that the leachfield is a relatively large rectangular-shaped area, measuring approximately 135 ft by 200 ft. The depth of the leachfield base is not known.

Previous sampling of the septic tank contents, soil underlying the leachfield, and background soil for this septic system was conducted by REECo in 1994 and 1995. Due to the presence of 1,4-dichlorobenzene above the NDEP guidance level, REECo recommended that the tank contents be closed as nondomestic waste under NDEP guidelines (REECo, 1995). During the field effort, REECo personnel noted that the septic tank contained approximately 3,500 gal of liquid and sludge. The sludge layer appeared to be approximately 1.5 ft thick, was black in color, and had a strong septage odor. The liquid was relatively clear.

2.2.2 History of Area 26

In 1958, the Lawrence Radiation Laboratory (LRL), the predecessor of Lawrence Livermore and Lawrence Berkeley National Laboratories, was contracted to begin construction for Project Pluto in Area 26, formerly known as Area 401. Project Pluto was a joint program between the AEC and DoD to demonstrate the feasibility of using a nuclear ramjet engine to propel a supersonic low altitude missile (Author Unknown, 1960). Between 1961 and 1964, LRL conducted six experimental tests to develop a nuclear reactor for the ramjet engine. Four of the tests involved the Tory II-A nuclear reactor and the other two involved the Tory II-C nuclear reactor (DRI, 1988).

The facilities built to support Project Pluto were separated into three functional areas for operational reasons: control, testing, and disassembly areas. The control area included the Control Room (Building 2101), Assembly Building (Building 2102), Data Reduction Building (Building 2107), Hot Critical Facility (Building 2103), and Check Station (Building 2105). The testing area included the Test Bunker (Building 2203), and the disassembly area consisted of the Disassembly Building (Building 2201) and the Railcar Washdown (Building 2202).

Significant quantities of radioactive material were produced during the Tory reactor testing program, some of which was disposed in the disassembly area radioactive leachfield (CAS 26-05-01). In addition, process and sanitary effluents were generated and disposed of in septic systems associated with the facilities described above. In general, engineering controls were in place to separate radioactive effluent from other effluents, but the assumption that sanitary leachfields are not radiologically contaminated cannot safely be made because of different standards, criteria, and characterization information used in the past.

Two other known activities occurred in Area 26 after the initial Project Pluto activities. In 1981, the DoD and the DOE began a joint accident nuclear weapons accident training exercise, NUWAX-81, at the NTS. The exercise was designed to put into action a planned emergency response to radioactive material scattered in the vicinity of a fictitious town named Wahmonie, California, as a result of a nuclear weapons accident. The Project Pluto control area and surrounding area supported NUWAX operations and served as the location for Wahmonie. The NUWAX-81 scenario involved a simulated crash of an U.S. Army helicopter transporting nuclear weapons to a storage site. The simulated helicopter crash site was the west bank of Wahmonie's water reservoir (now CAS 26-03-01). Aircraft parts and pieces of inert nuclear training weapons were prepositioned at the site. Short-lived radioisotopes, radium-223 (Ra-223) and mercury-197 (Hg-197), were distributed via an agricultural sprayer to a localized area to simulate contamination by weapons-grade plutonium (U.S. Army, 1989).

In 1983, the joint venture between the DoD and DOE to train personnel for emergency response to nuclear weapons accidents was continued with the advent of NUWAX-83. The Federal Emergency Management Agency also participated in NUWAX-83. With the exception of a few details, a scenario similar to NUWAX-81 was conducted. Short-lived radioisotopes, Ra-223 and palladium-103, were distributed during this exercise to simulate contamination with plutonium and americium. This accident simulated a crash in the mock city of Port Gaston, VA (DOE, 1983). The NUWAX-83 exercise did not impact any of the CASs investigated as part of CAU 271.

Subsequent to Project Pluto and NUWAX operations, additional activities may have been conducted at the facilities in Area 26. The type of activities and the purpose are not known.

In the subsections that follow, the Area 26 CASs are organized according to the three Project Pluto functional areas. However, CAS 26-03-01 is associated with NUWAX-81 and will be discussed separately.

2.2.2.1 Project Pluto Control Area

The control area for Project Pluto was the center for administrative, operational, and other nonhazardous functions (AEC, 1964).

2.2.2.1.1 Building 2105 Septic System (CAS 26-04-01)

Building 2105 (Check Station) is located between the disassembly building and the control room. It was used for limiting access to the test area during testing and also used as a control point for health physics and other aspects of safety (AEC, 1964). Building 2105 is currently in a standby status (BN, 2000).

Engineering drawing 2105-SW2 (BMEC, 1960a) indicates that the Check Station septic system (CAS 26-04-01) was constructed in 1960. The system is located approximately 200 ft west of Building 2105, and was used from 1961 to 1964. The sources of effluent from Building 2105 included four floor drains, two service sinks, two water closets, one urinal, and one lavatory.

Engineering drawing 2105-SW2 (BMEC, 1960a) shows that the collection system line for CAS 26-04-01 consists of approximately 200 ft of 6-in. VCP connecting Building 2105 to the septic tank. One manhole divides the line into two segments.

The septic tank is a steel, one-chamber design, with a 1,000-gal capacity (REECo, 1995). The tank is accessed by one manway. A concrete distribution structure is located 10 ft west of the septic tank. A steel lid provides access to the structure (BMEC, 1960a; BMEC, 1960b).

Engineering drawing 2105-SW3 (BMEC, 1960b) shows that the leachfield is approximately 48 ft long by 93 ft wide. The leachfield base is approximately 2 to 3 ft bgs; the actual depth to the base is unknown. The leachfield configuration is similar to the middle system shown in Leachfield Work Plan, Figure 3-1. Two distribution manifolds extend from the distribution structure through the center of the leachfield; six distribution lines are connected to each manifold. The 4-in. VCP distribution lines are 45 ft long and spaced 8 ft apart on center. Each line was placed in an 18-in. wide trench. A 12-in. layer of gravel was installed as leachrock. Above the leachrock, each trench was backfilled with soil to the finished grade.

Previous sampling of the septic tank contents, soil underlying the leachfield, and background soil for this septic system was conducted by REECo in 1994 and 1995. Neither federal action levels for the toxicity characteristic or PCBs, nor NDEP guidance levels were exceeded in samples of the septic tank contents, leachfield soil, or background soil. Based on this information, REECo recommended that the system be classified as nonhazardous and closed as a domestic sewage system under NSHD guidelines (REECo, 1995). During the sampling effort, REECo personnel noted that the tank contained approximately 400 gal of liquid.

2.2.2.1.2 Building 2103 Septic System (CAS 26-04-02)

Building 2103 (Hot Critical Facility) housed a large high-temperature oven used in performing a series of critical measurements of reactor materials (Author Unknown, 1960). Building 2103 was deactivated before the beginning of the Tory II-C tests in 1963 (AEC, 1964). The operational status was not listed in the NTS occupancy report (BN, 2000).

Engineering drawing 2101-SW4.1 (BMEC, 1959a) indicates that one septic system (CAS 26-04-02), constructed in 1960, is associated with Building 2103. The system is located approximately 100 ft north of Building 2103; it was used from 1961 to 1964. The sources of effluent from Building 2103 included one sink, two urinals, one floor drain, and one water cooler.

Engineering drawing 2101-SW4.1 (BMEC, 1959a) shows that the collection system line consists of approximately 100 ft of 6-in. VCP connecting Building 2103 to the septic tank. One manhole and two cleanouts may provide access to the line.

The single-chamber septic tank is concrete, with a 650-gal capacity (REECo, 1995). The single access manway to the tank is not visible at the ground surface. A concrete distribution structure is located 10 ft north of the septic tank (BMEC, 1959a; BMEC, 1959b).

Engineering drawing 2101-SW4.1 shows that the leachfield is approximately 24 ft long by 73 ft wide. The leachfield base is approximately 2 to 3 ft bgs (BMEC, 1959b); the actual depth to the leachfield base is unknown. The leachfield configuration is similar to the middle system shown in the Leachfield Work Plan, Figure 3-1. Two distribution manifolds extend from the distribution structure through the center of the leachfield; four distribution lines are connected to each manifold. The 4-in. VCP distribution lines are 35 ft long and are spaced 8 ft apart on center. Drawing 2101-SW6.1 (BMEC, 1959b) shows that the distribution lines were placed in 18-in. wide trenches. A 12-in. layer of gravel was installed as leachrock. Above the leachrock, the trench was backfilled with soil to the finished grade.

Previous sampling of the septic tank contents, soil underlying the leachfield, and background soil for this septic system was conducted by REECo in 1994 and 1995. Neither the federal action levels for the toxicity characteristic or PCBs, nor the NDEP guidance levels were exceeded for samples of the tank contents, leachfield soil, or background soil. However, REECo recommended that the septic system be closed as a nondomestic sewage system under NDEP guidelines due to the presence of beryllium in the septic tank contents (REECo, 1995). During the sampling effort, REECo personnel noted that the influent and effluent lines inside the septic tank were sealed with concrete. The tank contents were dry and medium brown in color.

2.2.2.1.3 Buildings 2101, 2102, and 2107 Septic System (CAS 26-05-05)

Building 2101 (Control Building) housed equipment used to remotely control, display, and record data associated with the locomotive operations, track switching, reactor duct disconnect, test air system, diagnostic equipment, and Tory reactor nuclear controls (AEC, Date Unknown). Building 2101 is currently in a standby status (BN, 2000). Building 2102 (Assembly Building) was used to assemble and fabricate subassemblies and served as a materials-receiving station and vault (Author Unknown, 1960). The status of Building 2102 is currently listed as active (BN, 2000). Building 2107 (Data Reduction Building) is currently listed with an active status and was identified as the Port Gaston Cafe (BN, 2000). No information on the use of Building 2107 was identified, although from the name, it appears likely that data gathered during the Tory reactor tests were analyzed in this building.

Engineering drawing 2101-SW4.1 (BMEC, 1959a) shows that one septic system (CAS 26-05-05) serviced all three of these buildings. The system, constructed in 1960, is located approximately 235 ft north of Building 2102 and was used from 1961 to 1964. The sources of effluent from

Buildings 2101, 2102, and 2107 include 13 floor drains, 6 toilets, 4 urinals, 6 bathroom sinks, 3 utility sinks, 1 laboratory sink, and 1 shower.

Engineering drawing 2101-SW4.1 indicates that this is a typical sanitary system composed of a septic tank, distribution structure, and leachfield. However, a preliminary assessment and subsequent site visit conducted by ITLV indicated that an additional distribution structure and possibly an additional septic tank are present. The additional distribution structure is located in the approximate center of a fenced area assumed to be the leachfield. The suspected additional septic tank is located outside of the leachfield fence. It is not on the centerline for the system, which is somewhat unconventional relative to other septic systems in the area.

Drawings 2101-SW4.1 and 401-004-C1 (Holmes & Narver, 1961) indicate that the collection system lines for CAS 26-05-05 consist of approximately 650 ft of VCP. The VCP includes 4-, 6-, and 8-in. diameter segments. Three manholes and at least one cleanout may provide access to the piping.

The capacity of the septic tank is reported to be 1,500 gal (Frazier, 1987). Drawing 2101-SW6.1 (BMEC, 1959b) indicates that the tank has a single manhole for access. A concrete distribution structure is located 10 ft northwest of the septic tank. As discussed above, another septic tank and distribution structure, which are not shown on engineering drawings, may be associated with this CAS.

Engineering drawing 2101-SW4.1 (BMEC, 1959a) shows the CAS 26-05-05 leachfield is approximately 48 ft long by 109 ft wide. The leachfield base is approximately 2 to 3 ft bgs (BMEC, 1959b); however, the actual depth to the leachfield base is unknown. The configuration of the leachfield is similar to the middle system shown in the Leachfield Work Plan, Figure 3-1. Two distribution manifolds extend from the distribution structure through the center of the leachfield; six distribution lines are connected to each manifold. The 4-in. VCP distribution lines are 53 ft long and are spaced 8 ft apart on center. Drawing 2101-SW6.1 (BMEC, 1959b) shows that the lines were placed in 18-in. wide trenches. A 12-in. layer of gravel was installed as leachrock. Above the leachrock, the trench was backfilled with soil to the finished grade. A recent site visit indicates that the leachfield dimensions shown in the “as built” engineering drawing may not match the actual dimensions. The area enclosed by a fenced (assumed to be the leachfield) was observed to be approximately three times longer than presented in the “as built.” A reference documenting expansion or modification of the original CAS 26-05-05 septic system has not been found. To date, no known sampling or characterization efforts have been conducted at this CAS.

2.2.2.2 Project Pluto Test Area - Building 2203 Septic System (CAS 26-05-03)

The test area consisted of the Test Bunker (Building 2203), air heating facility, air storage farm, and compressor building (AEC, 1964). The facility of concern to CAU 271 is Building 2203. This building served as ground zero for Project Pluto reactor testing operations. Building 2203 housed a heater combustion system, hydraulic power unit, air supply piping and controls, reactor cooling blowers, and ventilation fans. A stored air system was located adjacent to the bunker (Author Unknown, 1960).

The Test Bunker facility was used from 1961 to 1964 during the Project Pluto activities (DRI, 1988). Personal interviews indicate that Building 2203 has been used sporadically after that time period for training exercises and other “black operations” (Cebe, 1997). The status of Building 2203 is currently listed as active (BN, 2000).

Engineering drawing 2203-SW1.1 (BMEC, 1960c) indicates that one septic system (CAS 26-05-03) is associated with a restroom facility in Building 2203. The system, located approximately 60 ft southeast of the vertical heat exchange tanks at Building 2203, was constructed in 1959. Sources of effluent from the building included two toilets, one urinal, two sinks, and one floor drain. A separate hot waste line handled radioactive effluents generated in Building 2203; that line is addressed by CAU 168 as CAS 26-17-01.

Engineering drawing 2202A-C-10 (NEC, 1961) indicates that the collection system line for CAS 26-05-03 consists of approximately 70 ft of pipe. The line may be VCP or cast iron. A manhole or cleanout is located on the line, adjacent to Building 2203.

The single-chamber concrete septic tank has a reported 1,500-gal capacity (Frazier, 1987; BMEC, 1960d). Drawing 2203-SW5 (BMEC, 1960d) shows a concrete distribution structure is located 10 ft southeast of the septic tank. However, drawing 2202A-C-10 indicates that the distance between the distribution structure and septic tank is approximately 40 ft.

Engineering drawing 2203-SW5 (BMEC, 1960d) shows that the leachfield is approximately 48 ft long by 93 ft wide. The depth of the leachfield base is approximately 2 to 3 ft bgs; however, the actual depth is unknown. The configuration of the leachfield is similar to the middle system shown in Leachfield Work Plan Figure 3-1. Two distribution manifolds extend from the distribution structure through the center of the leachfield; six distribution lines are connected to each manifold. The 4-in. tile distribution lines are 45 ft long and are spaced 8 ft apart on center. Drawing 2203-SW5 shows that the lines were placed in 18-in. wide trenches. A 12-in. layer of gravel was installed as leachrock. Above the leachrock, the trench was backfilled with soil to the finished grade.

A three-strand barbed wire fence surrounds the leachfield, which is posted as "Caution Radioactive Material." Miscellaneous debris is present on the ground surface at two locations in the leachfield. These locations showed elevated radiological readings during a driveover survey of the site (IT, 2000b). The debris itself may account for the posting. Neither the distribution structure nor the septic tank are posted. No other sampling of the CAS 26-05-03 system has been identified.

2.2.2.3 Project Pluto Disassembly Area

The Disassembly Building (Building 2201) was constructed in 1959 and 1960. It was used from 1961 to 1964 during Project Pluto to decontaminate the Tory II-A and Tory II-C reactors (LRL, 1960). The building contains a large disassembly bay and two smaller disassembly shops used for the remote dismantling and inspection of the radioactive or "hot" reactors. It also includes an assembly bay. Liquid wastes generated during the decontamination activities contained radioactive contaminants and possibly chemical solvents and degreasers (DOE, 1988b). The types and quantity of these products are unknown. A report on testing of the Tory II-C reactor states that reactor fuel elements consisted of uranium dioxide and beryllium oxide (AEC, 1964).

Building 2201 was used again in 1972 for repackaging operations (REECo, 1972). Solid fuel elements from the Pluto Project were repackaged for shipment from Area 26. Neither the radioactive leachfield nor the septic system were used during this operation. Following 1972, classified experiments occurred in Building 2201; however, no information regarding these operations or potential impacts to the leachfield were identified. The building was administratively occupied by Sandia National Laboratories in 1997 (Parker, 1998). The current status is active (BN, 2000).

A railroad was used to transport the Tory reactors between the Disassembly Building and Test Bunker. A Railcar Washdown structure (Building 2202) was located on the railroad, approximately 500 ft east of Building 2201. While passing through the washdown structure, the reactor and possibly the railcars were decontaminated prior to proceeding to Building 2201. The effluent from this operation was disposed in the CAS 26-05-01 radioactive leachfield. The operational status of Building 2202 was not listed in the NTS occupancy report (BN, 2000).

2.2.2.3.1 Buildings 2201 and 2202 Radioactive Leachfield (CAS 26-05-01)

Radioactive effluent produced during the Project Pluto Tory reactor testing program was disposed of in the CAS 26-05-01 radioactive leachfield (alternatively known as the Area 26 Tory Reactor Leachfield or 401 Maintenance, Assembly, and Disassembly Facility Leachfield). Engineering drawing 2201-SW1 (BMEC, 1958d) indicates that the radioactive leachfield is associated with Buildings 2201 and 2202, and is located approximately 1,450 ft southeast of Building 2201. The leachfield was constructed between 1959 and 1960, and it received effluent from 1961 to 1964. The potential sources of effluent from Buildings 2201 and 2202 included 36 "hot" waste lines and 11 floor drains.

The CAS 26-05-01 radioactive leachfield system received process effluents. It does not have a septic tank; therefore, it was not designed for disposal of sanitary wastes. The Disassembly Building (Building 2201) was designed and built with independent piping systems to segregate radioactive ("hot") effluent from sanitary effluent. Radioactive effluent was discharged to the CAS 26-05-01 leachfield system, while sanitary effluent was discharged to the Building 2201 septic system (CAS 26-05-04, discussed in Section 2.2.2.3.2).

"As built" engineering drawing 2201-SW1 (BMEC, 1958d) shows that the collection system line for CAS 26-05-01 consists of approximately 1,575 ft of 8-in. diameter pipe connecting Building 2201 to the leachfield and approximately 225 ft of 6-in. diameter pipe connecting Building 2202 to the main line from Building 2201. Four manholes are located along the main 8-in. line, and a floor drain is located at Building 2202. As discussed above, this system does not include a septic tank. One concrete distribution structure is present (BMEC, 1958d).

Engineering drawing 2201-SW7.A (BMEC, 1958g) shows that the CAS 26-05-01 leachfield is relatively large, approximately 190 ft long by 203 ft wide. The depth of the leachfield base is approximately 2 to 3 ft bgs; however, the actual depth is unknown. The configuration of the leachfield is similar to the middle system shown in Leachfield Work Plan Figure 3-1. Two 6-in. diameter VCP distribution manifolds extend from the distribution structure through the center of the leachfield; 25 distribution lines are connected to each manifold. The 6-in. diameter tile distribution lines are 100 ft long and are spaced 8 ft apart on center. The lines were placed in 18-in. wide trenches. An 18-in. layer of gravel was installed as leachrock. Above the leachrock, the trench was backfilled with soil to the finished grade (BMEC, 1958g). A security fence surrounds the leachfield and distribution box. The leachfield is posted as "Underground Radioactive Material."

Sampling of the CAS 26-05-01 radioactive leachfield was performed by REECo in 1986. During this sampling effort, 19 soil samples were collected from the leachfield. Thirteen samples contained elevated Cs-137. The highest concentration detected was 222 picocuries per gram (pCi/g). Uranium-235 (U-235) was also detected at 18.1 pCi/g in a soil sample from a depth of 6 to 12 in. bgs (REECo, 1986b). No sampling of the leachfield for chemical constituents has been identified. This sampling effort is discussed further in Section 2.5.1.

2.2.2.3.2 Building 2201 Septic System (CAS 26-05-04)

Engineering drawing 2201-SW1 (BMEC, 1958d) indicates that one septic system (CAS 26-05-04) is associated with the Building 2201 floor drains and restroom facilities. The system was constructed between 1959 and 1960 as the sanitary component to this building. It is located approximately 250 ft south of Building 2201. The sources of effluent from Building 2201 include up to 23 floor drains, two water closets, two lavatories, one service sink, and one urinal.

Drawing 2201-SW1 (BMEC, 1958d) shows that the collection system line for CAS 26-05-04 consists of approximately 215 ft of 6-in. VCP connecting Building 2201 to the septic tank. Two manholes divide the line into three segments. This CAS includes a large two-chamber septic tank with a reported capacity of 4,300 gal (Frazier, 1987). Three manholes provide access to the tank. A concrete distribution structure is located 10 ft south of the septic tank (BMEC, 1958e).

Engineering drawing 2201-SW4.A (BMEC, 1958e) shows that the leachfield is approximately 64 ft long by 83 ft wide. The depth of the leachfield base is approximately 2 to 3 ft bgs; however, the actual depth is unknown. The configuration of the leachfield is similar to the middle system shown in Leachfield Work Plan, Figure 3-1. Two 6-in. diameter VCP distribution manifolds extend from the distribution structure through the center of the leachfield; nine distribution lines are connected to each manifold. The 4-in. diameter tile distribution lines are 40 ft long and are spaced 8 ft apart on center. The lines were placed in 18-in. wide trenches. A 12-in. layer of gravel was installed as leachrock. Above the leachrock, the trench was backfilled with soil to the finished grade (BMEC, 1958e). A three-strand barbed wire fence surrounds the leachfield. Data from previous sampling of the CAS 26-05-04 system have not been identified.

2.2.2.4 Port Gaston Training Area Contaminated Water Reservoir (CAS 26-03-01)

In 1981, the area containing the CAS 26-03-01 contaminated water reservoir was known as the NUWAX area. In 1983, with the advent of NUWAX-83, the name was changed to the Port Gaston Area. Although CAS 26-03-01 was not associated with NUWAX-83, the area containing this CAS will be referred to as the Port Gaston Training Area in this document because “Port Gaston Training Area” is used in the FFACO.

In 1991, the DOE/NV Environmental Protection Division originally identified this site as an abandoned sewage lagoon. Due to this classification, CAS 26-03-01 was grouped into CAU 271 and promoted to Appendix III in the FFACO (1996). It has since been determined that CAS 26-03-01 was actually a water reservoir, constructed in 1980, and used for NUWAX training in 1981. The contaminated water reservoir is located approximately 800 ft south of the Port Gaston Complex (Project Pluto control area).

Engineering drawing JS-026-002-C3 (Holmes & Narver, 1980) indicates that the water reservoir was constructed in 1980. Dimensions of the water reservoir are approximately 75 ft long by 36 ft wide. The berm is approximately 4 ft high. The reservoir was lined with 30-mil black plastic. A photograph shows that the reservoir contained water in 1981 (EG&G/EM, 1981). However, the length of time the reservoir held water is not known. A recent site visit indicates that the reservoir is dry, and the plastic liner is brittle and cracked in places. Soil has washed or blown onto the liner.

One surface soil sample was taken at the center of the lagoon by ITLV Preliminary Assessment personnel in 1997. The sample was described as dry, light brown silt. It was noted that observable staining was not present in the soil on the water reservoir bottom. The soil sample was analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), TPH, RCRA metals, pesticides, PCBs, gross alpha/beta radioactivity, and gamma-emitting radionuclides. Analyte concentrations were below detection limits (Forsgren, 1998).

2.2.3 History of Area 27

The Lawrence Livermore Laboratory (now Lawrence Livermore National Laboratory) has maintained several facilities in Area 27. The facilities were the primary location for the assembly of nuclear device test assemblies for the nuclear test program from approximately 1961 to 1970 (DOE/NV, 1998a). The facilities are grouped into three sites known as the Super Kukla reactor facility, Able site, and Baker site.

The Super Kukla was a prompt burst reactor designed to serve as a source for the irradiation of a wide variety of test specimens or samples, including fissile materials (ERDA, 1977b). Super Kukla was mostly utilized to simulate the effect of an intense radiation burst on nuclear warhead components (LLL, 1972). The Super Kukla reactor is permanently out of service (DOE, 1988b).

The Able site (5100 Complex) consists of several buildings constructed in 1960 to handle explosives. The Able site is no longer permitted to handle these types of operations. One building was used for the storage of spare Super Kukla fuel elements. (ERDA, 1977b).

The Baker site (5300 Complex) was engaged in the assembly, disassembly, and modification of nuclear explosives, nonnuclear explosives, and assemblies containing special nuclear material. It served as the staging point for the manufactured components of the nuclear devices. The complex consisted of four buildings and six storage magazines. One building housed radiographic equipment and x-ray equipment used in the assembly area. Magazines were specially constructed for storing or holding hazardous materials including explosives, special nuclear materials, and parts. They were located away from the other buildings at the Baker site (ERDA, 1977b).

Buildings 5200 and 5210 (Mechanical Technician Shop and Cafeteria, respectively) are located outside of the Baker site but may have been associated with activities conducted at Baker. The two buildings were used primarily for support functions.

2.2.3.1 Building 5200 Leachfield (CAS 27-05-02)

Engineering drawing 410-004-C10.2 (Holmes & Narver, 1962) shows that CAS 27-05-02 septic system was connected to Building 5210 in 1962. One year later, the system was also connected to Building 5200 as shown in engineering drawing NV-35-33-02-P-1 (Moffitt and Hendricks, 1963). The septic system is located southwest of Building 5210 and west of Building 5200. The west side of the CAS 27-05-02 leachfield is bordered by a natural wash (i.e., arroyo).

The septic system received effluent from restroom facilities including toilets, urinals, sinks, and floor drains inside the buildings. In addition, Building 5210 had a full kitchen with food preparation, dish washing, and cleanup operations. Building 5200 contained a service sink and an acid dip tank located beside a sink on a "solder bench." The status of Building 5200 is currently listed as active, and Building 5210 is listed with a standby status (BN, 2000). However, even if the buildings were reactivated, use of the septic system would be prohibited because the leachfield is immediately adjacent to a natural wash. The *Nevada Administrative Code,* 444.792-2 (NAC, 2000a), prohibits the location of septic systems within 100 feet of any watercourse.

Engineering drawing 410-004-C10.2 (Holmes & Narver, 1962) indicates that the collection system line from Building 5210 to the septic tank is approximately 125 ft of 4-in. VCP. At least one cleanout is present on the line; the entire line runs beneath a paved parking area south of Building 5210. Drawing NV-35-33-02-P-1 (Moffitt and Hendricks, 1963) shows that Building 5200 is connected to the septic system via approximately 90 ft of 4-in. VCP. Two cleanouts may provide access to this collection system line.

The septic tank is not visible at the ground surface and is thought to be buried beneath the parking lot for Building 5210. The capacity of the tank is reported to be 1,500 gal (Frazier, 1987). The distribution structure is located approximately 5 ft southeast of the septic tank. It is a round 4-ft diameter concrete structure with one 6-in. VCP inlet and five 4-in. VCP outlets. The structure is capped by a large round metal lid.

Engineering drawing 410-004-C10.2 shows the leachfield to be approximately 80 ft long by 24 ft wide. The leachfield base is at least 2.5 ft bgs; the actual depth to the base is not known. The CAS 27-05-02 leachfield configuration is similar to that of the system shown at the top of Leachfield Work Plan, Figure 3-1. Five parallel 4-in. orangeburg distribution lines connect directly to the distribution structure. The lines are approximately 80 ft long and are spaced 6 ft apart on center. The distribution lines are placed in 2-ft wide trenches. A layer of approximately 18 in. of coarse gravel served as leachrock in each trench. The remaining trench was backfilled to the finished grade with native soil (Holmes & Narver, 1962). Data from previous sampling of this septic system has not been identified.

2.3 Waste Inventory

Interviews with former site employees, review of procedures, and interpretations of engineering drawings and facility processes indicate that sanitary and process effluents were discharged to the soil underlying the CAU 271 leachfields. In addition, contamination of the CAS 26-03-01 water reservoir by short-lived radionuclides has been documented. Available information including historical sampling results was evaluated during the DQO process, and a list of potential contaminants was developed.

Radioactive effluent is known to have been discharged to the CAS 26-05-01 posted radioactive leachfield. However, no records of volume or nature of the effluents discharged to CAU 271 systems have been located. Previous sampling efforts, summarized in Section 2.5.1, Section 2.5.2, and Section 2.5.3, have identified radioactive and potentially hazardous materials present in media associated with some of the CAU 271 septic and leachfield systems.

2.4 Release Information

The source of potential contamination related to the CAU 271 septic and leachfield systems was effluent routed through collection system drains to the leachfields. Effluent was released to the leachfields after it passed through septic and leachfield system features, including collection system piping and various combinations of septic tanks and distribution structures. The leachfields were designed for liquid to be dispersed over an area just above the leachfield base (leachrock/native soil interface) and to subsequently percolate through the leachrock and into the underlying soil. The driving force for downward migration of potential contamination was the discharge of effluent associated with the facilities. The possibility of leakage at points along the collection system exists, but there is no evidence of documented leaks or releases.

The volumes of water disposed of using the CAU 271 septic and leachfield systems are unknown. The systems are currently inactive, but some may still receive passive effluent such as rainwater from sources including open pad drains, floor drains, and equipment drains.

Short-lived radionuclides were intentionally sprayed into the CAS 26-03-01 contaminated water reservoir in 1981 as part of the NUWAX-81 exercise. The maximum Ra-223 and Hg-197 activity reportedly deposited was 25 microcuries per square meter (Mitchell, 1981). Photographic evidence indicates that the reservoir was full of water in 1981; however, the length of time it contained water is not known (Section 2.2.2.4). Since the reservoir was lined, it is assumed that the release of water and potential contamination to underlying geologic media would have been very limited. In addition, Mitchell (1981) states that due to the short half-lives of the isotopes used in the exercise and the purity standards employed in the production of the sprayed solution, the intentional release associated with NUWAX-81 did not add detectable levels of any contaminant, including mercury, to the site.

2.5 Investigative Background

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 271. This checklist compels DOE/NV project personnel to evaluate their proposed project against a list of several potential environmental impacts which include, but are not limited to, air quality, chemical use, waste generation, noise level, and land use. Completion of the checklist results in a determination of the appropriate level of NEPA documentation by the DOE/NV NEPA Compliance Officer.

General site investigation activities are described in Section A.4.1 of the Leachfield Work Plan. Site investigation activities associated with CAU 271 have been identified and documented, in general, in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996a).

The following subsections describe the known previous characterization activities that have taken place at the CAU 271 CASs.

2.5.1 1986 REECo Report

A *Hazardous Waste Installation Assessment Report* was completed by REECo in 1986 (REECo, 1986a). This report identified the CAS 26-05-01 radioactive leachfield (Tory Reactor 401 Leachfield) as a release site known to contain radioactive material, but noted that the total quantity of radioactive material released was undocumented. Existing documentation states that liquid waste generated by decontamination operations at the Tory Reactor was released to CAS 26-05-01. The type and quantity of chemical waste that may have been released to CAS 26-05-01, if any, are unknown (REECo, 1986a).

Data for the characterization effort were reported under separate cover in *Nevada Test Site Underground Contaminants* (REECo, 1986b). Laboratory results for soil samples collected at unspecified locations in the CAS 26-05-01 leachfield identified elevated radionuclide levels at two locations. Gamma spectroscopy identified Cs-137 as high as 222 pCi/g, and U-235 as high as 18.1 pCi/g in soil collected from these two locations.

Apparently, up to two soil samples were collected at the CAS 26-05-01 leachfield and analyzed for pesticides, herbicides, metals, and VOCs. Although unclear, it appears most of the analyses were performed on Toxicity Characteristic Leaching Procedure (TCLP) extracts. The resulting data were not reported; however, it can be assumed that results were all below detection limits. This is because all detections for all sites investigated were tabulated in the report, and no results for the CAS 26-05-01 leachfield were listed (REECo, 1986a).

2.5.2 1988 DOE Preliminary Report

The DOE Office of Environment, Safety, and Health’s Office of Environmental Audit reviewed available historical information to identify environmental problems and areas of environmental risk associated with the NTS. A preliminary report of findings was issued in April 1988 (DOE, 1988b).

This preliminary report identified the CAS 26-05-01 radioactive leachfield as 1 of 21 leachfields at the NTS that received or could have received liquid wastes other than sanitary wastes. The remaining septic systems addressed by CAU 271 were not identified in the preliminary report. Soil sampling results for CAS 26-05-01 are provided in the preliminary report. The results appear to be the same data reported in the 1986 REECo reports (REECo, 1986a and 1986b).

The CAS 26-05-01 radioactive leachfield is identified as "LFP-1 at the Tory Reactor" in the 1988 DOE preliminary report. Disposal of liquid wastes containing radioactive contaminants, generated from decontamination operations of the Tory reactor is reported, and the potential for discharge of chemical solvents and degreasers is noted. Document review and interviews conducted during the preliminary assessment of CAU 271 did not identify the use of listed chemicals. Review of the sampling results did not indicate the presence of nonradioactive contaminants (as discussed in Section 2.5.1). Radioactive contamination was identified, with Cs-137 results reaching 222 ± 19 pCi/g in a 0 to 6-in. interval surface soil sample, 4.9 ± 0.4 pCi/g in a 0- to 3-in. sample from a surface cleanup, and Cs-137 results from all other samples measuring less than 1 pCi/g. Uranium-235 was detected at 18.1 ± 1.6 pCi/g, and a rhodium-106 detection of 0.499 ± 0.126 pCi/g was reported in a soil sample. Apparent background levels of several other naturally occurring radionuclides were also reported. The 1988 DOE preliminary report indicated that some hot spots may exist, but the general level of contamination was negligible.

2.5.3 1995 REECo Report

The primary source of existing data on COPCs for CAU 271 is the *Preliminary Characterization of Abandoned Septic Tank Systems* (REECo, 1995). This document describes preliminary characterization activities conducted by REECo in 1994 and 1995. The purpose of the work was to investigate and identify waste streams at sites reported by a Tiger Team (DOE environmental audit/assessment team). The abandoned septic systems were to be closed at a later date (DOE, 1990). The activity was not intended to be a full-site characterization or remediation effort. There were a total of 19 sites located and characterized through biased samples collected from septic tanks, leachfield soils, and background soils.

Nine of the 19 sites investigated are septic systems currently included as CASs in CAU 271. Samples were analyzed for VOCs, SVOCs, RCRA metals, beryllium, TPH (gasoline-, diesel-, and oil-range organics), oil and grease, PCBs, isotopic plutonium, gamma-emitting radionuclides, and tritium. Aliquots of soil and septic tank sludge/solid samples also were subjected to the TCLP, and resulting leachates were analyzed for VOCs, SVOCs, and RCRA metals. The COPCs observed at each of the CASs are summarized in Table 2-1.

Table 2-1
Contaminants of Potential Concern Identified in REECo (1995)

CAS	Contaminant of Potential Concern (COPC)									
	VOC	SVOC	RCRA Metals	Beryllium	TPH	Oil and Grease	PCB	Plutonium 238/239	Cesium 137	Tritium
25-04-01	•	•[a]	•			•			•[b]	
25-04-03		•	•		•[c]	•[d]	•			
25-04-04	•	•[a]	•		•[c]	•[d]	•			
25-04-08			•			•				
25-04-09			•			•	•[e]		•	
25-04-10		•[a]	•			•		•[b]		
25-04-11		•[a]	•			•[d]	•	•		•
26-04-01	•	•	•		•	•			•	
26-04-02			•	•[f]		•	•			

[a] Exceeded NDEP guidance levels (greater than one-tenth the TCLP regulatory limit or greater than ten times the Nevada Drinking Water Standard).
[b] Exceeded DOE Offsite Radiation Exposure Review Project background concentrations and/or U.S. Environmental Protection Agency drinking water regulations.
[c] Exceeded *Nevada Administrative Code* 459.9973 action level of 100 milligrams per kilogram (mg/kg) (NAC, 2000f).
[d] Exceeded guideline of 100 milligrams per liter for disposal in Area 23 Sewage Lagoon.
[e] No guidance or regulatory levels were exceeded; however, due to the presence of PCBs, a nondomestic waste, it was recommended that closure authority be under NDEP guidelines.
[f] Exceeded proposed 40 *Code of Federal Regulations* Parts 264, 265, 270, and 271; Corrective Action for Solid Waste Management Units at Hazardous Waste Facilities; Subpart S action level of 0.2 mg/kg for beryllium in soil (proposed Subpart S regulations).

Also included in Table 2-1 is a comparison to regulatory and guidance levels performed by REECo (1995). Where sampling indicated that no contaminants exceeded Federal Action Levels or NDEP guidance levels, closure was recommended under NSHD guidelines as a domestic sewage system. This applied to CASs 25-04-08 and 26-04-01. If sampling indicated the presence of certain contaminants in any quantity (e.g., PCBs), or analytical results indicated that the septic system had contaminants above action levels, REECo recommended that the septic system be closed under NDEP guidelines. This applied to CASs 25-04-01, 25-04-03, 25-04-04, 25-04-09, 25-04-10, 25-04-11, and 26-04-02.

2.5.4 2000 ITLV Radiological Survey Report

In May 2000, ITLV Preliminary Assessment personnel performed driveover or walkover radiological surface surveys at 14 of 15 CASs in CAU 271. In addition, ITLV conducted downhole exposure rate monitoring in vent tubes of septic tanks and distribution structures, where accessible, and removable contamination swipes were collected at selected locations. Corrective Action Site 27-05-02 was the only CAS not included in the ITLV effort. Results of the surveys and monitoring will be used to identify potential hot spots, radiological health hazards, and to provide safety information for protection of workers and the environment.

The ground surface and areas adjacent to the sites were surveyed for beta/gamma-emitters with a vehicle-mounted Large Area Plastic Scintillation Detector. Field conditions required walkover surveys on portions of the investigation areas. Walkover surveys consisted of total surface contamination measurement using an alpha/beta detector and dose rate measurement using a micro-rem meter. Downhole exposure rates were measured with an energy-compensated Geiger-Muller detector. Swipes were analyzed in the field for total gross alpha and total gross beta radioactivity.

Driveover and walkover surveys of nine CASs demonstrated that the radiation level did not exceed the established mean background level by greater than three standard deviations. At three CASs (25-04-04, 25-04-09, and 25-04-11), isolated locations were measured with surface radiation levels in excess of three standard deviations above the mean background; however, these levels may not represent surface contamination and may be due in part to variation in the natural radioactivity of soil (IT, 2000b). Radiological measurements were above the established range for area background in two general areas at CAS 26-05-03. These measurements appeared to coincide with pipes along the north fenceline and a pallet containing miscellaneous nuts, bolts, and metal parts located in the southeast corner of the leachfield. It should be noted that no surface contamination was measured at the CAS 26-05-01 radioactive leachfield.

Swipe samples were collected and analyzed from the CAS 26-03-01 plastic liner and the scrap material in the CAS 26-05-03 leachfield discussed above. The results indicated that no removable radiological contamination was present above the levels requiring radiological posting for alpha or beta contamination.

Downhole exposure rate monitoring was performed in the distribution structures at CASs 25-04-04, 26-04-01, 26-05-03, and 26-05-04, and the septic tank at CAS 25-04-04. Exposure-rate measurements were logged at 4-in. intervals to provide vertical profiles of gamma activity in the components. No significant gamma radiation was detected in any of the components (IT, 2000b). Maximum rates were less than three standard deviations from the mean background downhole exposure rate.

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 271 are equivalent to those developed in the Leachfield Work Plan.

3.1 Conceptual Site Model

The conceptual model for CAU 271 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, Table A.2-1. The scope and strategy of this investigation may be revised if the conceptual model provided in this CAIP and applicable portions of the conceptual model provided in the Leachfield Work Plan fail. The CAU 271 conceptual model may fail if substantially different historical operational information is discovered, or field observations demonstrate the nature or extent of contamination associated with the CAU is substantially different than anticipated. If necessary, the investigation will be rescoped.

Because the CAS 26-03-01 contaminated water reservoir is not covered by the Leachfield Work Plan, conceptual model elements for this CAS are specifically listed in Appendix A, Table A.2-1. The driving force for water-borne transport of COPCs from this CAS would be the pressure exerted by the water column in the reservoir. This driving force would be limited by the relatively short duration the reservoir presumably held water. The plastic liner (Section 2.2.2.4) would further limit or entirely prevent movement of water containing COPCs into the soil below the reservoir, depending on the integrity of the liner. For these reasons, the lateral and vertical extent of potential contamination would be restricted to the soil or sediment on top of the liner and the subsurface soil immediately beneath the liner.

3.2 Contaminants of Potential Concern

Types of contaminants that might be present were identified through a review of site history documentation, process knowledge, personal interviews, past investigation efforts, and inferred activities associated with the CAU. Effluent discharged to the septic systems was most likely relatively uncontaminated sanitary effluent; however, based on activities associated with the facilities, hazardous or radioactive effluents cannot be ruled out. Effluent discharged to the CAS 26-05-01 radioactive leachfield probably consisted of relatively large volumes of water contaminated with low concentrations of radioactive and possibly hazardous material. The CAS 26-03-01 reservoir was intentionally contaminated with short-lived radionuclides.

Laboratory analysis of soil, liquid, and possibly sludge samples will provide the means for a quantitative measurement of the COPCs. Based on process knowledge and the results of previous sampling efforts when available (Section 2.5), an analytical program was established to determine the nature of potential contamination for each CAS addressed by CAU 271. This analytical program is presented in Table 3-1; additional information on the analytical program is presented in Appendix A, Section A.3.0. The selection of samples for laboratory analysis is discussed in Appendix A, Section A.6.0.

Analytical methods and minimum reporting limits (MRLs) for each analyte are provided in Table 3-1 of the Leachfield Work Plan, with the exception of MRLs for radionuclides and beryllium. Beryllium is addressed below. The MRLs for radionuclides are listed in Table 3-2. Analysis for tritium will be performed using U.S. Environmental Protection Agency (EPA) Method 906.0 (EPA, 1980), or an equivalent method. Minimum detectable activities (MDAs), preliminary action levels (PALs), and MRLs for radionuclides are provided in Table 3-2. The MDA is the smallest amount of activity of a particular analyte that can be detected in a sample with an acceptable level of error. The MDAs listed in Table 3-2 are typical default levels available from a commercial radioanalytical laboratory. Preliminary action levels are discussed further in Section 3.3; PALs were calculated using data from the NTS and surrounding region (Adams, 2000a and 2000b). The MRL is a practical reporting limit that ensures data generated by the laboratory will be usable by the investigation. Minimum reporting levels were developed considering both the MDA and PAL (Adams and Dionne, 2000).

Not all the radionuclides listed in Table 3-2 have been identified as COPCs for CAU 271. However, since general categories of COPCs such as "activation and fission products" have been included at some sites (Appendix A), it was appropriate for Table 3-2 to contain an inclusive group of radionuclides.

Table 3-1
Analytical Program for CAU 271

Sample Type	Sample Medium	Fecal Coliform Bacteria	Total VOCs	Total SVOCs	Total RCRA Metals	Total Be	TPH	PCBs	TCLP VOCs	TCLP SVOCs	TCLP RCRA Metals	Gamma-Emitting Rad	Isotopic Pu	Isotopic U	Sr-90	Tritium
Septic Tank Contents	sludge or other solid material	•	•	•	•	•[a]	•	•[b]	•	•	•	•	•	•	•	•[c]
	liquid	•	•	•	•	•[a]	•	•[b]				•	•	•	•	•
Leachfield	soil	•[d]	•	•	•	•[a]	•	•[b]			•[e]	•[f]	•[g]	•[h]	•[i]	
26-03-01 Reservoir[j,k]	soil		•[l]	•	•		•					•[m]				

[a]Total beryllium will be an analyte at CASs 26-04-01, 26-04-02, 26-05-01 (no septic tank present), 26-05-03, 26-05-04, and 26-05-05.
[b]PCBs will be analytes at CASs 25-04-04, 25-04-09, 25-04-11, 26-04-02, 26-05-01, 26-05-03, 26-05-04, 26-05-05, and 27-05-02.
[c]Tritium will be an analyte only if material is saturated with water.
[d]If fecal coliform bacteria are detected in septic tank contents, limited additional testing may be necessary.
[e]At CASs 26-05-01 and 26-05-03 (sites with radiologically posted leachfields), locations selected at discretion of Site Supervisor.
[f]At least 25 percent (or 100 percent for CASs 25-04-01, 26-04-02, 26-05-01, and 26-05-03) will be analyzed for gamma-emitting radionuclides.
[g]At least 25 percent (or 100 percent for CASs 25-04-10, 26-05-01, and 26-05-03) will be analyzed for isotopic plutonium.
[h]At least 25 percent (or 100 percent for CASs 26-04-02, 26-05-01, and 26-05-03) will be analyzed for isotopic uranium.
[i]At least 25 percent (or 100 percent for CASs 26-04-02, 26-05-01, and 26-05-03) will be analyzed for strontium-90.
[j]Samples will also be analyzed for total pesticides and total herbicides.
[k]At least 25 percent of samples will undergo analysis for full suite.
[l]Subsurface soil samples only.
[m]100 percent by on-site gamma spectrometry.

Be - Beryllium
PCB - Polychlorinated biphenyl
Pu - Plutonium
Rad - Radionuclide
RCRA - *Resource Conservation and Recovery Act*
Sr - Strontium
SVOC - Semivolatile organic compound
TCLP - Toxicity Characteristic Leaching Procedure
TPH - Total petroleum hydrocarbon (diesel- and gasoline-range organics)
U - Uranium
VOC - Volatile organic compound

Table 3-2
Minimum Detectable Activities, Preliminary Action Levels, and Minimum Reporting Limits for Radionuclides in Samples Collected at CAU 271

Isotope	Soil and Sludge			Liquid		
	MDA[a] (pCi/g)[d]	**PAL**[b] (pCi/g)[d]	**MRL**[c] (pCi/g)[d]	**MDA**[a] (pCi/L)[e]	**PAL**[b] (pCi/L)[e]	**MRL**[c] (pCi/L)[e]
Tritium (Hydrogen-3 vapor)	0.0032[f]	0.01939[f]	0.016			
Tritium (Hydrogen-3 liquid)	1.0	0.0035	1.0	400	300	400
Cobalt-60	0.66[g]	0.1	0.66	15	15	15
Strontium-90	0.41[g]	1.17	0.41	1	0.22	1
Niobium-94	0.63[g]	0.63	0.63	15	15	15
Cadmium-109	4.0	4.0	4.0	400	400	400
Antimony-125	0.5	0.5	0.5	40	40	40
Cesium-137	0.43[g]	7	2.14	10	10	10
Europium-152	1.3	1.3	1.3	90	90	90
Europium-154	2.17[g]	2.17	2.17	70	70	70
Europium-155	1.1	1.35	1.1	30	30	30
Radium-226	0.18[g]	3.21	0.91	1	0.69	1
Uranium-234	0.08[g]	1.56	0.38	0.07[g]	8.92	0.37
Uranium-235	0.27[g]	0.07	0.27	0.06[g]	0.36	0.32
Uranium-238	0.06[g]	3.2	0.29	0.07[g]	9.39	0.33
Plutonium-238	0.05	<0.002	0.05	0.1	0.0011	0.1
Plutonium-239/240	0.05[g]	0.24	0.05	0.1	0.0034	0.1
Americium-241	0.7[g]	0.048	0.70	50	50	50

[a] MDA is the minimum detectable activity. Values are MDAs for laboratory liquid blank samples or are default levels listed in Paragon Analytics, Inc. *Laboratory Quality Manual*, Revision 4, February 2000 (unless annotated otherwise) (Paragon, 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; US Ecology and Atlan-Tech, 1992; and DOE/NV, 1999). If an isotope has not been reported in soil samples taken from undisturbed background locations, the PAL is set equal to the MDA.
[c] MRL is the minimum reporting level. It is set equal to 5 times the MDA, or if 5 times the MDA is greater than the PAL, the MRL is set equal to the MDA.
[d] pCi/g is picocuries per gram.
[e] pCi/L is picocuries per liter.
[f] Tritium MDA and tritium PAL are based on soil gas measurements (US Ecology and Atlan-Tech, 1992).
[g] MDA for this nuclide is based on the 95 percent Upper Confidence Level for the MDAs reported for soil samples collected by ITLV in Area 25 during site investigations in 1999 and 2000.

Analysis for total beryllium will be performed by EPA SW-846 Method 6010B (EPA, 1996). The MRLs are 5 micrograms per liter in water and 0.5 milligrams per kilogram in soil (DOE/NV, 1996b). Precision and accuracy objectives for total beryllium analyses are identical to those listed for total RCRA metals in Table 3-1 of the Leachfield Work Plan.

Geotechnical and hydrological analysis will be performed according to the requirements of Section 3.2.1 of the Leachfield Work Plan. At least one geotechnical sample will be collected from soil underlying each leachfield and the CAS 26-03-01 reservoir.

If bioassessment samples are collected, they will be analyzed according to the requirements of the Leachfield Work Plan. Bioassessment samples may be collected if field screening detects VOC concentrations greater than field-screening levels (FSLs), and the spatial pattern of detection suggests a fuel or solvent plume may be present. Significant concentrations of VOCs indicate the potential for VOC contamination that may respond to bioremediation-based corrective actions.

Coliform bacteria analysis of septic tank content samples will be performed on site using the multiple tube fermentation technique specified in Method 9221 of *Standard Methods for the Examination of Water and Wastewater*, 20th Edition (APHA, 1998), and 40 *Code of Federal Regulations* (CFR) Part 141.21(f) (5) (CFR, 2000a). For each sample, an analysis will be conducted for total coliforms. If total coliforms are present in the culture, fecal coliforms analysis will be conducted.

3.3 Preliminary Action Levels

Screening levels for on-site field-screening methods and PALs for off-site analytical methods will be used to determine the presence of contamination. Specific screening levels and PALs, or methods used to determine these levels, are provided in Section 3.3 of the Leachfield Work Plan.

Investigation of CASs 26-05-01 and 26-05-03 posted leachfields will require *in situ* measurement of subsurface radioactivity levels using direct-push, cone penetrometer technology (CPT) (Section 4.2.1). Prior to conducting *in situ* radiation measurements, establishment of supplementary CAS-specific *in situ* subsurface radiological-screening levels will be required. These *in situ* radiological-screening levels are not addressed by the Leachfield Work Plan. A CAS-specific *in situ* radiological-screening level will be established at unimpacted locations adjacent to each of the posted leachfields by integrating *in situ* radiation measurements to obtain a maximum total background gamma value. *In situ* radiation measurements of potentially contaminated soil associated with the posted leachfields will be evaluated using these total background gamma values as screening levels. Specific locations identified as exceeding screening levels, if found, would guide the investigation strategy.

The PALs for radionuclides listed in Table 3-2 are isotope-specific and are defined as the maximum concentration of a given isotope found in environmental samples taken from undisturbed background locations. Environmental background samples may be taken in the vicinity of CAU 271. If collected, these samples will be analyzed and compared with the results for environmental samples taken from other undisturbed background locations in Area 25. In addition, the radionuclide concentrations in the CAU 271 and Area 25 background samples will be compared with the radionuclide concentrations found in environmental samples taken from undisturbed background locations in the vicinity of the NTS (McArthur and Miller, 1989; US Ecology and Atlan-Tech, 1992).

The PALs for chemical COPCs are given in Section 3.3 of the Leachfield Work Plan. An exception is that current EPA *Region IX Industrial Preliminary Remediation Goals* (PRGs) (EPA, 2000) will be applied to this site, rather than the 1998 PRGs listed in the Leachfield Work Plan. The application of industrial PRGs restricts future use of the sites to industrial use. An industrial use exposure scenario is appropriate because a series of public land orders has withdrawn the NTS from public use (DOE/NV, 1996a), and public access is restricted. Areas 25 and 26 are within a research test and experiment land-use zone, and Area 27 is a defense industrial zone (DOE/NV, 1998a).

3.4 DQO Process Discussion

Details of the DQO process are presented in Appendix A. The investigation strategy developed for each CAS was dependent on the nature of contamination (e.g., radiologically posted leachfields) and pertinent characteristics of the site (e.g., leachfield size and design). Due to potential subsurface migration of COPCs, an investigation consisting of subsurface sampling was identified for all 15 CASs. To support potential remedial actions and waste management decisions, plans for the inspection and sampling of collection systems were established.

The following four CAS-specific sampling strategies were developed as part of the DQO process:

- Complex radiologically posted systems
- Complex systems
- Simple systems
- NUWAX training area contaminated water reservoir

Each of these strategies is discussed in detail in Section 4.0 and Appendix A, Section A.5.0. Applicable COPCs, analytical methods, and reporting limits agreed upon during the DQO process are provided in Table 3-1 of the Leachfield Work Plan and Section 3.2 of this CAIP. Data quality will be verified and evaluated as stated in the Leachfield Work Plan and the Industrial Sites QAPP (DOE/NV, 1996b).

4.0 Field Investigation

The investigation activities to be performed at CAU 271 are based on general field investigation activities discussed in Section 4.0 of the Leachfield Work Plan, with the exception of the CAS 26-03-01 contaminated water reservoir. The water reservoir will be investigated using a site-specific approach.

4.1 Technical Approach

The technical approach for CAU 271 consists of the following activities:

- Collect samples of each distinct phase of septic tank contents (i.e., liquid, sludge, or residue).
- Record the dimensions of the septic tank and the composition (e.g., steel or concrete).
- Perform on-site fecal coliform bacteria analysis of septic tank content samples.
- Analyze septic tank samples for COPCs identified in Section 3.2. Submit samples for TCLP analysis, where appropriate (i.e., sludge samples).
- Collect samples of soil underlying both ends of septic tanks and the outfall end of distribution structures.
- Perform an *in situ* shallow subsurface radiation survey using CPT at soil sampling locations (CASs 26-05-01 and 26-05-03 only).
- Collect samples of soil underlying the leachfields.
- Collect samples of soil from above and below the liner at the CAS 26-03-01 contaminated water reservoir.
- Field screen samples for VOCs, radiological activity, and possibly TPH (see Section 4.2).
- Select soil samples for laboratory analysis; analyze selected samples for COPCs identified in Section 3.2.
- Inspect and sample collection systems, as required and where possible.
- Conduct *in situ* radiation measurements of collection system pipes at CASs 26-05-01 and 26-05-03, if necessary and where possible.

- Collect samples from native soils beneath the leachfields and the CAS 26-03-01 water reservoir and analyze for geotechnical/hydrologic parameters.

- Collect and analyze bioassessment samples at the discretion of the Site Supervisor, if VOCs exceed field-screening levels in a pattern that suggests a VOC plume may be present.

- Stake or flag sample locations and record coordinates (in Universal Transverse Mercator coordinate system).

This investigation strategy will allow the nature and extent of contamination associated with each CAS to be established. In general, soil underlying septic tanks, distribution structures, leachfields, and the contaminated water reservoir will be investigated until soil samples are obtained from two consecutive vertical intervals with contaminant concentrations below appropriate FSLs (described in Section 3.3 of the Leachfield Work Plan). Modifications to the investigation strategy provided in this document may be required in the unlikely event that a septic system or leachfield with an unexpected 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 significantly different from those described in this document. If contamination is more extensive than anticipated, the maximum investigation depth will be limited by the capabilities of the equipment used to collect subsurface soil samples. If this occurs, the investigation will be rescoped (Appendix A, Table A.6-1).

The 14 septic and leachfield system CASs will be investigated by implementation of an ordered approach. This approach does not consist of formal phases, but it is designed to ensure that activities are performed and data are collected in a logical progression such that required information is available to make critical decisions during the field investigation. The approach is outlined in Table 4-1.

More information on the field activities and the need for conducting them in sequence will be presented in the sections that follow. The ordered approach is not applicable to the CAS 26-03-01 contaminated water reservoir.

4.2 Field Activities

This section provides an overview of the activities to be performed during the CAU 271 field investigation. Field activities at the septic and leachfield systems will follow one of three basic strategies based on the complexity of the leachfield and the nature of potential contamination (Appendix A).

Table 4-1
Ordered Investigation Approach for CAU 271

Sequence	Major Activity	Comments
1	Sample and analyze contents of septic tank and, as appropriate, distribution structure.	Analytical results from contents are needed to make decisions regarding inspection and characterization of collection system (Appendix A, Section A.5.5).
2	Perform *in situ* shallow subsurface gamma radiation measurements (CASs 26-05-01 and 26-05-03 only).	Determine radiological levels and contamination depth profile prior to beginning of intrusive sampling; ensure investigative method is protective of worker health and safety.
3	Collection of soil samples from biased locations	Confirm the location and configuration of the leachfield in preparation for random sampling at specified CASs.
4	Collection of soil samples from random locations at CASs, where necessary.	At those CASs where random samples will be collected; significant differences between planned and actual configurations may require modification of random sampling scheme (Section 4.3).
5	Inspection and characterization of collection systems, as required.	Planned as the last field activity to maximize the time available for analysis and interpretation of septic tank content data, with the exception of limited pipe inspections during septic tank/distribution structure inspection and sampling (see Section 4.2.2.3 and Section 4.2.3.3).

The strategies are:

- Complex radiologically posted systems
- Complex systems
- Simple systems

In general, these investigative approaches follow the sampling strategies developed in the Leachfield Work Plan. The investigation of the CAS 26-03-01 contaminated water reservoir will follow a strategy designed specifically for that CAS.

All sampling activities will be conducted in compliance with the Industrial Sites QAPP (DOE/NV, 1996b). Quality requirements for field sampling and laboratory analysis are also contained in the Industrial Sites QAPP and the Leachfield Work Plan. Documents superseding the Industrial Sites QAPP will be implemented without a ROTC to this document.

For the septic system and leachfield CASs, this investigation focuses on both accidental and designed effluent releases. Collection system releases are typically caused by a loss of system integrity, but significant leaks associated with the discharge and outfall lines are unlikely. The leachfields were designed to route effluent through distribution manifolds and out of distribution lines for disposal in the underlying soil.

Samples will be collected from liquid and sludge contained within septic tanks and/or distribution structures as described in the Leachfield Work Plan. In general, relatively minor amounts of sediment accumulate in distribution structures, and sample collection may be impossible due to inadequate sample volume. Samples will not be recovered if confined space entry or destruction of the structures is required for sample collection. Also, material that is clearly not representative of system operation (e.g., gravel in a collapsed distribution structure) will not be sampled.

Samples will be collected from soil below the base of both septic tank ends, and the outfall end of distribution structures as described in the Leachfield Work Plan. These integrity samples will be representative of soil likely to have been impacted if leakage occurred.

The impact of designed effluent release will be determined by sampling the soil underlying the leachfields (see Figure 4-1 of Leachfield Work Plan for generic locations). Samples will be collected from soil underlying each leachfield at the locations discussed in Section 4.2.1.2, Section 4.2.2.2, and Section 4.2.3.2. The 1.0-ft interval 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). The second sampling interval will be 2.5 ft to 3.5 ft beneath the leachfield base. Additional samples may be collected from deeper intervals based on field-screening results or field observations. The actual depth of sampling intervals may require adjustment based on field conditions (e.g., geologic refusal of sampling device or *in situ* subsurface radiation survey results). The depth of the leachfield base will be estimated from engineering drawings when it cannot be identified in the field. Leachrock and tile piping will not be sampled unless the highest measured radiation levels are associated with these materials, and the radiation levels are elevated relative to FSLs. If these conditions occur, leachrock and/or tile samples will be collected and analyzed for radioisotopes by on-site gamma spectrometry. In general, only leachfield material (i.e., soil) suitable for analysis will be submitted to the off-site laboratory. The selection of specific samples for laboratory analysis is discussed in Appendix A, Section A.6.0.

Residual sediment contained in the collection system pipes may be investigated using either limited visual inspection and sampling at strategic locations or limited video surveys. In addition, at CASs 26-05-01 and 26-05-03, an *in situ* radiation-monitoring survey of collection system pipes may be performed. Previous investigations have indicated that abandoned septic and leachfield system piping is commonly used as shelter by rodents. The pipes are often obstructed by vegetation and feces introduced by the rodents, making pipe surveys impossible. Media contaminated with animal excrement will not be collected because it cannot be analyzed by the laboratory and is not representative of material associated with effluent discharge.

For the CAS 26-03-01 contaminated water reservoir, both surface and subsurface soil samples will be collected. Surface soil samples will consist of material collected above the plastic liner at each location. Subsurface soil sampling intervals below the plastic liner will be similar to those defined for leachfields. This approach is discussed further in Section 4.2.4.

Field-screening for VOCs and radiological activity will be performed at all sites to guide the investigation and sample selection, and to assist with health and safety and waste management decisions. Field screening will be conducted for VOCs using a headspace method and for elevated radiological activity using an alpha/beta scintillator. Field screening for TPH will be conducted only if the process does not include generation of potentially mixed investigation-derived waste (IDW). Field-screening requirements are discussed in Section 3.3 and Section 4.1.3 of the Leachfield Work Plan.

The number of samples collected and the number of samples submitted to the laboratory depends on field-screening results. While all of the samples will be field screened, a limited number of these samples will be submitted to the off-site laboratory. Samples to be analyzed will be selected based on the results of field screening and minimum sampling requirements. The number of samples analyzed will depend on decisions made in the field.

A sample of the soil underlying each leachfield and the CAS 26-03-01 water reservoir will be collected to assess its geotechnical and hydrologic characteristics. Bioassessment samples may be collected at the Site Supervisor's discretion if extensive VOCs are detected by field screening. These samples will be collected within brass sleeves (or other container, as appropriate) to minimize disturbance of the natural physical characteristics of the soil. Section 3.2.1 of the Leachfield Work Plan addresses these analyses.

Damage to roads, concrete pads, and utilities will be minimized. Damage to active or inactive (as opposed to abandoned) sewer lines will be avoided. Where the potential for discharge to a system exists, the system will be sufficiently isolated to prevent effluent from entering it during and subsequent to characterization. This will generally be accomplished by grouting collection system pipes at a minimum of one location. The pipes will be grouted at locations near buildings, where accessible. This may include cleanouts or excavated breaks in the pipes. Unless inspection indicates the need, grouting will not be performed at CASs where the system has been previously bypassed (e.g., 25-04-04, 25-04-09, and 25-04-11) or CASs where no buildings are present (e.g., 25-04-01, 25-04-03, 25-04-08, and 25-04-10). Leachfield distribution lines will not be grouted at any CAS.

Excavation and potential borehole locations will be based on interpretation of engineering drawings and surface features. Excavated soil will be stored in a manner which will prevent runon and runoff. Upon completion of the investigation activities, excavated soil will be returned to the excavation as close to its original location as practical. If soil cuttings are produced by drilling, cuttings will be returned to the boreholes, if practical, or will be disposed of as IDW according to Section 5.0. Additional information on excavation procedures is included in Section 4.1.2 of the Leachfield Work Plan.

Field activities for each investigation strategy are discussed in more detail in the following subsections.

4.2.1 Complex Radiologically Posted Systems

Two CASs (26-05-01 and 26-05-03) were categorized as complex radiologically posted systems (Appendix A, Section A.5.0). Corrective Action Site 26-05-01 is the Project Pluto radioactive effluent leachfield associated with Buildings 2201 and 2202, and CAS 26-05-03 is a septic system at

Building 2203, the Project Pluto Test Bunker (Figure 1-2). Since the leachfields of both CASs are radiologically controlled areas, *in situ* shallow subsurface radiation measurements will be made at leachfield sample locations and biased sample locations associated with system components (i.e., septic tank and/or distribution structure) as determined by the site supervisor. Excavation is the planned method of intrusive investigation for these two CASs. However, if the results of the *in situ* measurement program show that radiological contaminant levels warrant greater protection for workers or cause mixed waste concerns, drilling will be utilized rather than excavation to collect soil samples.

Relatively high radioactivity levels are possible for the posted leachfield systems, and sample collection is contingent upon the radioactivity of the material to be sampled. Material that cannot be practically handled, transported, or analyzed will not be submitted for off-site laboratory analysis. Results of contingency sampling and justification for proposed samples not recovered due to information identified during *in situ* radiation measurement or intrusive investigation will be provided in the Corrective Action Decision Document (CADD). Contingencies for high radioactivity include on-site gamma spectrometry, sampling from deeper intervals, collecting lower radioactivity-level samples, or collecting samples from stepout locations.

4.2.1.1 Septic Tank and Distribution Structure Investigations

The lids or manways of septic tanks and distribution structures will be opened and the components will be inspected to describe the nature and quantity of material present and to determine if the material should be sampled. Samples will be collected if the Site Supervisor determines that a sufficient volume of material is present, the material is accessible, and it is representative of the system operation. Material such as rodent droppings or nests, or gravel/soil that is clearly unrelated to the system operation, will not be sampled. A sample of each distinct phase (e.g., liquid, sludge) contained in the septic tank will be collected.

Two integrity samples for each septic tank and one integrity sample for each distribution structure will be collected in accordance with Section 4.0 of the Leachfield Work Plan. Septic tank integrity samples will be collected from soil below the base of the proximal and distal ends of the septic tanks. Distribution structure integrity samples will be collected from soil below the base of the structure, on the outlet side. These integrity samples will be representative of soil most likely to have been impacted if system leakage occurred.

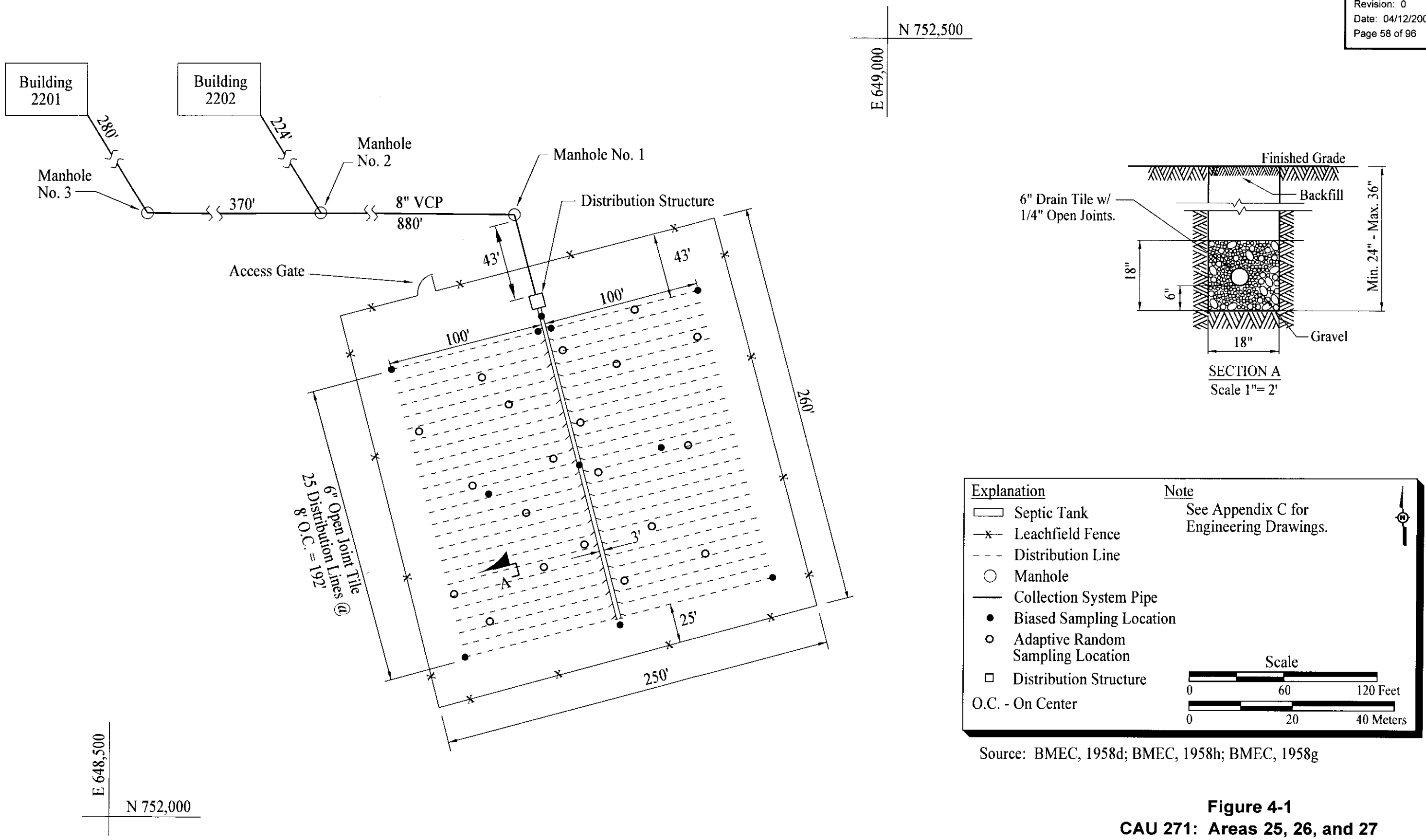
At CAS 26-05-01, only a concrete distribution structure is present. No septic tank is included since this CAS did not receive sanitary effluent. Corrective Action Site 26-05-03 includes a single-chamber concrete septic tank and a concrete distribution structure. More information on these components is presented in Section 2.2.2.3.1 and Section 2.2.2.2, respectively.

4.2.1.2 Leachfield Investigations

The CAS 26-05-01 leachfield is expected to have 25 distribution lines on each side as shown in Figure 4-1, and the CAS 26-05-03 leachfield is expected to have 6 distribution lines on each side as shown in Figure 4-2. These leachfields will be investigated by excavation as described in Section 4.1.2 of the Leachfield Work Plan. Drilling may be substituted for excavation if necessitated by elevated radiation levels. Prior to sample collection, shallow subsurface radioactivity levels will be measured by an *in situ* survey at selected sample locations. Vertical profiles of gamma radioactivity will be measured *in situ* using CPT. Enough data will be collected to support and document decisions regarding the soil sampling method and sample shipping requirements. At a minimum, the *in situ* survey will be performed at sample locations where worse-case contamination is expected (e.g., the initial discharge points of the two proximal distribution lines).

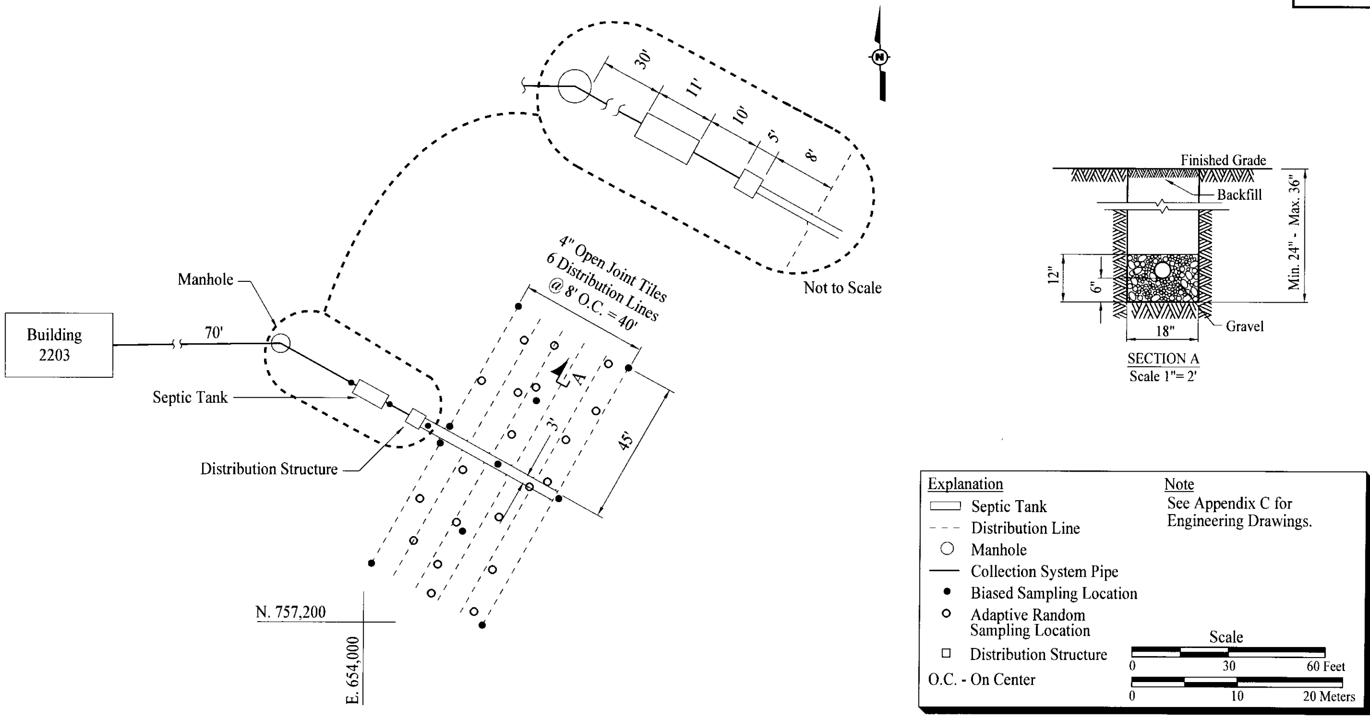
Sampling points will be located based on system dynamics and statistical analysis. Biased soil samples will be collected at the initial discharge points in the two proximal distribution lines, the area between the distribution manifold ends, and the four corners and center of each leachfield. Samples will also be collected at the center of each half of the leachfields. Biased soil samples will be collected either to constrain the lateral and vertical extent of potential contamination (e.g., corners of the leachfield) or to investigate areas with the highest potential for contamination (i.e., initial discharge points). A total of 10 biased sample locations are planned for each leachfield. Additional biased soil samples may be collected from other leachfield-specific locations, as necessary.

Adaptive random soil samples will also be collected at 20 locations within the leachfields to compensate for variability between the actual leachfield configuration and the configuration provided by “as built” and other engineering drawings. The number and location of these soil samples were



Source: BMEC, 1958d; BMEC, 1958h; BMEC, 1958g

Figure 4-1
CAU 271: Areas 25, 26, and 27
Septic Systems
CAS 26-05-01 Proposed Sampling Locations



Source: BMEC, 1960c; BMEC, 1960d; Norman Engineering Co., 1961

Figure 4-2
CAU 271: Areas 25, 26, and 27
Septic Systems
CAS 26-05-03 Proposed Sampling Locations

H:\CAU_271\CAIP\271leach8_b.dgn 10-APR-2001 determined by an analysis of the COPCs and use of the program "Visual Sample Plan" (Davidson and Wilson, 1999). The process used for selecting the number of adaptive random sample locations is described in Appendix A, Section A.7.0. The locations selected for adaptive random soil sampling are based on an adaptive fill scheme designed to consider the locations of biased soil samples and maximize coverage of the remaining leachfield area.

At both CASs, soil samples will be collected from a total of 30 locations (10 biased plus 20 random locations). The combination of biased and random soil boring locations will ensure adequate coverage of the potentially contaminated area associated with the leachfield. The total number of sampling locations may change depending on the leachfield configuration determined during the investigation.

Sample interval depths will be relative to the depth of the leachfield base as discussed in Section 4.2 of this CAIP and Section 4.1.2 of the Leachfield Work Plan. However, the exact sampling intervals may be modified based on the subsurface vertical gamma radiation profiles measured by the *in situ* CPT survey. If the highest gamma radiation levels that exceed *in situ* screening levels occur within an interval above the leachrock/native soil interface (i.e., within the leachrock), that interval will be sampled and analyzed for gamma emitters by on-site spectrometry. For random sample locations where leachrock or other leachfield material is not intercepted, the first sample will be collected at either the average depth of the leachfield base, as determined by previous sampling, or the average depth of maximum gamma radioactivity levels, as determined by the *in situ* survey. At all leachfield sample locations, sampling will continue until two samples not exceeding FSLs are recovered, contingent upon conditions discussed in Section 4.3.

Contingencies have been developed to reposition the adaptive random sample locations if the actual leachfield dimensions do not match those presented in this CAIP. Contingencies will also be in place to ensure that the lateral and vertical extent of contamination has been defined (see Section 4.3).

4.2.1.3 Collection System Pipe Inspections

Portions of CAS 26-05-01 and CAS 26-05-03 collection systems may be inspected using a video survey and *in situ* radiation measurements as described in Section 4.1.1.4 of the Leachfield Work Plan. The *in situ* radiation measurements are designed to determine if the pipes meet free-release criteria, as defined in the *NV/YMP Radiological Control Manual* (DOE/NV, 2000a). Modifications consistent with the intent of the Leachfield Work Plan may be required based on the survey method selected. Situations may arise (e.g., pipe breaks or obstructions) that warrant the use of alternate methods to determine if collection system pipes meet the free-release criteria. Under these conditions, at the discretion of the Site Supervisor, one or more of the following methods will be used to inspect the collection system:

- Conduct direct sampling of the collection system pipe contents to determine radiation levels associated with the collection system pipes.
    - Samples may be collected from access points (e.g., cleanouts and manholes) if appropriate, accessible, and adequate material is present.
    - Alternatively, samples may be obtained from excavated breaks in the collection system pipes.
- Obtain swipes from access points and/or from excavated breaks in the collection system pipes.
- Measure radiation levels using hand-held instruments at access points and/or excavated breaks in the collection system pipes.

As discussed in Section 4.2 and Section 4.2.1.1, material will not be sampled if it is not representative of the system operation. Where required to isolate the system from subsequent contamination, breaks in collection system pipes made during the investigation will be grouted prior to backfilling excavations.

The CAS-specific information regarding inspection of collection system lines is as follows:

- CAS 26-05-01: Four manholes are located along the collection system line from Buildings 2201 and 2202 to the leachfield, and a floor drain is present at Building 2202 (Section 2.2.2.3.1). These locations, along with the distribution structure, are potential access points for a video inspection and *in situ* radiation measurements of the collection system. If not accessible via the manholes or floor drain, the line would be accessed by excavation at the midpoint of each segment.
- CAS 26-05-03: A manhole or cleanout is located on the line, adjacent to Building 2203, and other potential access points for a video inspection and *in situ* radiation measurements are the septic tank and distribution structure (Section 2.2.2.2). If the collection system line is not accessible via these points, the line would be accessed by excavation at the midpoint of each segment.

4.2.2 Complex Systems

Seven CASs were categorized as complex systems because the leachfield component of each is relatively large (Appendix A, Section A.5.0). Four of the CASs (25-04-03, 25-04-04, 25-04-10, and 25-04-11) are associated with the Area 25 RCP, and one (CAS 25-04-09) is located at ETS-1 (Figure 1-1). The other two are associated with Project Pluto facilities in Area 26: CAS 26-05-04 at Building 2201; and CAS 26-05-05 at Buildings 2101, 2102, and 2107 (Figure 1-2). All of the complex systems were designed to receive sanitary effluent; none are radiologically posted.

Excavation is the planned method of intrusive investigation for these CASs, as described in the Leachfield Work Plan. In addition to the biased soil samples specified in the Leachfield Work Plan, random soil samples will be collected from each leachfield to ensure that an adequate number of sampling locations have been considered during the field investigation.

4.2.2.1 Septic Tank and Distribution Structure Investigations

The septic tanks and distribution structures for all CASs categorized as complex systems will be investigated according to the strategy described in Section 4.2.1.1. Additional CAS-specific information is as follows:

- CAS 25-04-09: A small concrete box with a steel access lid was apparently used to tie several trailer sewage hookups into the ETS-1 sanitary system (Section 2.2.1.3). Although the box is not a structure for distributing effluent to the leachfield, it will be investigated according to the strategy presented in Section 4.2.1.1.

- CASs 25-04-10 and 25-04-11: The distribution structures at these CASs contain gravel and/or soil; therefore, the contents will not be sampled. However, the size and construction (e.g., concrete or steel) of the distribution structures will be documented during integrity sampling.

- CAS 26-05-05: As discussed in Section 2.2.2.1.3, although engineering drawings show only a single septic tank and distribution structure, two separate tanks and distribution structures appear to be present at this CAS. The field investigation will determine the configuration of the system, and all components will be investigated according to the strategy presented in Section 4.2.1.1.

4.2.2.2 Leachfield Investigations

Complex leachfields will be investigated by excavation using strategies modified from Section 4.1.2 of the Leachfield Work Plan. The complex leachfields are expected to be branching, two distribution manifold systems similar to the center system shown on Figure 3-1 of the Leachfield Work Plan.

A total of 10 biased sample locations are planned for each leachfield. The locations are the same as those listed in Section 4.2.1.2 for complex radiologically posted systems. Additional biased excavations may be conducted at other leachfield-specific locations, as necessary. Adaptive random locations will also be excavated at 20 locations within each leachfield. Additional information on the need for random sampling and the process of selecting random locations is provided in Section 4.2.1.2.

At all CASs categorized as complex systems, soil samples will be collected from a total of 30 leachfield locations (10 biased plus 20 random locations). The combination of biased and random soil boring locations will ensure adequate coverage of the potentially contaminated area associated with the leachfield. The total number of sampling locations may change depending on the leachfield configuration determined during the investigation.

Sample interval depths will be relative to the depth of the leachfield base as discussed in Section 4.2 of this CAIP and Section 4.1.2 of the Leachfield Work Plan. For random sample locations where leachrock or other leachfield material is not intercepted, the first sample will be collected at the average depth of the leachfield base, as determined by previous sampling in the leachfield. At all leachfield sample locations, sampling will continue until two samples not exceeding FSLs are recovered, contingent upon conditions discussed in Section 4.3.

Because excavation allows direct inspection of the distribution system, actual sample locations may vary from proposed random locations when an adjacent distribution line is exposed within the excavation. This variation will generally be limited to less than 4 ft perpendicular to the distribution lines because the spacing between the lines is typically 8 ft. Contingencies have been developed to reposition the adaptive random sample locations if the actual leachfield dimensions do not match those presented in this CAIP. Contingencies will also be in place to ensure that the lateral and vertical extent of contamination has been defined (Section 4.3).

The leachfields of all CASs categorized as complex systems (shown in Figures 4-3 through 4-9) will be investigated according to the strategy described above. Additional CAS-specific information is as follows:

- CASs 25-04-03, 25-04-10, and 25-04-11: As discussed in Sections 2.2.1.4.1, 2.2.1.4.3, and 2.2.1.4.4, engineering drawings showing the subsurface configuration of these leachfields were not available. However, because the location of the septic tank is known at each CAS, the leachfields will be located based on the location of the septic tank and exploratory excavation.

- CAS 25-04-04: As discussed in Section 2.2.1.4.2, sometime prior to 1983 the septic system was abandoned, and sanitary effluent from the RCP was rerouted to an oxidation pond. The sewage line which bypasses the septic system physically overlies the CAS 25-04-04 leachfield. Because the RCP sewage line is active, care will be taken during the investigation to protect the integrity of the line. If this action prevents collection of specific leachfield soil samples, alternate sampling locations will be selected by the Site Supervisor. The alternate locations, including justification for selection, will be documented in the field, and the impact on characterization will be presented in the CADD.

- CAS 26-05-05: As discussed in Section 2.2.2.1.3, a preliminary assessment and subsequent site visits by ITLV personnel indicate that the leachfield may be larger than shown on existing engineering drawings. Figure 4-9 shows the approximate fenced boundary assumed to enclose the leachfield, based on a site visit. The field investigation will determine the actual configuration of the system, and soil samples will be collected from the appropriate locations. As discussed in Section 4.3, contingencies for locating random samples have been developed to address uncertainty in leachfield size.

4.2.2.3 Collection System Pipe Inspections

The contents of the complex leachfield collection systems will be inspected via manholes and cleanouts. If these features cannot be located or are not sufficient, the collection systems will be excavated at strategic locations (e.g., the midpoints) and inspected. If present, appropriate, and accessible, material in the pipes will be collected at the inspection locations and submitted for laboratory analyses. As discussed in Section 4.2.1.1, material will not be sampled if it is not representative of the system operation. Also, as discussed in Section 2.2, portions of sewer lines are associated with Area 25 facilities that are active or in standby status, as opposed to abandoned. Only lines documented to be abandoned will be included in this investigation.

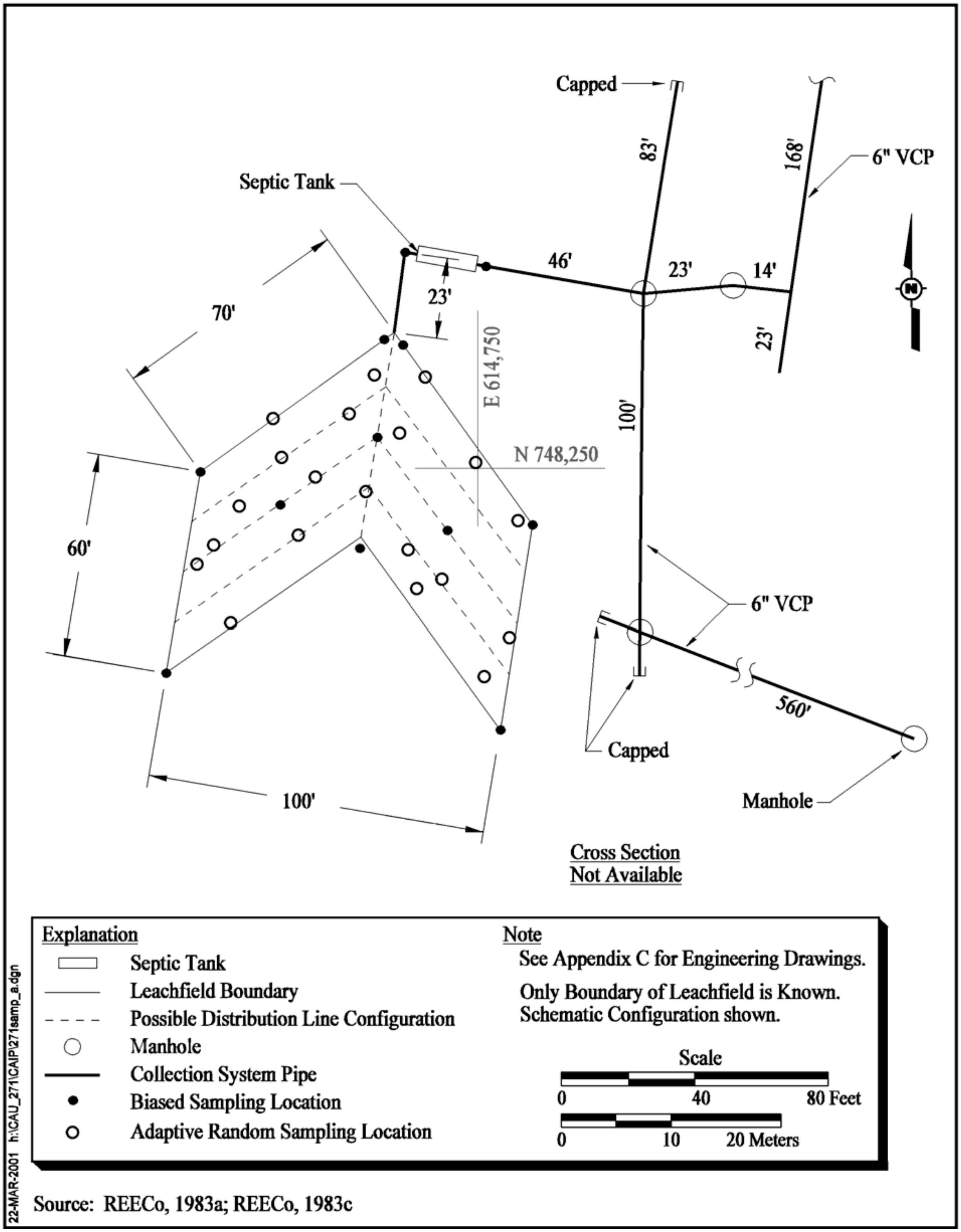
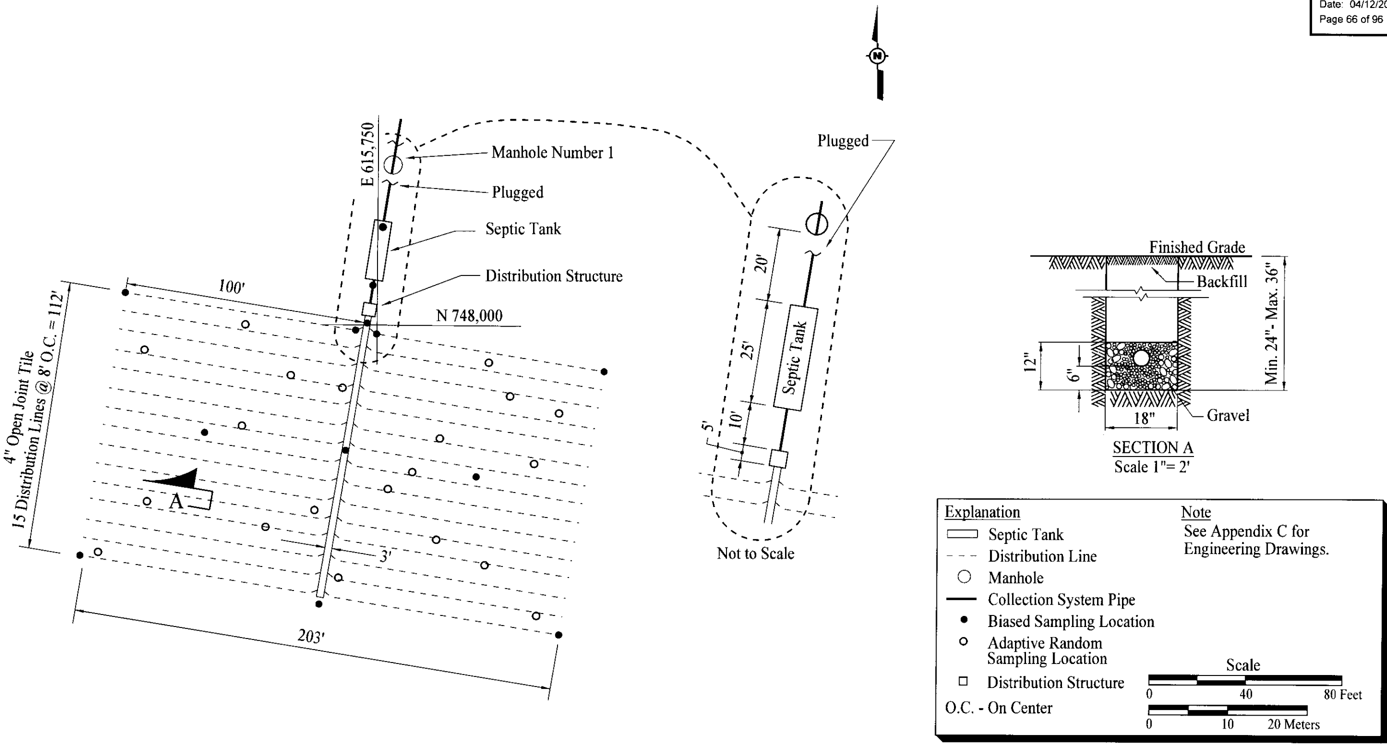


Figure 4-3
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 25-04-03 Proposed Sampling Locations



Source: BMEC, 1958a; BMEC, 1958c

Figure 4-4
CAU 271: Areas 25, 26, and 27
Septic Systems
CAS 25-04-04 Proposed Sampling Locations

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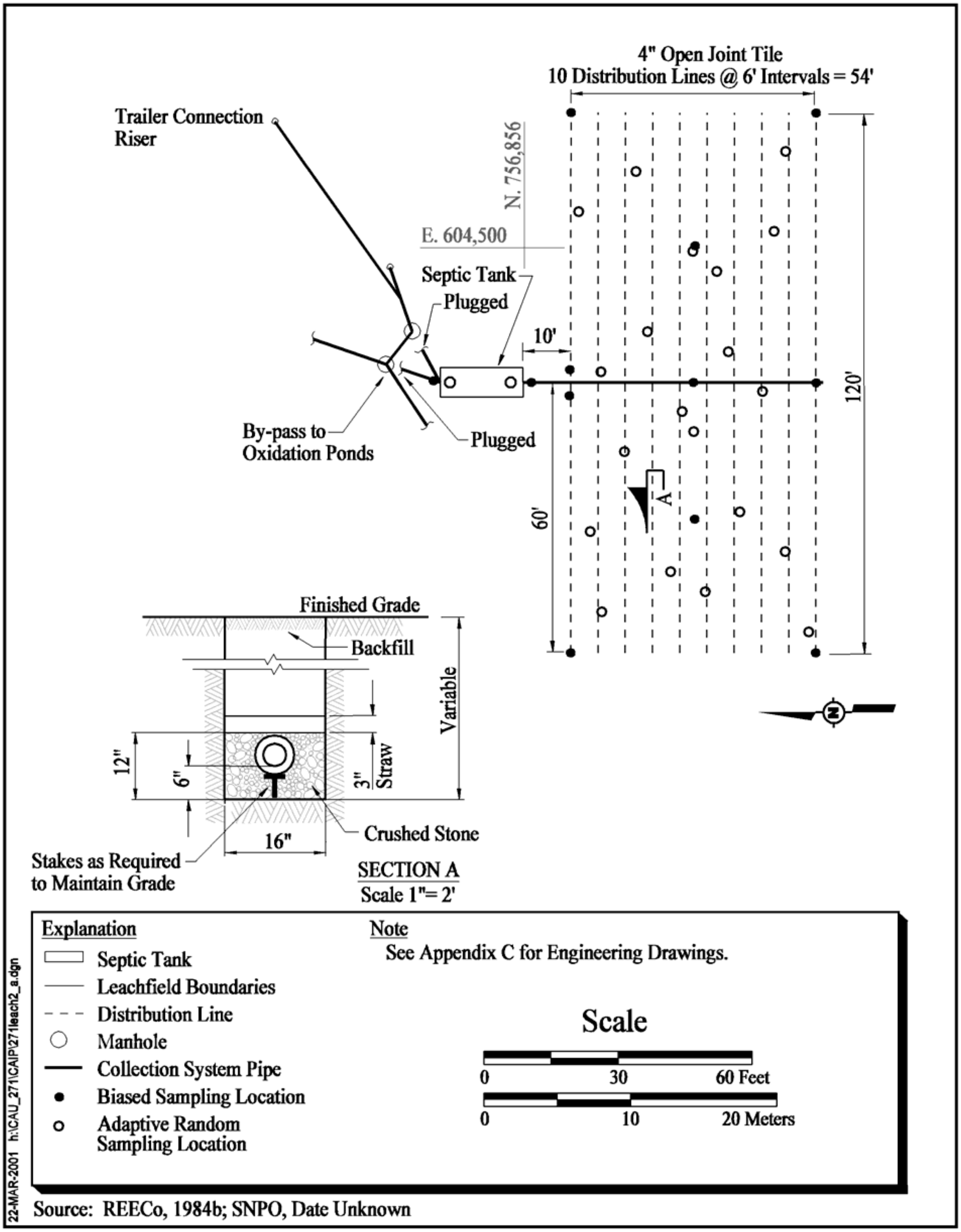
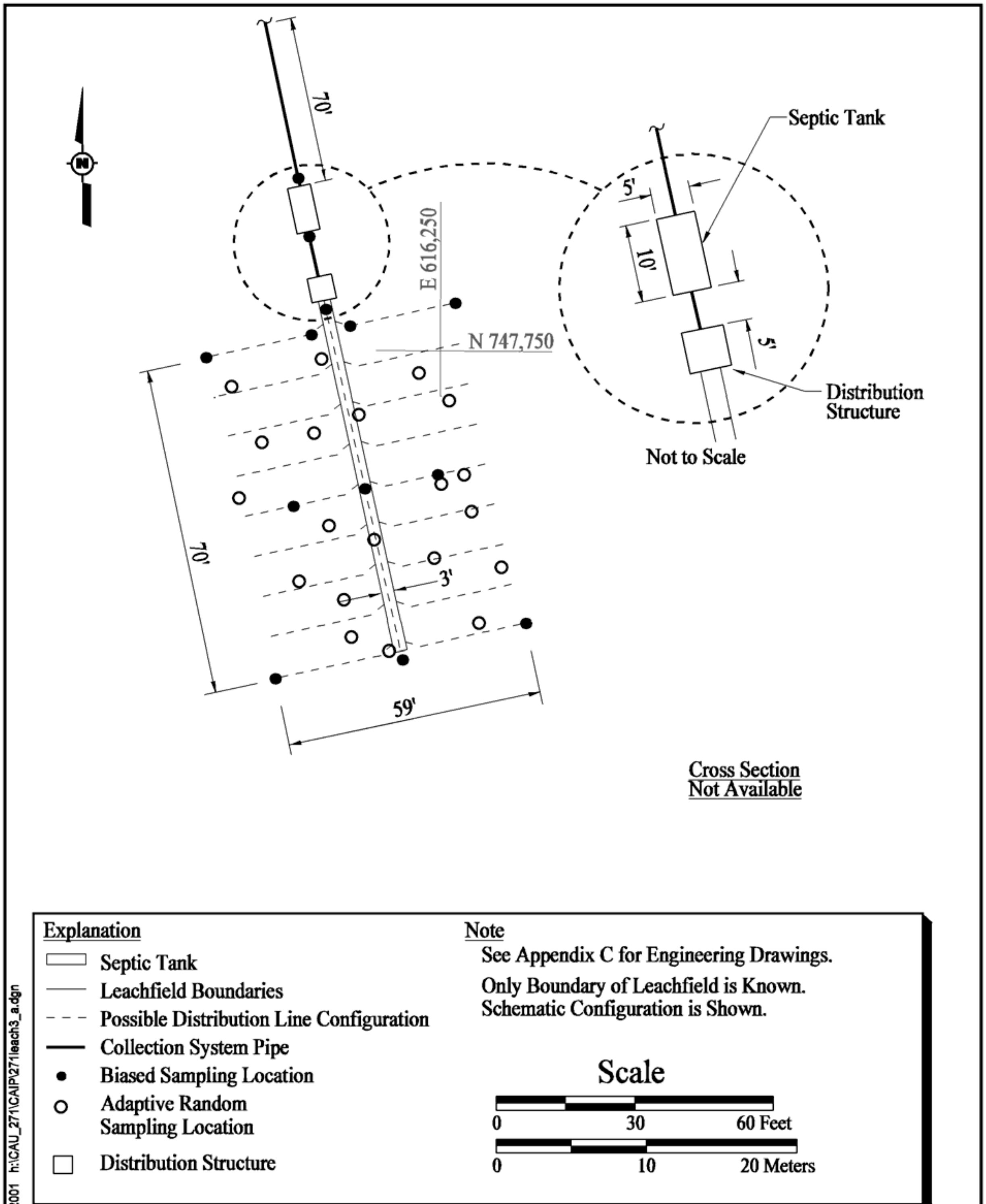


Figure 4-5
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 25-04-09 Proposed Sampling Locations



Source: REECo, 1983b

Figure 4-6
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 25-04-10 Proposed Sampling Locations

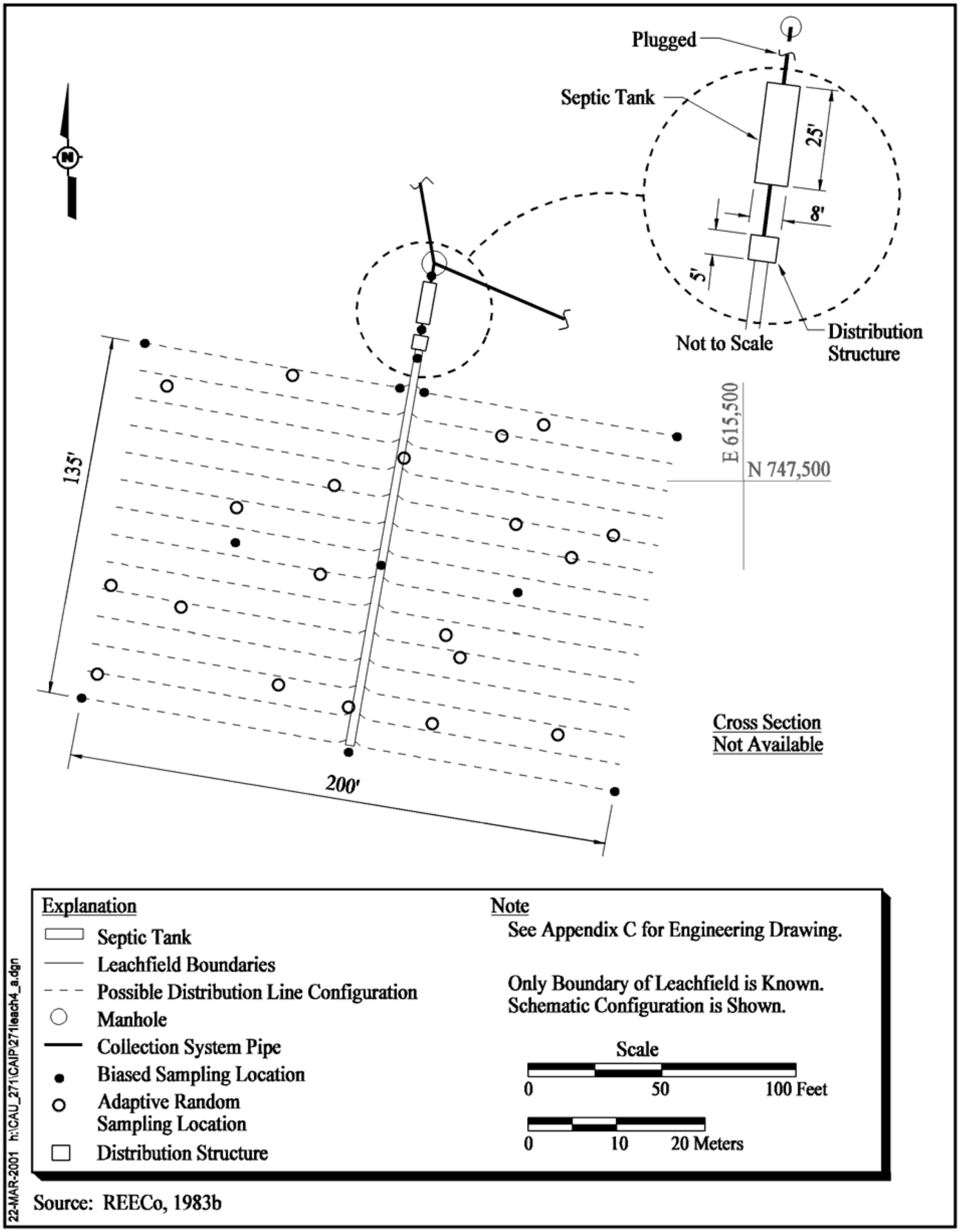
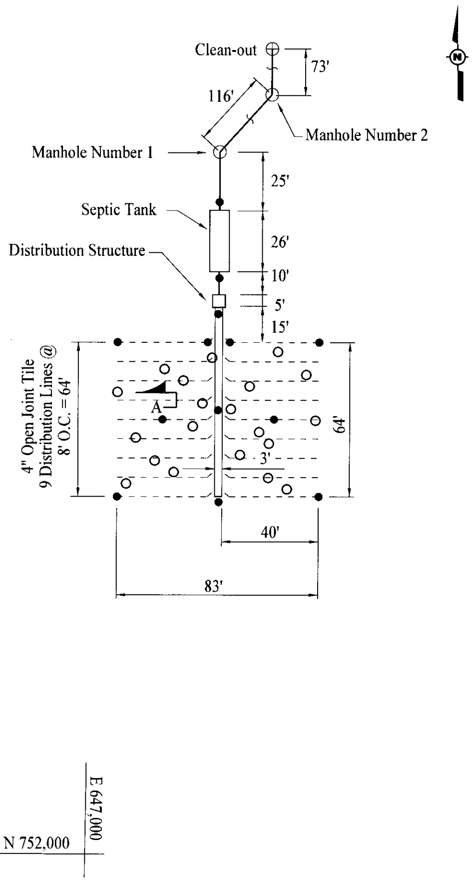
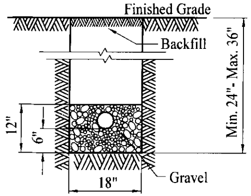


Figure 4-7
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 25-04-11 Proposed Sampling Locations





SECTION A
Scale 1"= 2'

Explanation
- Septic Tank
- Distribution Line
- Manhole
- Collection System Pipe
- Biased Sampling Location
- Adaptive Random Sampling Location
- Distribution Structure

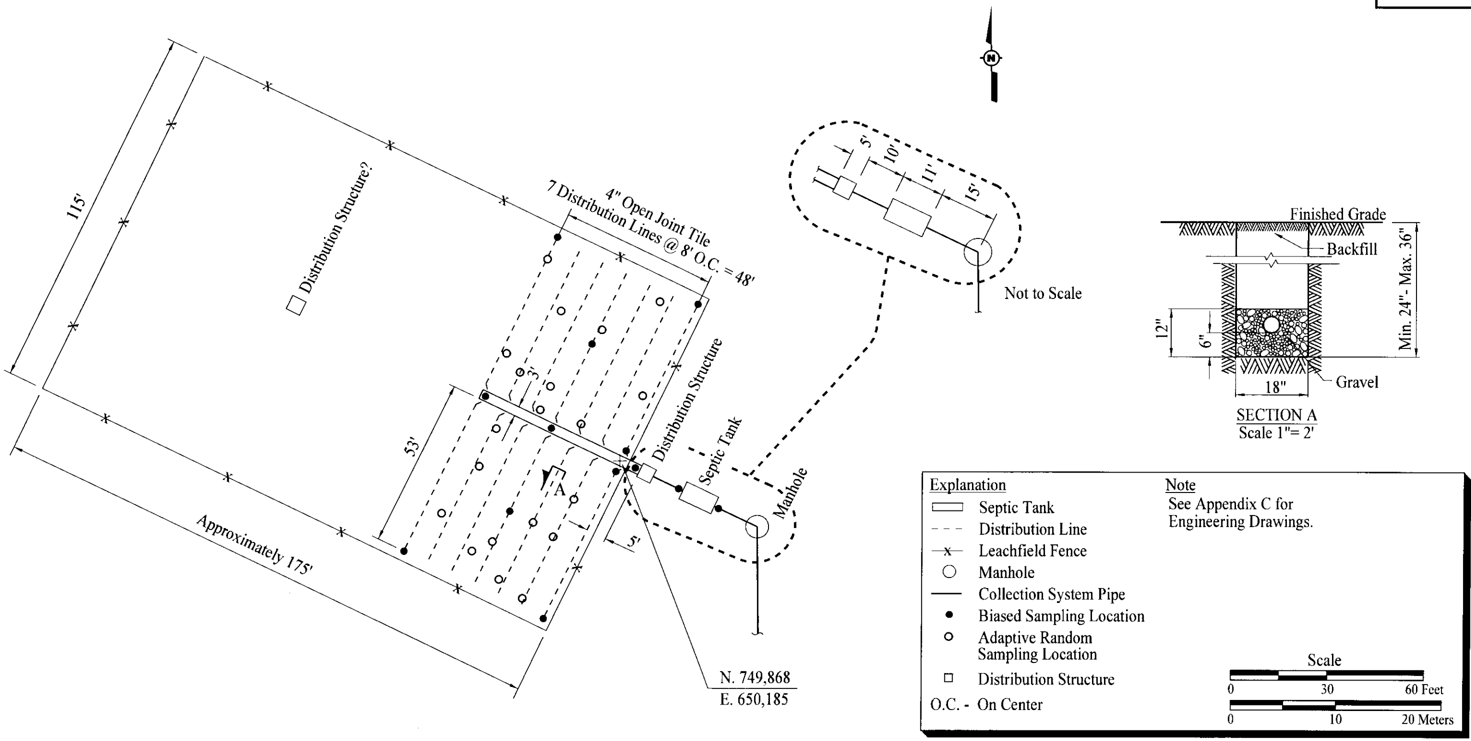
O.C. - On Center

Note
See Appendix C for Engineering Drawings.

Scale
0 40 80 Feet
0 10 20 Meters

Source: BMEC, 1958d; BMEC, 1958e; BMEC, 1958f

Figure 4-8
CAU 271: Areas 25, 26, and 27
Septic Systems
CAS 26-05-04 Proposed Sampling Locations



Source: BMEC, 1959a; BMEC, 1959b

Figure 4-9
CAU 271: Areas 25, 26, and 27
Septic Systems
CAS 26-05-05 Proposed Sampling Locations

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In general, inspection of collection system lines will be one of the last field activities to be performed in order to completely utilize available field-screening results and analytical data from the investigation. Based on process knowledge and previous investigations (Section 2.0), the CASs categorized as complex systems are not expected to be contaminated with radiological COPCs in excess of the free-release criteria presented in DOE/NV (2000a). For this reason, *in situ* radiation surveys of collection system piping will not be performed, unless field-screening results or analytical data indicate the need for them. Where possible, inspection of collection system lines will include field screening for radioactivity. Also, at the discretion of the Site Supervisor, swipes may be obtained for radiological characterization. Additional information on the planned approach to inspecting collection system lines is presented in Appendix A, Section A.5.5.

The collection system lines of all CASs categorized as complex systems will be investigated according to the strategy described above. Additional CAS-specific information is as follows:

- <u>CAS 25-04-03:</u> This investigation will focus on the segments of the collection system line that are abandoned (Section 2.2.1.4.1). Potential inspection locations include two manholes (shown in Figure 4-3) and an additional manhole on the bypass line. Based on information obtained during the 1995 REECo preliminary characterization effort (REECo, 1995), a gap exists in the line that connected the septic tank to the leachfield. The REECo investigators stated that the gap was probably related to the installation of the sewage bypass. However, to document that a release related to a break in the line did not occur, the gap will be located by excavation, and biased soil samples will be collected in accordance with the Leachfield Work Plan.

- <u>CAS 25-04-04:</u> As discussed in Section 2.2.1.4.2, the septic system that serviced the RCP was abandoned prior to 1983, and sanitary effluent was rerouted to two oxidation ponds. The lines that connect the RCP to the oxidation ponds may be active; therefore, will not be characterized. This investigation will confirm by inspection that the line to the septic system is plugged at the bypass manhole located approximately 20 ft upgradient of the septic tank. If necessary and possible, a video inspection of the line will be conducted by entering the line via the inlet of the septic tank.

- <u>CAS 25-04-09:</u> Sometime prior to 1984, sewage collection lines from the ETS-1 facility were rerouted to two oxidation ponds, bypassing the ETS-1 septic system (Section 2.2.1.3). The bypass of the system occurs at a manhole located approximately 20 ft upgradient of the septic tank. Several trailers (no longer present) outside of the ETS-1 border fence were connected to the CAS 25-04-09 septic system. The sewage lines from the trailers also appear to have been rerouted to the oxidation ponds. This investigation will confirm by inspection that the line to the septic system is plugged at the bypass manhole. If necessary and possible, a video inspection of the line will be conducted by entering through the inlet of the septic tank.

The collection lines from the former trailers will also be inspected because these lines are abandoned. However, because the facility is currently in standby status (Section 2.2.1.3), this investigation will not characterize the collection lines that connect the ETS-1 to the oxidation ponds.

- CAS 25-04-11: As discussed in Section 2.2.1.4.4, the septic system that serviced RCP Buildings 3127 and 3129 and the former sleeping trailers was abandoned prior to 1983, and sanitary effluent was rerouted to two oxidation ponds. Engineering Drawing 25-CP-C2 (REECo, 1983b) shows that the line to the leachfield was plugged and abandoned at a manhole a few feet north of the septic tank. Because the sewage line connecting Buildings 3127 and 3129 to the oxidation ponds may be active, it will not be characterized. This investigation will confirm by inspection that the line to the septic system is plugged at the bypass manhole. Drawing 25-CP-C2 also shows that approximately 380 ft of abandoned 6-in. VCP is present in the former LASL sleeping trailer area; inspection of this abandoned line will be included in the investigation.

4.2.3 Simple Systems

Five CASs were categorized as simple systems because the leachfield of each is relatively small and the leachfield configuration is known from existing engineering plans (Appendix A, Section A.5.0). Two of the CASs (25-04-01 and 25-04-08) are located in Area 25 (Figure 1-1), two (26-04-01 and 26-04-02) are within Area 26 (Figure 1-2), and one (27-05-02) is in Area 27 (Figure 1-3). All of the simple systems were designed to receive sanitary effluent; none are radiologically posted.

Excavation, as described in the Leachfield Work Plan, is the planned method of intrusive investigation for these CASs. The overall investigation strategy is very similar to the complex system strategy, except that soil samples will not be collected from randomly selected leachfield locations. The biased sample locations specified in the Leachfield Work Plan will provide an adequate number of samples to characterize potential contamination of leachfields at CASs categorized as simple systems. If the field investigation reveals a leachfield significantly larger or more complicated than anticipated, a combined biased and random sampling approach as described in Section 4.2.2.2 for complex systems will be adopted and documented in a ROTC (see Section 4.1).

4.2.3.1 Septic Tank and Distribution Structure Investigations

The septic tanks and distribution structures for all CASs categorized as simple systems will be investigated according to the strategy described in Section 4.2.1.1.

4.2.3.2 Leachfield Investigations

Simple leachfields will be investigated using excavations as described in Section 4.1.2 of the Leachfield Work Plan. The CASs categorized as simple systems do not share a common leachfield design; several different configurations are anticipated.

Biased excavations will be located based on system dynamics; specific sampling locations will be listed in the CAS-specific information provided at the end of this section. Biased soil samples will be collected either to constrain the lateral and vertical extent of potential contamination (e.g., corners of leachfield) or to investigate areas with the highest potential for contamination (i.e., initial discharge points). Additional biased excavations may be conducted at other leachfield-specific locations, as necessary. Contingencies will be in place to ensure that the lateral and vertical extent of contamination has been defined (Section 4.3).

Sample interval depths will be relative to the depth of the leachfield base as discussed in Section 4.2 of this CAIP and Section 4.1.2 of the Leachfield Work Plan. At all leachfield sample locations, sampling will continue with depth until two samples not exceeding FSLs are recovered, contingent upon conditions discussed in Section 4.3.

The leachfields of all CASs categorized as simple systems will be investigated according to the strategy described above. Additional CAS-specific information is as follows:

- CAS 25-04-01: The leachfield consists of a single 50-ft long distribution line (Section 2.2.1.1). Soil samples will be collected by excavation at three biased locations: (1) initial discharge point, (2) midpoint, and (3) end of the distribution line. These sampling locations are shown in Figure 4-10.

- CAS 25-04-08: The leachfield is expected to have three parallel distribution lines, each 60-ft long (Section 2.2.1.2). Rather than each pipe being placed in a separate trench, the entire leachfield appears to have been installed as a continuous 15-ft wide bed of leachrock. Soil samples will be collected by excavation at seven biased locations: (1) initial discharge point of each distribution line, (2) end of each distribution line, and (3) center of the leachfield. These locations are shown in Figure 4-11.

- CASs 26-04-01 and 26-04-02: The leachfield of both CASs is of the "typical" design, with two distribution manifolds extending from a distribution structure through the center of the leachfield and distribution lines connected to each manifold (Section 2.2.2.1.1 and Section 2.2.2.1.2). At each leachfield, soil samples will be collected by excavation at ten

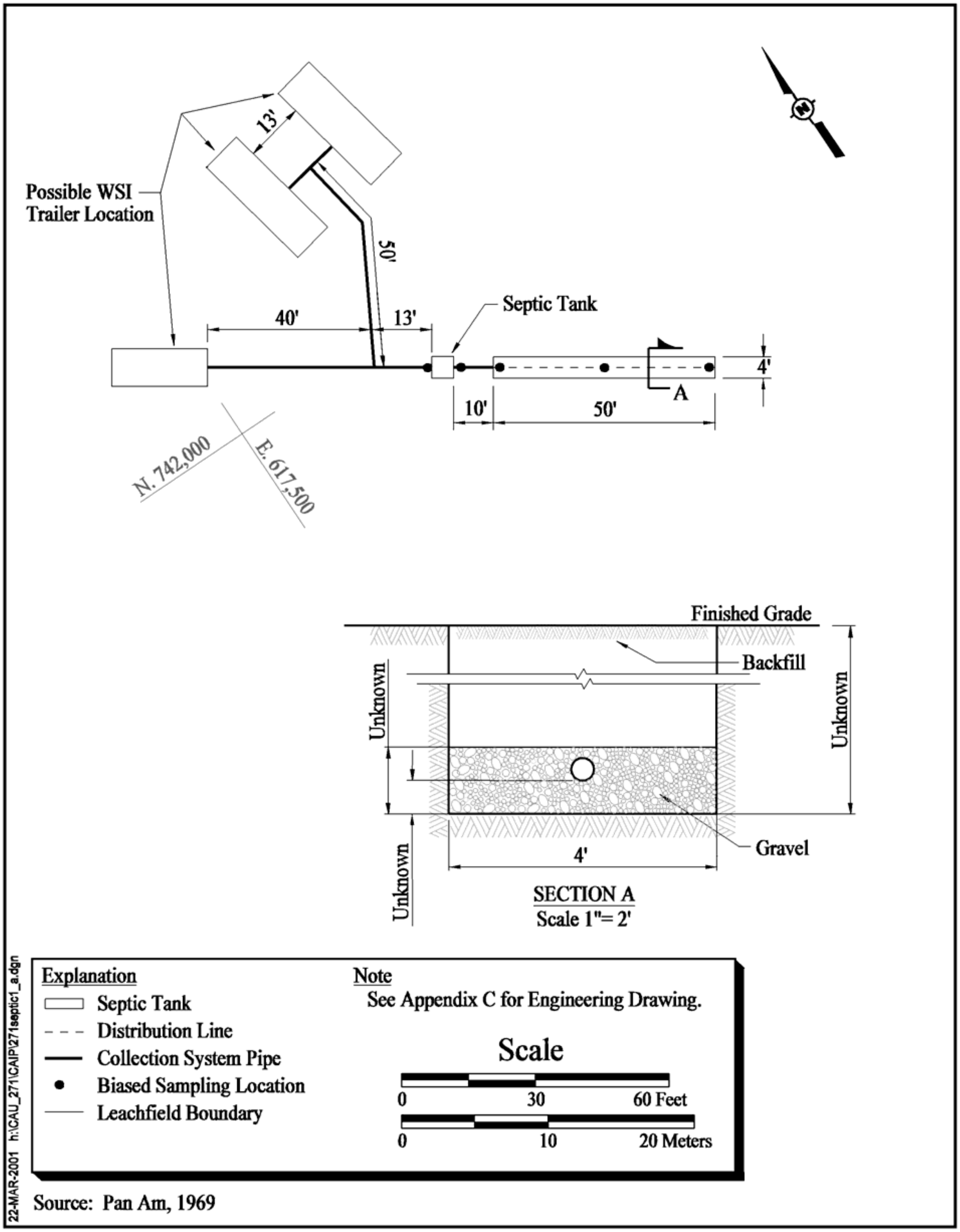

Figure 4-10
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 25-04-01 Proposed Sampling Locations

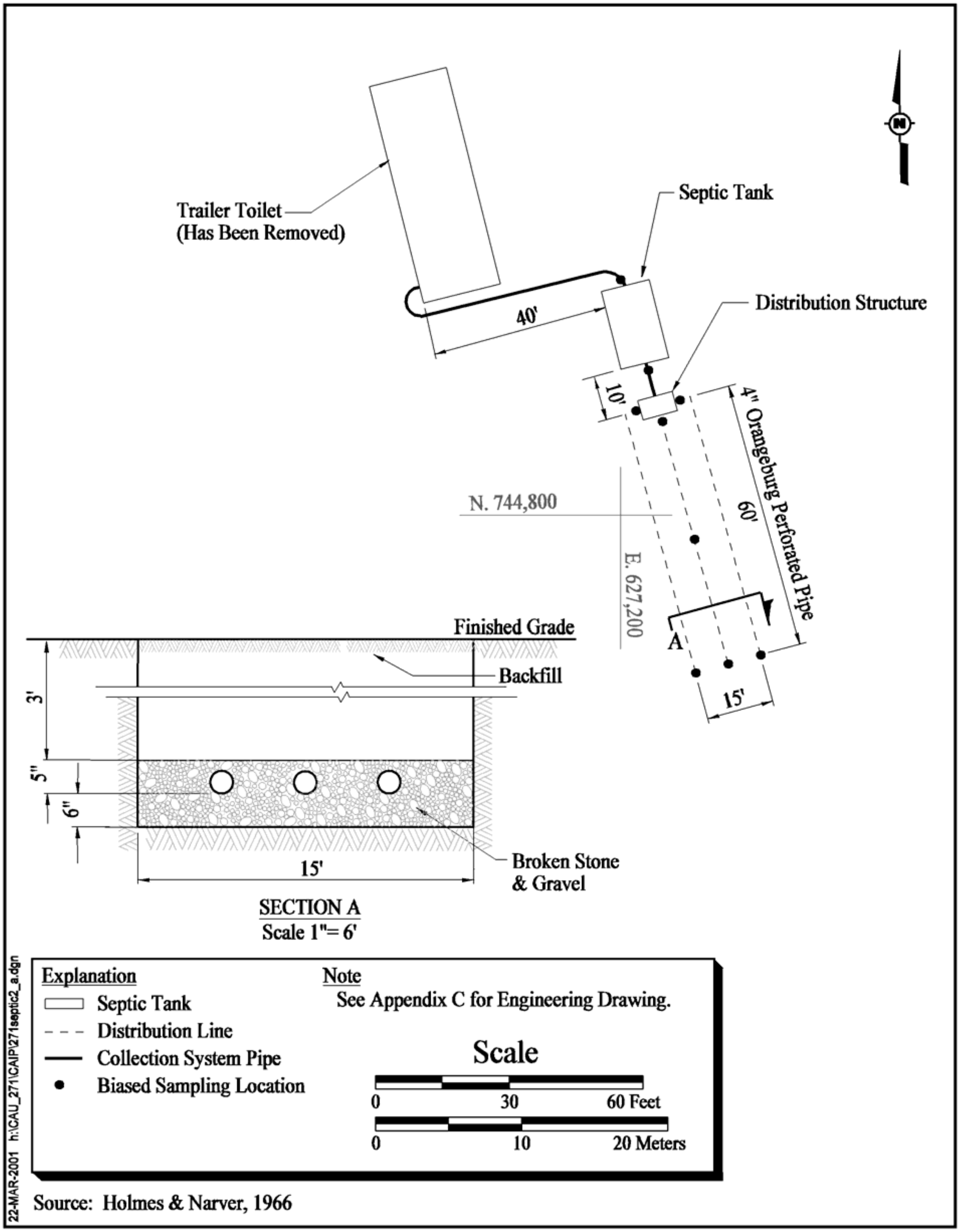

Figure 4-11
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 25-04-08 Proposed Sampling Locations

biased locations: (1) initial discharge points in the two proximal distribution lines, (2) area between the distribution manifold ends, (3) four corners of the leachfield, (4) center of each half of the leachfield, and (5) center of the leachfield. These locations are shown in Figure 4-12 and Figure 4-13.

- CAS 27-05-02: The leachfield is expected to have five parallel distribution lines (Section 2.2.3.1). Soil samples will be collected by excavation at seven biased locations: (1) initial discharge point of three distribution lines (center line and line on each edge of leachfield), (2) end of three distribution lines (center line and line on each edge of leachfield), and (3) center of the leachfield. These locations are shown in Figure 4-14. Because the CAS 27-05-02 leachfield is adjacent to a small wash (Section 2.2.3.1), at least one sediment sample will be collected from the wash near the downstream edge of the leachfield.

4.2.3.3 Collection System Pipe Inspections

The planned approach for the inspection of simple leachfield collection system piping is identical to the process presented in Section 4.2.2.3.

4.2.4 Port Gaston Training Area Water Reservoir (CAS 26-03-01)

Samples will be collected from two biased sampling locations at the CAS 26-03-01 contaminated water reservoir: (1) the lowest point in the reservoir, and (2) the approximate location of the maximum radiological measurement observed by ITLV during a survey of the reservoir (IT, 2000b). To ensure that an adequate number of sample locations have been considered, samples will also be collected from five randomly selected locations. The process used for selecting the number of random sample locations is described in Appendix A, Section A.7.0.

At each of the seven locations shown in Figure 4-15, both surface and subsurface soil samples will be collected. Material collected from above the plastic liner at each location will comprise the surface soil sample. The sample will be collected from the uppermost 0.5-ft interval or the entire interval, if less than 0.5 ft thick. If no surface soil is present and the liner is exposed at the sample location, a surface soil sample will not be collected. Subsurface soil sampling intervals below the plastic liner will be similar to those defined for leachfields (Section 4.2). A 1.0-ft thick interval immediately below the liner will define the uppermost sampling interval. The second sampling interval will be 2.5 ft to 3.5 ft beneath the liner. Additional samples may be collected from deeper intervals based on field-screening results or field observations. The actual depth of sampling intervals below the plastic liner may require adjustment based on field conditions (e.g., geologic refusal of sampling device).

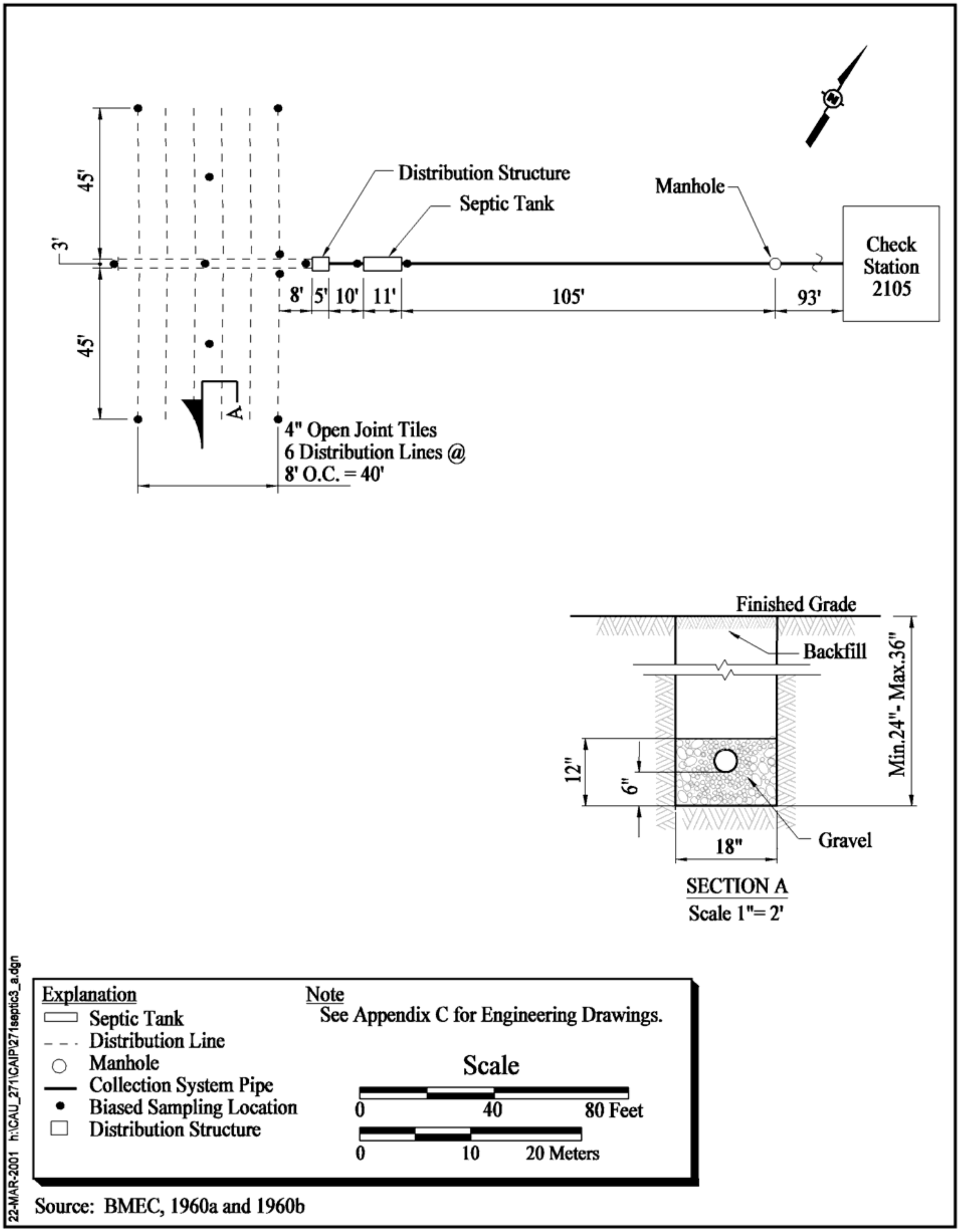

Figure 4-12
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 26-04-01 Proposed Sampling Locations

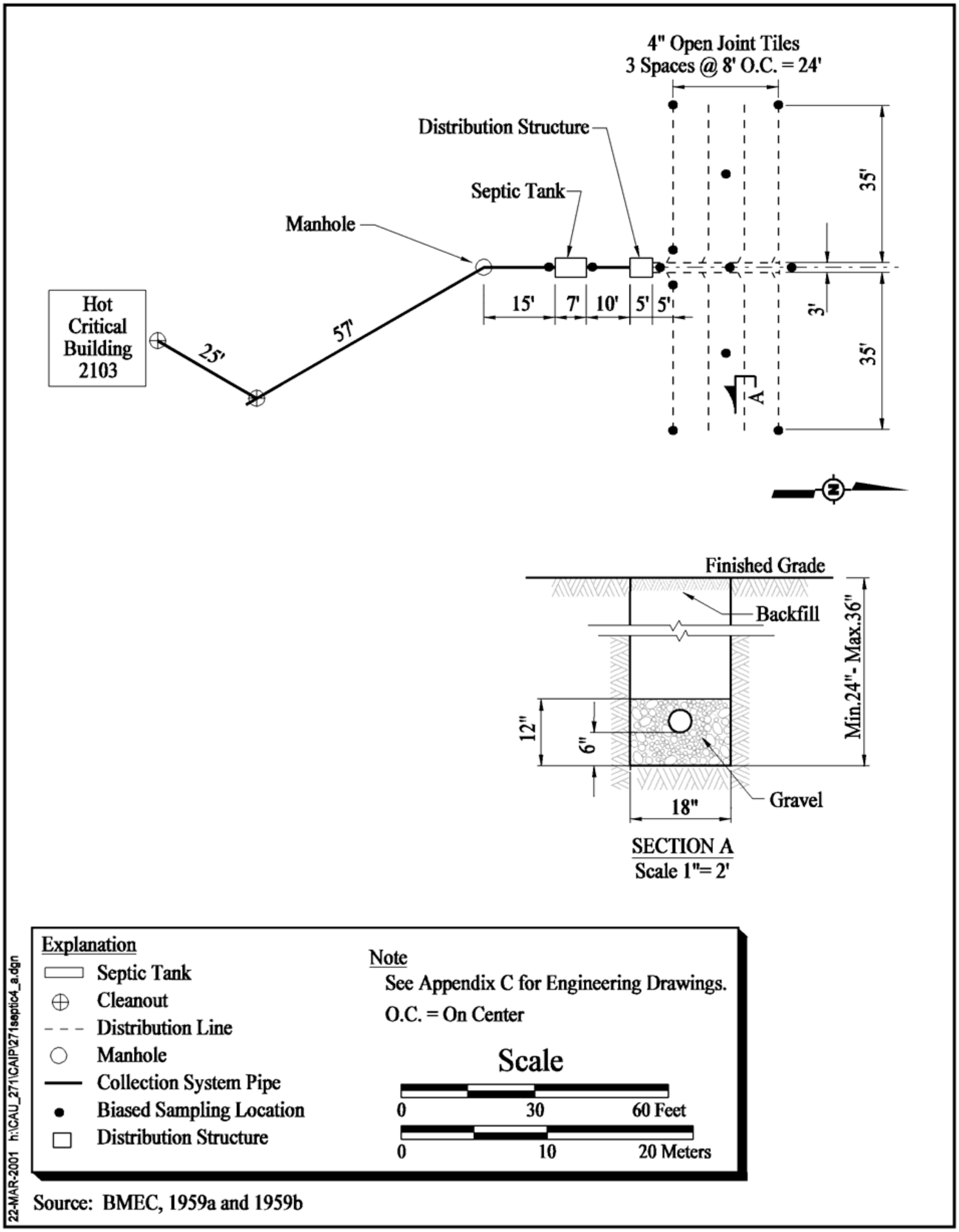

Figure 4-13
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 26-04-02 Proposed Sampling Locations

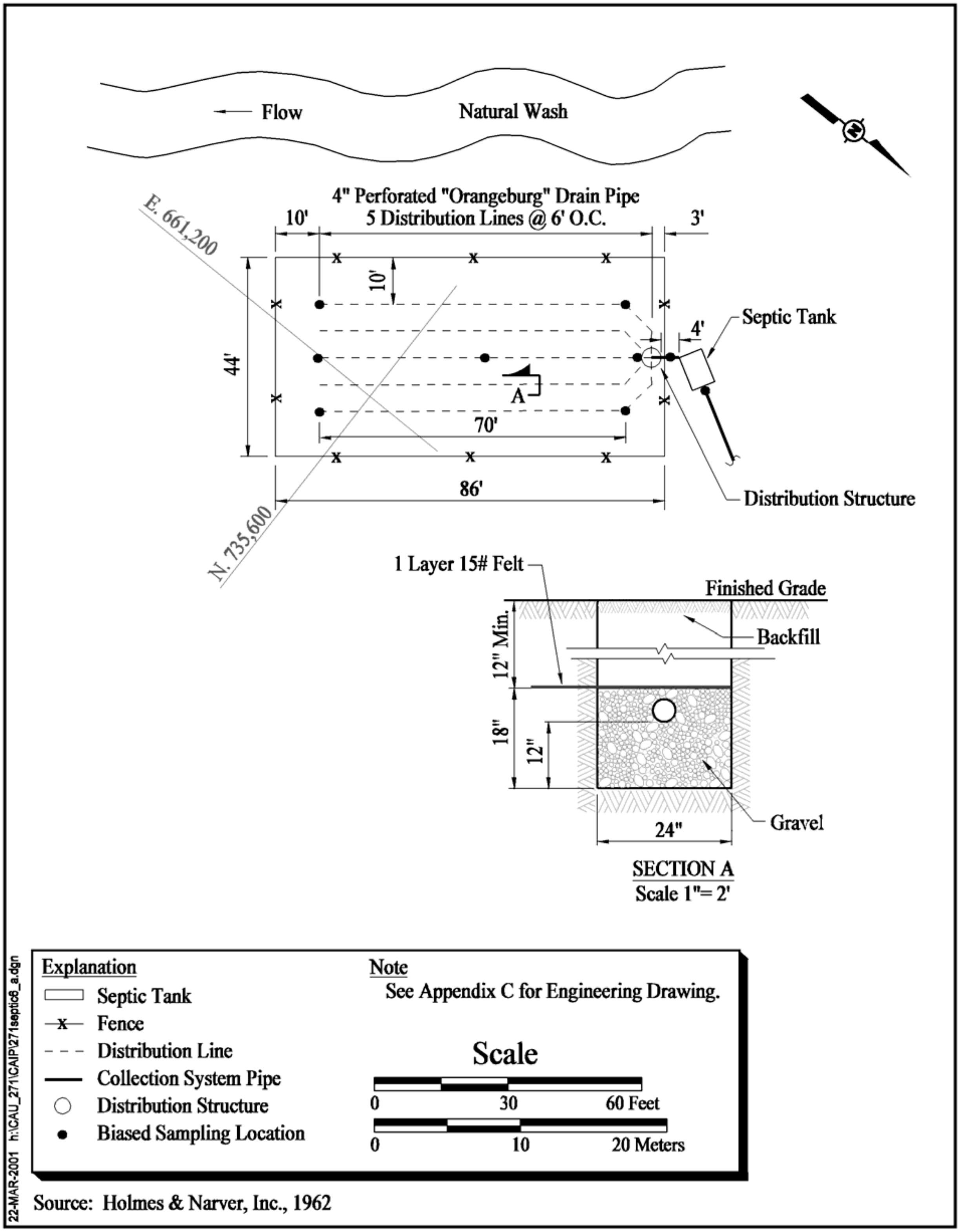

Figure 4-14
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 27-05-02 Proposed Sampling Locations

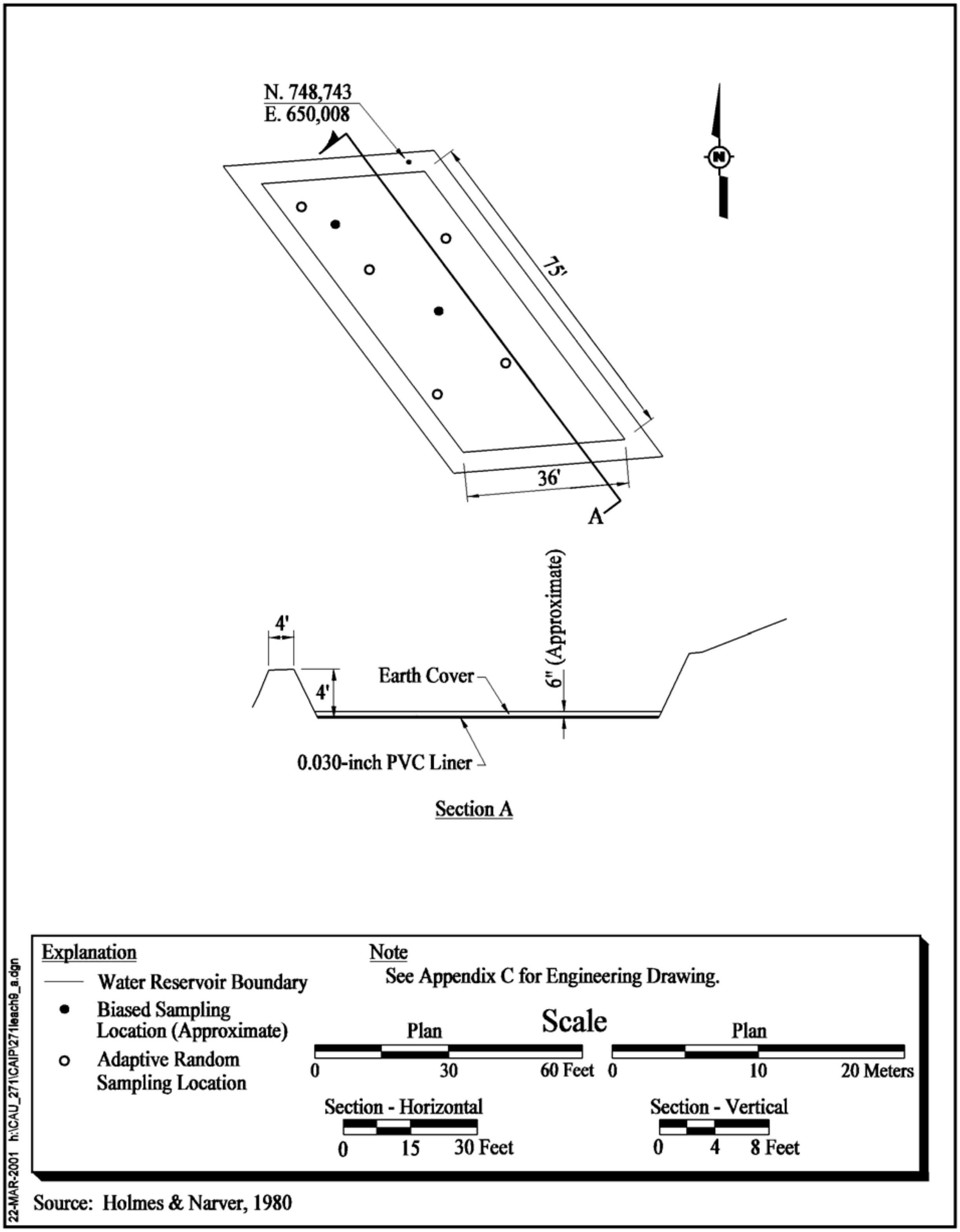

Figure 4-15
CAU 271: Areas 25, 26, and 27 Septic Systems
CAS 26-03-01 Proposed Sampling Locations

Samples will be collected by excavation, drilling, or direct-push technology (e.g., Geoprobe®). Surface soil samples may be collected by hand.

4.3 Additional Sampling and Contingencies

Additional excavation or drilling may be conducted if field-screening results indicate that contamination continues below or outside of the planned sampling locations. Analytical results from samples collected earlier in the investigation will be considered if they are available, but further investigation may be initiated based on field observations and field-screening data. If field-screening or analytical results indicate the extent of contamination is not defined because concentrations exceed specified FSLs or PALs, additional sampling locations or depths will be selected to determine the contamination extent. In general, further investigation would be accomplished utilizing supplementary sampling as described in Section 4.1.2.1 of the Leachfield Work Plan.

If required, continued investigation may consist of deepening sampling locations within the leachfield to determine the vertical extent of contamination or adding sampling locations designed to establish the lateral contamination extent. If excavation cannot determine the vertical extent of contamination, drilling will be conducted.

Initial step-out sampling points will be located 15 ft horizontally from the original, planned location where FSLs or PALs were exceeded. Stepouts will be arranged in a triangular pattern, with the original sampling location as one corner of the triangle. Sampling will be advanced to depths adequate to determine the vertical extent of contamination. Samples will be collected at 5-ft intervals, beginning at the greatest depth where contamination exceeding FSLs or PALs was detected in the original sample location. Sample collection will begin at the established depth of the leachfield distribution lines, if additional locations without associated planned sample locations are required. Although highly unlikely, if contamination extends below 50 ft bgs, DOE/NV and NDEP will be contacted, and a suitable course of action will be decided (e.g., rescoping the investigation).

Leachfield sampling will generally begin by locating and sampling the four corners to facilitate location of subsequent samples. During this process, if the actual leachfield dimensions are found to be significantly different than those used to determine random sampling locations for complex-posted and complex CASs, the random locations will be modified. The modification will consist of a linear transformation of one or both dimensions, if necessary. This process will allow rescaling to fit the observed leachfield size while maintaining the integrity of the random sampling scheme. The distribution lines at each corner may not be located if drilling is used rather than excavation. Under this condition, the corners may be delineated by the presence/absence of leachrock in drill cuttings.

Because the random sample locations are selected based on an adaptive fill design that considers the location of biased samples, new random locations would be needed if the biased locations changed significantly from the planned locations. This could occur if the actual leachfield configuration was different than expected. Under these conditions, the “Visual Sample Plan” program (Davidson and Wilson, 1999) will be used to select new random sample locations. Provisions will be made prior to the start of the field investigation to ensure that new random locations can be selected quickly, if necessary.

5.0 Waste Management

Waste management activities to be performed for CAU 271 are addressed in Section 5.0 of the Leachfield Work Plan.

5.1 Waste Minimization

Waste Minimization activities to be performed for CAU 271 are addressed in Section 5.1 of the Leachfield Work Plan.

5.2 Potential Waste Streams

All 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 obtained for CAU 271, possible solid (nonhazardous), hydrocarbon, hazardous, low-level radioactive, or mixed waste may be generated. Process knowledge compiled thus far does not indicate that a specific listed hazardous waste was discharged to any of the septic/leachfield systems in this CAU. Investigation-derived waste will be evaluated against characteristic criteria unless contrary information is discovered during the investigation. Action levels for IDW contaminants are stated in Table 5-1 of the Leachfield Work Plan.

5.3 Investigation-Derived Waste Management

Waste will be managed according to the requirements identified in Section 5.3 of the Leachfield Work Plan until laboratory analyses are received and a final waste determination is made. Applicable waste management regulations and requirements are listed in Table 5-1.

Any IDW generated during this investigation will be segregated by waste stream and placed in packages meeting U.S. Department of Transportation (49 CFR 172 [CFR, 2000d]) specifications and appropriate for the type and amount of waste generated. Packages will meet specifications for containers outlined in Section 5.3 of the Leachfield Work Plan.

Table 5-1
Waste Management Regulations and Requirements

Waste Type	Federal Regulation	Additional Requirements
Solid (nonhazardous)	NA	NRS 444.440 - 444.620[a] NAC 444.570 - 444.7499[b] NTS Landfill Permit SW13.097.04[c] NTS Landfill Permit SW13.097.03[d]
Liquid/Rinsate (nonhazardous)	NA	NTS Waste Water Facility Permit GNEV93001, Rev. 3 iii[e]
Hydrocarbon	NA	NAC 445A.2272(b)[f] NTS Landfill Permit SW13.097.02[g]
Hazardous	RCRA[h]	NRS 459.400 - 459.600[i] NAC 444.850 - 444.8746[j]
Low-Level Radioactive	NA	DOE Orders and NTSWAC[k]
Mixed	RCRA[h]	NTSWAC[k]
Polychlorinated Biphenyls	TSCA[l]	NRS 459.400 - 459.600[i] NAC 444.940 - 444.9555[m]

[a]*Nevada Revised Statutes* (NRS, 1998a)
[b]*Nevada Administrative Code* (NAC, 2000b)
[c]Area 23
[d]U10c Crater located in Area 9
[e]Nevada Test Site Sewage Lagoons
[f]*Nevada Administrative Code* (NAC, 2000d)
[g]Area 6 Hydrocarbon Landfill
[h] *Resource Conservation and Recovery Act* (CFR, 2000b)
[i]*Nevada Revised Statutes* (NRS, 1998b)
[j] *Nevada Administrative Code* (NAC, 2000c)
[k] Nevada Test Site Waste Acceptance Criteria, Revision 3 (DOE/NV, 2000b)
[l] *Toxic Substance Control Act* (CFR, 2000c)
[m] *Nevada Administrative Code* (NAC, 2000e)

NA = Not applicable

Each of the 15 CASs has been reviewed to ensure that sufficient analyses to support IDW disposal have been planned. Additional analyses may be required to support specific NTS on-site or off-site disposal criteria.

6.0 Duration and Records Availability

6.1 Time Frame

After submittal of the Final CAIP for CAU 271 to NDEP (FFACO milestone deadline of August 31, 2001), the following is a tentative schedule of activities (in calendar days):

- Day 0: Preparation for field investigation will begin.
- Day 45: The field investigation, including field screening and sampling, will commence. Samples will be shipped to meet laboratory holding times.
- Day 135: The field investigation will be completed.
- Day 200: The quality-assured, analytical data will be available for NDEP review.
- The FFACO date established for the CADD is September 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 facilities located in Las Vegas and Carson City, Nevada, or by contacting the DOE Project Manager. The NDEP maintains the official Administrative Record for all activities conducted under the auspices of the FFACO.

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Appendix A

Data Quality Objectives Worksheets

A.1.0 Introduction

A.1.1 Problem Statement

Potentially hazardous and radioactive wastes were discharged to twelve septic systems, one contaminated water reservoir, one sanitary leachfield, and one radioactive leachfield in Areas 25, 26, and 27 of the NTS. The septic systems include some or all of the following components: septic tanks, distribution structures (or boxes), leachfields, and associated piping. Together, the sites are addressed as CAU 271, Areas 25, 26, and 27 Septic Systems. Six of the CASs were associated with Project Pluto. Four of the CASs are associated with the RCP in Area 25. The remaining five CASs are located at Guard Station 500 (25-04-01, Septic System), ETS-1 (25-04-09, Septic System), Port Gaston (26-03-01, Contaminated Water Reservoir), the BREN Tower (25-04-08, Septic System), and Baker Site (27-05-02, Leachfield) facilities. Although listed in the FFACO as a leachfield, CAS 27-05-02 also includes a septic tank and distribution box. The six CASs associated with Project Pluto are 26-04-01 (Septic System), 26-04-02 (Septic System), 26-05-01 (Radioactive Leachfield), 26-05-03 (Septic System), 26-05-04 (Septic System), and 26-05-05 (Septic System). The four CASs associated with the RCP facility are 25-04-03 (Septic System), 25-04-04 (Septic System), 25-04-10 (Septic System), and 25-04-11 (Septic System). Existing information about the nature and extent of contamination is insufficient to evaluate and select preferred corrective actions for these sites.

These sites will be investigated based on DQOs developed by representatives of NDEP and DOE/NV. This investigation will determine if COPCs are present within the septic/leachfield system components and/or the soils associated with the septic/leachfield system components. This investigation will also determine if COPCs are present in soils at the CAS 26-03-01 water reservoir. Additionally, it will be determined whether the concentrations of COPCs exceed regulatory levels. If COPCs are detected, the lateral and vertical extent of contamination will be determined. This investigation will focus on collection of data adequate to close the sites under NDEP, RCRA, and DOE requirements.

A.1.2 DQO Kickoff Meeting

Table A.1-1 lists the participants present at 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 Quality Assurance Project Plan* (DOE/NV, 1996) and the *Work Plan for Leachfield Corrective Action Units: Nevada Test Site and Tonopah Test Range, Nevada* (DOE/NV, 1998b), hereafter referred to as the Leachfield Work Plan.

Table A.1-1
November 16, 2000 - DQO Meeting Participants

Participants	Affiliation
Steven Adams	ITLV
Bernadine Bailey	ITLV
Paul Brown	BN
Kevin Cabble	DOE/NV
Lydia Coleman	ITLV
Donald Cox	BN
Robert Curiale	ITLV
Jill Dale	ITLV
Candice Fillmore	ITLV
TerryLynn Foley	ITLV
Joe Hutchinson	ITLV
Brad Jackson	ITLV
Wayne Johnson	BN
Mike McKinnon	NDEP
William Nicosia	ITLV
Barbara Quinn	ITLV
Robert Sobocinski	ITLV
Milinka Watson-Garrett	ITLV
Jeanne Wightman	ITLV
Ted Zaferatos	NDEP

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

The CAU 271 septic systems received sanitary effluent and, in some cases, process effluent primarily from operations conducted within associated Area 25, 26, and 27 facilities. The CAS 26-05-01 leachfield received radioactive effluent associated with Project Pluto operations. The CAS 26-03-01 reservoir was intentionally contaminated with short-lived radionuclides as part of a training exercise. Dates of system activity for the CASs are variable and poorly constrained, but the Area 25 facilities were most active between 1959 and 1973, the Area 26 facilities from 1961 to 1964, and the Area 27 facilities during the 1960s. Training exercises associated with the CAS 26-03-01 water reservoir were conducted in 1981. All of the sites addressed by CAU 271 are currently inactive or abandoned, but some leachfields may still receive effluent from passive generation (i.e., open pad drains, floor drains, and equipment drains).

Within this document, “effluent” is generally applied to all liquid waste disposed of in septic systems without regard to toxic, hazardous, or radioactive properties. Effluent discharged to the CAU 271 septic systems and leachfields is considered potentially contaminated with various constituents, but the probabilities of actual contamination are highly variable. “Sanitary effluent” is considered equivalent to domestic sewage and potentially toxic, “process effluent” is considered potentially hazardous, and “radioactive effluent” is considered potentially radioactive and hazardous. The leachfields at CASs 26-05-01 and 26-05-03 are posted as “Underground Radioactive Material” and “Caution Radioactive Material,” respectively. Posted leachfields are considered radioactively contaminated.

The terms “septic system” and “leachfield system” are not interchangable as used in this CAU. Both systems have in common collection system piping, leachfields and, in most cases, distribution boxes (Leachfield Work Plan, Section 3.1). However, a system must include a septic tank to be classified as a septic system.

For each CAU 271 septic system, effluent was discharged from source buildings and routed through the collection system to a septic tank and, in most cases, a distribution box. Subsequent discharge to the leachfield via distribution lines allowed effluent to percolate into the underlying soil for disposal. Effluent contaminants were transported by relatively large volumes of water. This conceptual model is consistent with the general conceptual model for leachfield CAUs provided in Section 3.1 of the Leachfield Work Plan. Except for the absence of a septic tank, the conceptual model for the CAS 26-05-01 leachfield system is similar to the conceptual model for the septic systems.

For the CAS 26-03-01 water reservoir, the short-lived radionuclides Hg-197 and Ra-223 were intentionally sprayed into the reservoir in 1981. The planned maximum combined contamination level was reported to be 25 microcuries per square meter (Mitchell, 1981). This is the only known source of contamination for this CAS. The reservoir is currently dry; how long it contained water is not known. The reservoir is lined with plastic, and infiltration was probably limited or did not occur. A thin layer of soil or sediment, presumably wind-blown, currently overlies the plastic liner.

An outline of CAU-specific and CAS-specific elements of the conceptual model for CAU 271 is provided in Tables A.2.1 and A.2.2.

Table A.2-1
General CAU 271 Conceptual Model
(Page 1 of 2)

Conceptual Model Element	Assumptions	Source
System dynamics, waste inventories, release information	Infiltration and concentration of contaminants in the form of liquid waste into the soil directly below the distribution lines and within the leachfields may have occurred. For CAS 26-03-01, contaminants were intentionally sprayed into the reservoir.	Knowledge of similar sites, Leachfield Work Plan (DOE/NV, 1998b Process knowledge)
	Groundwater contamination is unlikely due to environmental conditions at the sites, such as an arid climate, low permeabilities, and depth to groundwater.	Knowledge of similar sites, Leachfield Work Plan (DOE/NV, 1998b)
	Driving forces restricted to infiltration of limited precipitation subsequent to cessation of facility operations and redirection of generated effluent to alternative disposal systems. For CAS 26-03-01, the pressure of the water column in the reservoir would cause movement of water into underlying soils; however, this driving force is eliminated or restricted by the plastic liner.	Knowledge of similar sites, Leachfield Work Plan (DOE/NV, 1998b)
Lateral extent of potential contaminants	Subsurface effects are limited by low mobility of constituents.	Process knowledge and similar site investigations (i.e., CAUs 261/266/500 [DOE/NV, 1999; 2000a, 2000b])
	The potential lateral migration of contaminants is unknown, but if migration has occurred, it will likely be confined within the boundaries of the leachfield. For CAS-03-01, the lateral extent is unknown, but the potential for migration should be limited due to the presence of the plastic liner.	Process knowledge and similar site investigations (i.e., CAUs 261/266/500 [DOE/NV, 1999; 2000a; 2000b])
Vertical extent of potential contaminants	The vertical extent of potential contamination is unknown but, if present, will be primarily adjacent to and below the distribution lines. Potential contamination is probably concentrated at the native soil/leachfield material interface. Vertical extent should be limited by low mobility of COPCs and limited driving force. For CAS 26-03-01, the vertical extent should be limited by the plastic liner underlying the reservoir.	Process knowledge and similar site investigations (i.e., CAUs 261/266/500 [DOE/NV, 1999; 2000a, 2000b])

Table A.2-1
General CAU 271 Conceptual Model
(Page 2 of 2)

Conceptual Model Element	Assumptions	Source
Physical and practical constraints	Radiological control access requirements to posted areas surrounding posted leachfields (CASs 26-05-01 and 26-05-03). Current postings of these leachfields are “Underground Radioactive Materials Area” and “Caution Radioactive Materials Area,” respectively. Additional constraints include Yucca Mountain Project activities; activities of other Areas 25, 26, and 27 users (i.e., Department of Defense); nearby utilities; facility constraints including fencing, buildings, and concrete pads; adverse weather conditions; restricted access; heavy equipment and resource availability; health and safety concerns; approval of the CAIP.	Site knowledge; site visits
Future use	All of the CAU 271 CASs are contained within restricted use zones classified as either “Research Test and Experiment Zone” (Areas 25 and 26) or “Defense Industrial” (Area 27). The Research Test and Experiment Zone is designated for small-scale research and development projects and demonstrations; pilot projects; outdoor tests; and experiments for development, quality assurance, or reliability of material and equipment under controlled conditions. This includes compatible nondefense research, development, and testing projects and activities. The Defense Industrial Zone is designated for stockpile management of weapons, including production, assembly, disassembly or modification, staging, repair, retrofit, and surveillance. Also included are permanent facilities for stockpile stewardship operations involving equipment and activities such as radiography, lasers, material processing, and pulsed power.	Record of Decision Land Use Zones as defined in *NTS Resource Management Plan* (DOE/NV, 1998a)
Potential exposures	Ingestion, inhalation, external exposure to radiation, or dermal contact (absorption) of COPCs in soil, sludge, and/or liquids due to exposure during investigation.	Process knowledge
Waste management	Waste will be evaluated against characteristic criteria unless contrary information is discovered during the investigation.	Process knowledge

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 1 of 16)

Conceptual Model Element	Assumptions	Source
CAS Facility Association: Reactor Control Point		
CAS 25-04-03		
Release Information and System Location	This septic system received sanitary effluent generated from seventeen Pan American (Pan Am) housing trailers and one recreational trailer. The septic system is located west of the RCP.	Process knowledge Engineering drawings including: 25-CP-C1.1 (REECo, 1983a) 25-CP-C2 (REECo, 1983b) 25-CP-3 (REECo, 1983c)
Septic Tank	• Concrete tank • 750-gal capacity • Slight septage odor • Approximately 375 gal of liquid/sludge in 1995 • Liquid was yellow and had an oily sheen • Sludge was brown to black in color and appeared to contain gravelly soils	
Leachfield	• Chevron-shaped, each half approximately 50 x 70 ft • Unknown depth and configuration	
Manholes and Piping	• Approximately 360 ft of piping • Pipes are 6-in. perforated, red-clay • Minimal gravel base under the pipes • Two manholes located to the east of the septic tank and leachfield	
Other	• The line also branches southeast approximately 600 ft to where the sewer line is plugged prior to the septic system associated with the LASL Trailers (CAS 25-04-11) • A gap between the septic tank and the leachfield, at the “T” connection that had not been repaired, was documented • Unknown whether the gap is capped or if the pipe was broken	
Source Location	Within the former Pan Am trailers	
Contaminants of Potential Concern	• TPH as oil; oil and grease • No radiological COPCs were identified	Process knowledge REECo, 1995

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 2 of 16)

Conceptual Model Element	Assumptions	Source
CAS 25-04-04		
Release information and system location	The septic system received domestic sewage and wastewater from the major waste disposal facilities located in eight buildings. The septic system is located south of the RCP.	Process knowledge Engineering drawings including: 25-CP-C1.1 (REECo, 1983a) 25-CP-C2 (REECo, 1983b) 25-CP-3 (REECo, 1983c) Radiological Surveys (IT, 2000)
Septic Tank	• Steel • Capacity is 7,500 gal • Tank dimensions are 7.2 x 25.7 x 6.8 ft • One separation chamber • Moderate septage odor • 3,500 gal of liquid/sludge present in 1995 • Liquid was slightly clouded with a “floating oily phase”	
Distribution Box	• Located 10 ft south of the septic tank	
Leachfield	• Dimensions are 203 x 112 x 3 ft • Surrounded by a berm • 2 distribution manifolds • 30 lateral distribution lines	
Manholes and Piping	• Manhole No. 1 is located approximately 20 ft north of the septic tank • Manholes No. 2, 3, 3a, 3b, and 4 are located inside the RCP Complex fenceline • Manhole 2a is located northwest of Building 3107 • Approximately 1,495 ft of piping ran from each of the eight buildings to three main sewer lines, and then proceeded to the septic system • The only piping that will be addressed by this CAS is the 20 ft length between Manhole No. 1 and the septic tank	
Other	• A leachfield bypass line indicates effluent was diverted from CAS 25-04-04 to a sewage lagoon • The line to the septic system is plugged approximately 20 ft upgradient of the septic tank • The ground slopes down sharply, south of the distribution box	
Sources within Control Point (Building 3101)	• 3 urinals • 2 floor drains • 3 water closets • 3 hand sinks • 1 service sink • 1 drinking fountain	Engineering drawings including: 3101-SW1.2 (BMEC, 1958a) 3101-SW3 (BMEC, 1958b) 3101-SW5 (BMEC, 1958c) 3101-SW6.1 (BMEC, 1958d) 3101-M5.4 (BMEC, 1958e)
Sources within Power House (Building 3102)	• 4 floor drains • 1 drinking fountain	Engineering drawings including: 25-CP-C1.1 (REECo, 1983a) 25-CP-C2 (REECo, 1983b) 25-CP-3 (REECo, 1983c)
Sources within Los Alamos Scientific Laboratory Warehouse (Building 3103)	Unknown waste disposal system	Unknown

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 3 of 16)

Conceptual Model Element	Assumptions	Source
Sources within Storage Building (Building 3106)	Unknown waste disposal system	Unknown
Sources within Administration Building (Building 3104)		Engineering drawings including: 3104-M2.3 (BMEC, 1958f)
Sources within Former Medical/ Cafeteria (Building 3105)	• 2 urinals • 1 dishwasher • 5 floor drains • 2 water closets • 5 sinks (4 hand, 1 two-compartment sink)	Engineering drawings including: 3105-M2.4 (BMEC, 1958g)
Sources within Service Station (Building 3107)	• 2 hand sinks • 1 floor drain • 2 water closets • 1 drinking fountain	Engineering drawings including: 3107-M2.3 (BMEC, 1958h)
Sources within Technical Services (Building 3123)	• 2 urinals • 1 shower drain • 7 sinks (1 service, 1 developer, 4 hand, 1 two-compartment sink) • 4 water closets • 2 drinking fountains • 1 print washer • 17 floor drains • 1 dip tank	Engineering drawings including: 3123-M1.2 (BMEC, 1959a), 3123-M2.1 (BMEC, 1959b)
COPCs within all buildings (except Building 3123)	• Lead • Oil and Grease • Diesel • 1,4 -dichlorobenzene	Process knowledge
COPCs within Technical Services (Building 3123)	• Photographic chemicals • Lead • Oil and Grease • Diesel • 1,4 -dichlorobenzene	
COPCs within the Sludge and Liquid in the Septic Tank, and Leachfield Soil	• Barium • Cadmium • Lead • Oil and grease • 1,4-dichlorobenzene • 1,2-dichloroethene • Diesel • Gasoline • PCBs	Process knowledge REECo, 1995 Radiological Surveys (IT, 2000)

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 4 of 16)

Conceptual Model Element	Assumptions	Source
CAS 25-04-10		
Release Information and System Location	This septic system received effluent generated from either one or two former Radiological Safety trailers. The septic system is located south of the former Building 3107 and east of the RCP.	Process knowledge Engineering drawings including: 25-CP-C1.1 (REECo, 1983a) 25-CP-C2 (REECo, 1983b)
Septic Tank	• Steel • 650-gal capacity • Approximately 10 x 5 ft • One separation chamber • Contents are dry, brittle, and red-brown in color, and contained skeletal remains of rodents and snakes	
Distribution Box	• Configuration has not been identified • Filled with gravel	
Leachfield	• Approximately 60 x 70 ft • Unknown depth and configuration • Leachfield soil was damp to moist, gravelly silt, and medium-brown in color	
Piping	• Approximately 70 ft of piping • Pipes are 4-in. VCP	
Other	• Miscellaneous debris including concrete, gravel, and a wooden pallet	
Source Location	Within one or two former Radiological Safety trailers	
Contaminants of Potential Concern	• 1,4-dichlorobenzene • Oil and grease • Barium • Mercury • Tetrachloroethylene • Plutonium-239	Process knowledge REECo, 1995

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 5 of 16)

Conceptual Model Element	Assumptions	Source
CAS 25-04-11		
Release Information and System Location	Sanitary effluent generated from Building 3127 (Cafeteria), Building 3129 (Technical Operations Building), approximately 18 Pan Am sleeping trailers, and approximately 48 LASL sleeping trailers. The septic system is located to the southwest of the RCP. The Pan Am trailers were connected to a different septic system (CAS 25-04-03) prior to being connected to the CAS 25-04-11 septic system.	Process knowledge Engineering drawings including: 25-CP-6 (REECo, 1988) 25-CP-C1.1 (REECo, 1983a) 25-CP-C2 (REECo, 1983b) 25-CP-C3 (REECo, 1983c) 3127-U1.3 (Zick and Sharp 1962) 400-004-C4.1 (H&N, 1962a)
Septic Tank	• Approximately 25 ft in length • Buried 3 ft in a north to south direction • 7,500-gal capacity • 3,500 gal of liquid and sludge in 1995 • Liquid appeared clear • Sludge was black and was 1.5-ft thick, and had a strong septage odor • Accessed by two manholes with 2-ft diameter covers • Corrugated metal piping with 3-ft diameter surrounds the manholes • Manholes are recessed 2 ft below ground surface	
Distribution Box	• Concrete • Approximately 5 x 5 ft • Damaged metal lid • Partially filled with rocks and soil • Located 5 ft south of the southern end of the septic tank	
Leachfield	• Approximately 200 x 135 ft • Unknown depth and configuration • Soil described in 1995 as damp to moist, gravelly sand with silt, medium-brown in color	
Manholes and Piping	• Four manholes lead from Building 3127 to the septic system • There are two additional manholes prior to reaching the septic tank • The manholes are used to access the 6-in. VCP • 4-in. VCP exits from each of the buildings and connects to a 6-in. VCP • The line to the septic system is bypassed a few feet upgradient of the septic tank inlet	
Other	• Not Applicable	N/A
Source Location	• Has not been identified	
Contaminants of Potential Concern	• 1,4-dichlorobenzene • Oil and grease • PCBs • Barium • Plutonium-238/239 • Tritium	Process knowledge REECo, 1995

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 6 of 16)

Conceptual Model Element	Assumptions	Source
CAS Facility Association: Guard Station 500		
CAS 25-04-01		
Release Information and System Location	The septic system received effluent from four former WSI trailers. The site is located south of the Guard Station at Gate 500.	Process knowledge Engineering drawings including: 25-WJ11-C1 (REECo, 1985) AUX-PAA-0112 (Pan Am, 1966) AUX-PAA-0009 (Pan Am, 1969)
Septic Tank	• 400-gal capacity • Accessed by manhole with 3-ft concrete cover • There were 50 gal of liquid and 1 ft of sludge in the tank in 1995 • Liquid contents were clear • Sludge contents were brown and viscous	
Leachfield	• Approximately 4 x 50 ft • Depth is unknown • Lined with gravel • One influent line and one effluent line	
Manholes and Piping	• As much as 112 ft of piping from the WSI trailers to the septic tank • There is 10 ft of piping between the septic tank and the leachfield • The diameter of the piping is unknown • There are no other access points other than the septic tank manhole	
Other	• A distribution box associated with a sewage treatment plant and an open ditch effluent drain located to the northeast of CAS 25-04-01 • These items are not associated with this CAS	
Source Location	• Four former WSI trailers	
Contaminants of Potential Concern	• 1,4-dichlorobenzene • Oil and grease • Barium • Mercury • Cesium-137	Process knowledge REECo, 1995

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 7 of 16)

Conceptual Model Element	Assumptions	Source
CAS Facility Association Engine Test Stand - 1		
CAS 25-04-09		
Release Information and System Location	The septic tank received effluent from Building 3340 (Test Cell Building), Building 3330 (Fill Station/Tank Farm and Forward Control Area), Building 3320 (Utility Equipment Building/Substation Area), Building 3319 (Maintenance and Supply Building/ Welding and Machine Shop), Building 3310 (Control Point Building), and 17 former trailers. The septic system is located to the south of the ETS-1.	Process knowledge Engineering drawings listed below
Septic Tank	• Steel • 7,500-gal capacity (also reported as having a 2,600-gal capacity) • One separation chamber • Two manhole covers to access tank • Concrete and piping debris were noted in the tank bottom • Contents were dry, cake-like, medium brown in color, and light in weight	Process knowledge Engineering drawings including: 25-ETS-1-C1 (REECo, 1984a) 25-ETS-1-C2 (REECo, 1984b) 25-ETS-1-C3 (REECo, 1984c) NRDS-SF-M/C-3 (SNPO, 1970a) NRDS-S.F.-F.L./C-1 (SNPO, 1970b) 550-3340-P-001 (SNPO, Date Unknown-a) 550-3330-P-001 (SNPO, Date Unknown-b) 550-3310-P-001 (SNPO, Date Unknown-c) 550-3310-P-002 (SNPO, Date Unknown-d) 510-3315-A-001 (SNPO, Date Unknown-e) 620-3300-C-001 (SNPO, Date Unknown-f) 3320-P1.1 (Aetron, 1961)
Leachfield	• Approximately 120 x 60 ft • One main distribution manifold • 10 vitrified clay distribution lines per side	
Manholes and Piping	• As many as four manholes • As much as 200 ft of 6-in. VCP pipe • Piping appears to be stubbed off 20 ft before the septic tank	
Other	• Miscellaneous debris including wood, metal, and clay piping litters the site • Piping was diverted upstream of the septic tank to two oxidation ponds located southwest of the leachfield sometime prior to 1984 • The oxidation ponds are currently in standby status and are approved as a dewatering site to receive only septage and portable toilet waste in accordance with the NTS Water Pollution Control Permit, GNEV 93001	
Source Location	• Toilets • Sinks • Floor drains • Sumps • Floor clean outs	
Contaminants of Potential Concern	• Barium • Cadmium • Mercury • PCBs • Oil and grease	Process knowledge REECo, 1995

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 8 of 16)

Conceptual Model Element	Assumptions	Source
CAS Facility Association Bren Tower		
CAS 25-04-08		
Release Information and System Location	This septic system is associated with the restroom trailer at the BREN Tower Trailer Park. The septic system is located northeast of BREN Tower.	Process knowledge Engineering drawings listed below
Septic Tank	• Concrete • Capacity is 760 gal • Dimensions are 5.8 x 9.0 x 4.8 ft • Moderate septage odor • Approximately 500 gal of liquid was present in 1995 • Contents were medium-brown in color	Process knowledge Engineering drawings including: JS-028-T2.8a-C5.2 (H&N, 1966a) JS-028-T2.8a-C7.2-M4.2 (H&N, 1966b) 25-WJ11-C1 (REECo, 1983d)
Distribution Box	• Located south of the septic tank	
Leachfield	• Dimensions are 15.0 x 60.0 x 4.0 ft • Three orangeburg, perforated pipes extend 60 ft from the distribution box	
Manholes and Piping	• Approximately 40 ft of effluent piping	
Other	• Not Applicable	
Source Location	• Restroom trailer at the BREN Tower Trailer Park	
Contaminants of Potential Concern	• TPH as oil and grease • Barium	Process knowledge REECo, 1995

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 9 of 16)

Conceptual Model Element	Assumptions	Source
CAS Facility Association Port Gaston		
CAS 26-03-01		
Release Information and System Location	A water reservoir was intentionally contaminated with short-lived radionuclides in 1981. The reservoir is located 800 ft south of the Port Gaston complex, and 400 ft southwest of a line of trailers.	Process knowledge
Reservoir	• Reservoir dimensions are 36 x 75 ft • Lined with black plastic • Soil is dry, light brown silt with no observable staining • Was used for NUWAX training • The reservoir was originally identified as a sewage lagoon	Site visit Process knowledge
Other	• Perched groundwater occurs in highly fractured and altered rock and may extend to a depth of 261 ft before encountering a low-permeable confining layer • Depth to perched groundwater ranges from 81 to 167 ft bgs	Johnson and Ege, 1964
Source	• From an agricultural spreader	Engineering drawings including: A26-5 (H&N, Date Unknown-a) SK-026-83E-C28 (H&N, Date Unknown-c) JS-026-002-C3 (H&N, 1980) JS-026-002-C1.1 (H&N, 1981) JS-026-002-C7 (H&N, 1983)
Contaminants of Potential Concern	• Radium-223 and mercury-197 were added to the reservoir; radium-226 as impurity • Due to the relatively short half-lives of these low-level radioactive materials, they are no longer expected to be detected in the reservoir • Radiological driveover survey showed no areas with surface contamination above the established range for area background	Process knowledge Mitchell, 1981 Radiological Surveys (IT, 2000)

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 10 of 16)

Conceptual Model Element	Assumptions	Source
CAS Facility Association Project Pluto		
CAS 26-04-01		
Release Information and System Location	This septic system received effluent generated from the Check Station (Building 2105). The septic system is located 30 ft from the intersection of Cane Springs Road and the Port Gaston Training Complex, and 200 ft west of Building 2105.	Process knowledge Engineering drawings including: 2105 M1 (BMEC, 1960a) 2105 M2 (BMEC, 1960b) 2105 SW2 (BMEC, 1960c) 2105 SW3 (BMEC, 1960d) 2105 SW4 (BMEC, 1960e) Johnson and Ege, 1964
Septic Tank	• Concrete • Capacity of 1,000 gal • Dimensions of tank are 10 x 5 x 6 ft • 400 gal of liquid remained in the tank in 1995	
Distribution Box	• Dimensions of box are 5 x 5 x 4.5 ft	
Leachfield	• Dimensions of the leachfield are 48 x 93 x 3 ft • Twelve 45-ft distribution lines, six on each side of the leachfield • Two distribution manifolds • 4-in. open-joint laterals, plugged at the ends	
Manholes and Piping	• Approximately 200 ft of piping	
Other	• An additional effluent line is identified with five floor drains connected to a VCP that drains by gravity into a diversion ditch northwest of Building 2105 • The diversion ditch and associated drain lines have not been addressed as a CAS, but will not be included in this CAS investigation • Perched groundwater occurs in highly fractured and altered rock and may extend to a depth of 261 ft before encountering a low-permeable confining layer • Depth to perched groundwater ranges from 81 to 167 ft bgs	
Source Location	• Two process lines • Process line one services a restroom facility, and four floor drains from the restroom and janitor's room	
Contaminants of Potential Concern	• Barium • 1,4-dichlorobenzene • TPH (as oil and grease) • Cesium-137	Process knowledge REECo, 1995

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 11 of 16)

Conceptual Model Element	Assumptions	Source
CAS 26-04-02		
Release Information and System Location	This septic system received effluent generated from the Hot Critical Facility (Building 2103). The septic system is located north of Building 2103.	Process knowledge Engineering drawings including: 2103-A1.A (BMEC, 1959c) 2103-M1.1 (BMEC, 1959d) 2101-SW4.1 (BMEC, 1959e) 2101-SW6.1 (BMEC, 1959f) Johnson and Ege, 1964
Septic Tank	• Concrete • Capacity of 650 gal • In 1995, an unspecified volume of solids remained in the tank	
Distribution Box	• Concrete • Dimensions of 4 x 5 x 5 ft	
Leachfield	• Dimensions of the leachfield are 24 x 73 ft • Two distribution manifolds • Four 35-ft distribution lines on each side of the manifold • 4-in. open-joint tiles, plugged at the ends • The depth of the gravel is a maximum of 3 ft below ground surface	
Manholes and Piping	• Approximately 100 ft of piping • 6-in. diameter VCP piping	
Other	• Influent and effluent lines of septic tank are sealed with concrete • Perched groundwater occurs in highly fractured and altered rock and may extend to a depth of 261 ft before encountering a low-permeable confining layer • Depth to perched groundwater ranges from 81 to 167 ft bgs	
Source Location	• 1 sink • 2 urinals • 1 toilet • 1 floor drain • 1 water cooler	
Contaminants of Potential Concern	• Beryllium • Barium • TPH (as oil and grease) • Cadmium • PCBs • Aged fission products	Process knowledge REECo, 1995

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
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Conceptual Model Element	Assumptions	Source
CAS 26-05-01		
Release Information and System Location	This leachfield received effluent generated from the 401 Maintenance Assembly and Disassembly Facility (Building 2201) and the Railcar Washdown (Building 2202). The leachfield is located 0.25 miles east of Building 2201.	Process knowledge Engineering drawings listed below
Septic Tank	• None	Process knowledge Engineering drawings including: 2201-SW1 (BMEC, 1958n) 2201-SW9 (BMEC, 1958u) 2201-SW7.A (BMEC, 1958s) 2201-SW2 (BMEC, 1958r) 2201-M16.A (BMEC, 1958m) 2201-SW8 (BMEC, 1958t) 2201-M3 (BMEC, 1958j) 2201-M5.1 (BMEC, 1958k) 2201-M6.4 (BMEC, 1958l) 2201-SW11.1 (BMEC, 1958v) Johnson and Ege, 1964
Distribution Box	• Concrete • Dimensions of 5 x 5 ft • Metal cover with a diameter of 2 ft • 4-in. vent pipe extends from the slab	
Leachfield	• Dimensions of the leachfield are 192 x 203 ft • Fifty 100-ft distribution lines (25 on each side) • 6-in. tile distribution lines have open joints • The depth of the leachfield is between 24 and 36 in. • The leachfield is fenced and locked • The piping and the leachfield are posted with signs reading “Underground Radioactive Material”	
Manholes and Piping	• 1,806 ft of 8-in. piping is present between Building 2201, Building 2202, and the leachfield • Four manholes	
Other	• Perched groundwater occurs in highly fractured and altered rock and may extend to a depth of 261 ft before encountering a low-permeable confining layer • Depth to perched groundwater ranges from 81 to 167 ft bgs	
Sources within Building 2201	• 36 “hot” waste lines • Drains in Rooms 1, 3, 101-104, 106, 107, and 109 • Culminated in a single line exiting the east side of Building 2201	
Sources within Building 2202	• One drain located between the rails of the 401 railroad • Drain is located on the east side of the washdown area	
Contaminants of Potential Concern	• Cesium-137 • Uranium-235 • Beryllium • Photo supplies and chemicals • Solvents • Alpha-emitting contaminants • Beta/Gamma-emitting contaminants	Process knowledge REECo, 1986

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 13 of 16)

Conceptual Model Element	Assumptions	Source
CAS 26-05-03		
Release Information and System Location	This septic system received effluent generated from the Test Bunker (Building 2203). The septic system is located 60 ft from the heat exchangers at the Test Bunker (Building 2203).	Process knowledge Engineering drawings listed below
Septic Tank	• Capacity of 1,500 gal • Dimensions of 10 x 5 x 4 ft • Located 10 ft from the diversion box (site visit indicates distance may be greater)	Process knowledge Engineering drawings including: 2203-SW1.1 (BMEC, 1960f) 2203-SW5 (BMEC, 1960g) 2203-M1.1 (BMEC, 1960h) A26-12 (H&N, Date Unknown-b) 2202A-C-10 (Norman Engineering Co., 1961) 2203A-A-1 (Norman Engineering Co., 1962) JS-026-2203-M4 (H&N, 1989b) JS-026-2203-M3 (H&N, 1989a) Radiological Surveys (IT, 2000) Johnson and Ege, 1964
Distribution Box	• Concrete • Dimensions are 5 x 5 ft • One vent pipe extends from the diversion box	
Leachfield	• Dimensions of the leachfield are 93 x 40 ft • The depth of the gravel is a maximum of 3 ft below ground surface • Posted as “Contaminated Area, Radiation Area, Caution Radioactive Material” • Two distribution manifolds • Twelve 45-ft distribution lines (six per side) • Distribution lines are 4-in. diameter and open-jointed	
Manholes and Piping	• Approximately 70 ft of 6-in. VCP or cast iron piping • One manhole or cleanout on line, adjacent to Building 2203	
Other	• Miscellaneous debris including a metal pipe, an antenna, a crushed bucket, and metal parts on a wooden pallet are located within the leachfield fence • The debris showed radioactivity readings above background levels • Perched groundwater occurs in highly fractured and altered rock and may extend to a depth of 261 ft before encountering a low-permeable confining layer • Depth to perched groundwater ranges from 81 to 167 ft bgs	
Source Location	• 2 toilets • 1 urinal • 2 sinks • 1 floor drain	
Contaminants of Potential Concern	Have not been identified	N/A

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 14 of 16)

Conceptual Model Element	Assumptions	Source
CAS 26-05-04		
Release Information and System Location	This septic system received effluent generated from the 401 Maintenance, Assembly, and Disassembly Facility (Building 2201). The septic system is located approximately 250 ft south of Building 2201.	Process knowledge Engineering drawings listed below
Septic Tank	• Capacity of tank is 4,300 gal • Two chambers • 8-in. metal ventilation pipe connects to the septic tank • Two or three access points	Process knowledge Engineering drawings including: 2201-SW1 (BMEC, 1958n) 2201-M16.A (BMEC, 1958m) 2201-M2 (BMEC, 1958i) 2201-SW4.A (BMEC, 1958o) 2201-SW5 (BMEC, 1958p) 2201-SW6 (BMEC, 1958q) Johnson and Ege, 1964
Distribution Box	• Dimensions are 5 x 5 ft	
Leachfield	• Dimensions of the leachfield are 64 x 83 ft • The fencing around the leachfield is 74 x 95 ft • The depth of the leachfield ranges from 24 to 36 in. • Eighteen 40-ft distribution lines • Lines placed in 18-in. wide trenches with gravel	
Manholes and Piping	• Two manholes with 2-ft diameter metal covers • Approximately 215 ft of piping between Building 2201 and the leachfield	
Other	• Perched groundwater occurs in highly fractured and altered rock and may extend to a depth of 261 ft before encountering a low-permeable confining layer • Depth to perched groundwater ranges from 81 to 167 ft bgs	
Source Location	• 23 drains from Rooms 2, 4, 110, 111, 112, 114, and 115 • 2 water closets • 2 lavatories • 1 service sink • 1 urinal	
Contaminants of Potential Concern	Have not been identified	N/A

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 15 of 16)

Conceptual Model Element	Assumptions	Source
CAS 26-05-05		
Release Information and System Location	This septic system received effluent generated from the Control Room (Building 2101), the Assembly Building (Building 2102), and the Data Reduction Building (Building 2107). The septic system is located north of Buildings 2101 and 2102, at base of hill.	Process knowledge Engineering drawings including: 2101-M1.2 (BMEC, 1960i) 2102-M1.1 (BMEC, 1959g) 2102-M2 (BMEC, 1959h) 401-2107-M2.1 (H&N, 1961b) 401-004-C1 (H&N, 1961a) 2101-SW4.1 (BMEC, 1959e)
Septic Tank	• The capacity of the tank is 1,430 gal • Septic tank is located 10 ft southeast of distribution box • U-shaped pipes ascend and descend from the ground between the three access points to an unknown underground structure.	
Distribution Box	• Concrete • Dimensions of the box are 5 x 5 ft	
Leachfield	• Dimensions of the known leachfield are 48 x 109 ft • Dimensions of the fencing around the leachfield are 175 x 115 ft • Actual leachfield may be larger than shown in engineering drawing • Fourteen 53-ft distribution lines (7 on each side) • Depth of leachfield base ranges from 24 to 36 ft bgs	
Manholes and Piping	• Manhole No. 1 is located 20 ft southeast of septic tank • Manhole No. 2 is located 80 ft south of Manhole No. 1 • 650 ft of collection system piping from buildings to septic system, consists of 4-, 6-, and 8-in. segments	Process knowledge Engineering drawings including: 2101-M1.2 (BMEC, 1960i) 2102-M1.1 (BMEC, 1959g) 2102-M2 (BMEC, 1959h) 401-2107-M2.1 (H&N, 1961b) 401-004-C1 (H&N, 1961a) 2101-SW4.1 (BMEC, 1959e) Johnson and Ege, 1964
Other	• Second distribution structure located in the center of the fenced leachfield does not appear on any engineering drawings • Perched groundwater occurs in highly fractured and altered rock and may extend to a depth of 261 ft before encountering a low-permeable confining layer • Depth to perched groundwater ranges from 81 to 167 ft bgs	
Sources within Building 2101	• 1 toilet • 1 urinal • 2 sinks (1 hand, 1 utility) • 5 floor drains	
Sources within Building 2102	• 1 toilet • 1 urinal • 1 shower • 4 sinks (2 hand, 1 utility, 1 laboratory) • 5 floor drains	
Source Location from Building 2107	• 4 toilets • 2 urinals • 4 sinks (3 hand, 1 utility) • 3 floor drains	
Contaminants of Potential Concern	Have not been identified	N/A

Table A.2-2
CAS-Specific CAU 271 Conceptual Model
(Page 16 of 16)

Conceptual Model Element	Assumptions	Source
CAS Facility Association Baker Site		
CAS 27-05-02		
Release Information and System Location	This septic system received effluent generated from the Cafeteria and/or Mess Hall (Building 5210), and from a Mechanical Technician Shop (Building 5200). The septic system is located southwest of Building 5210 and west of Building 5200.	Process knowledge
Septic Tank	• Capacity of 1,500 gal • Two access points	Engineering drawings including: 410-004-C10.2 (H&N, 1962b) 410-5210-M3.2 (H&N, 1962c) NV-35-33-02 (Moffitt & Hendricks, 1963) NN8814 (LRL, 1964)
Distribution Structure	• Five 4-in. VCP outlets • One 6-in. VCP inlet • Covered with a metal seal	
Leachfield	• Dimensions of the leachfield are 80 x 24 ft • The depth of the leachfield is at least 2.5 ft bgs • Gravel has been placed beneath the distribution lines • Five 4-in. orangeburg distribution lines extend from the manifold • The distribution lines are placed at 6-ft intervals	
Manholes and Piping	• None	
Other	• The septic system grade slopes toward a natural wash that borders the west edge of the septic system	
Sources within Building 5210	• 1 water closet • 1 urinal • 2 hand sinks • 4 floor drains • 1 can wash drain • 3 service sinks • 1 dishwasher	
Sources within Building 5200	• 1 water closet • 1 urinal • 1 hand sink • 1 floor drain • 1 service sink	
Contaminants of Potential Concern	Have not been identified	N/A

A.3.0 Potential Contaminants

Additional information on the COPCs for CAU 271, including PALs and quality assurance/ quality control requirements, are provided in Section 3.0 of either the Leachfield Work Plan or the CAIP.

Based on process knowledge developed during the preliminary assessment, radioactive, and chemical substances are COPCs for CAU 271. The septic/leachfield systems serviced buildings that were used for a variety of reactor testing and support activities. Activities within these buildings that likely contributed radioactive or chemical effluents to one or more of the CASs include:

- Film processing
- Decontamination
- Degreasing
- Radiochemistry
- Reactor assembly and disassembly

In general, process knowledge indicates that COPCs may be associated with:

- Organic solvents
- Hydrocarbons
- Paint
- Film processing agents
- Activation and fission products
- Beryllium at the Area 26 Project Pluto sites
- Ra-223, Hg-197, and associated isotopic impurities at CAS 26-03-01

Analytical results have been reported for several previous sampling efforts at CAU 271 sites. The primary source of existing data is the *Preliminary Characterization of Abandoned Septic Tank Systems* (REECo, 1995). This effort collected biased soil samples and samples of septic tank contents from nine of the CASs. Samples were analyzed for VOCs, SVOCs, RCRA metals, oil and grease, TPH, PCBs, gamma-emitting radionuclides, isotopic plutonium, and tritium. The detected COPCs were as follows:

- Area 25, RCP Septic Systems - VOCs, SVOCs, RCRA metals, and TPH (in some cases as oil and grease). In addition, PCBs at CASs 25-04-03, 25-04-04, and 25-04-11; and plutonium-238/239 at CASs 25-04-10 and 25-04-11.

- Area 25, Guard Station 500 Septic System - VOCs, SVOCs, RCRA Metals, TPH (as oil and grease), and cesium-137.

- Area 25, BREN Tower Septic System - RCRA metals and TPH (as oil and grease).

- Area 25, ETS-1 Septic System - RCRA Metals, TPH (as oil and grease), PCBs, and cesium-137.

- Area 26, Project Pluto Septic Systems - VOCs, SVOCs, RCRA metals, TPH, and cesium-137 at CAS 26-04-01; and RCRA metals, beryllium, TPH (as oil and grease), and PCBs at CAS 26-04-02.

Previous sampling activities at the Project Pluto radioactive leachfield (CAS 26-05-01) have identified relatively low activity concentrations of cesium-137, and uranium-235 in leachfield soils (REECo, 1986). It appears that the soil samples were analyzed only for gamma-emitting radionuclides.

Important considerations in defining the analytical program for CAU 271 are the following:

- The primary driver for selection of analytes is the process knowledge and information from previous characterization efforts presented above.

- The contents of septic tanks will be analyzed for a comprehensive suite of COPCs because, in general, worst-case concentrations should be obtained from septic tank samples. This is supported by the 1995 REECo characterization effort: during which COPCs were observed in samples from the septic tanks but generally not in samples of leachfield soil.

- The analytical program will be relatively more comprehensive for CASs with no existing characterization data and/or limited process knowledge (applies to CASs 26-05-03, 26-05-04, 26-05-05, and 27-05-02).

Samples of septic tank contents will be analyzed on site for coliform bacteria prior to submission of samples to an off-site laboratory. Following coliform analysis, samples of sludge or dried sludge from septic tanks will be submitted for laboratory analysis of the following COPCs to determine if potentially hazardous, radioactive, or hydrocarbon materials are present:

- Total VOCs
- Total SVOCs
- Total RCRA metals
- TPH (diesel range-organics [DRO] and gasoline-range organics [GRO])
- TCLP VOCs
- TCLP SVOCs
- TCLP RCRA metals
- Gamma-emitting radionuclides
- Isotopic plutonium
- Isotopic uranium
- Strontium-90
- Tritium

In addition, sludge or dried sludge samples from septic tanks at selected CASs will also be submitted for analysis of the following COPCs:

- PCBs (CASs 25-04-04, 25-04-09, 25-04-11, 26-04-02, 26-05-03, 26-05-04, 26-05-05, and 27-05-02)

- Total beryllium (CASs 26-04-01, 26-04-02, 26-05-03, 26-05-04, and 26-05-05).

Liquid samples from septic tanks, if available, will be submitted for laboratory analysis of the following COPCs to determine if potentially hazardous, radioactive, or hydrocarbon materials are present:

- Total VOCs
- Total SVOCs
- Total RCRA metals
- TPH (DRO and GRO)
- Gamma-emitting radionuclides
- Isotopic plutonium
- Isotopic uranium
- Strontium-90
- Tritium

In addition, liquid samples from septic tanks at selected CASs will also be submitted for analysis of the following COPCs:

- PCBs (CASs 25-04-04, 25-04-09, 25-04-11, 26-04-02, 26-05-03, 26-05-04, 26-05-05, and 27-05-02)
- Total beryllium (CASs 26-04-01, 26-04-02, 26-05-03, 26-05-04, and 26-05-05)

Soil samples collected from leachfields and other locations associated with system components will be submitted for laboratory analysis of the following COPCs:

- Total VOCs
- Total SVOCs
- Total RCRA metals
- TPH (DRO and GRO)

In addition, soil samples at selected CASs will also be submitted for analysis of the following COPCs:

- PCBs (CASs 25-04-04, 25-04-09, 25-04-11, 26-04-02, 26-05-01, 26-05-03, 26-05-04, 26-05-05, and 27-05-02)
- Total beryllium (CASs 26-04-01, 26-04-02, 26-05-01, 26-05-03, 26-05-04, and 26-05-05)
- TCLP Metals (CASs 26-05-01 and 26-05-03) at the discretion of the Site Supervisor

At least 25 percent (with exceptions in parentheses) of soil samples submitted for laboratory analysis will be analyzed for the following COPCs to determine if radioactive materials are present:

- Gamma-emitting radionuclides (100 percent for CASs 25-04-01, 26-04-02, 26-05-01, and 26-05-03)
- Isotopic uranium (100 percent for CASs 26-04-02, 26-05-01, and 26-05-03)
- Isotopic plutonium (100 percent for CASs 25-04-10, 26-05-01, and 26-05-03)
- Strontium-90 (100 percent for CASs 26-04-02, 26-05-01, and 26-05-03)

Sediment samples may be obtained from collection system lines (Section A.5.5). The list of analytes for these samples would be contingent on the results of septic tank sampling (if data are available), previous characterization (e.g., REECo, 1986 and 1995), and field-screening results.

To assist in selection of samples for submission to an off-site laboratory, 100 percent of soil samples from the Port Gaston Training Area water reservoir (CAS 26-03-01) will be analyzed on site for gamma-emitting radionuclides by gamma spectrometry. Twenty-five percent of the soil samples from CAS 26-03-01 will be submitted for laboratory analysis of the following COPCs:

- Gamma-emitting radionuclides
- Total VOCs (subsurface soil samples only)
- Total SVOCs
- Total RCRA metals
- Total pesticides
- Total herbicides
- TPH (DRO and GRO)

All laboratory analyses discussed in this chapter will be conducted according to Table 3-1 of the Leachfield Work Plan or as specified in the 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 sites.
- 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 or other applicable action level at site?	Potential contaminant identification	Previous sampling efforts (See Table A.2-2 and Section A.3.0 for COPCs generated by CAS-specific sampling efforts when applicable)	Not all septic systems sampled	Collect laboratory samples; analyze for COPCs
	Potential contaminant concentration	Previous sampling efforts (See Table A.2-2 and Section A.3.0 for COPCs generated by CAS-specific sampling efforts when applicable)	Unsampled components and septic systems Do concentrations exceed PALs or other applicable action level?	Collect samples from unsampled components and soil; perform field screening; submit samples for laboratory analysis from biased or biased and random locations that represent worst case for contamination and confirmatory clean locations; compare results to FSLs, to PALs, or to other applicable action level
	Potential contaminant distribution	Locations of most septic systems components are known with some degree of certainty; vertical and lateral extent limited by removal of source and limited driving force and mobility of COPCs	Vertical and lateral extent of COPCs Not all septic systems have adequate drawings to indicate leachfield configuration Only one grab sample from CAS 26-03-01 reservoir	Excavation to investigate collection system, septic tank, and distribution box piping as needed; collect samples at and from inside septic tanks and distribution boxes; collect samples from leachfields. Use excavation or drilling to establish worst case depth of COPCs; collect additional samples from excavations or drill stepout borings, as required, to determine lateral extent if COPCs are detected near leachfield boundaries; 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; general weather and wind speed and direction noted on daily field logs
	Geologic/hydrologic data	General geologic/hydrologic characteristics of site; specific geologic conditions of nearby sites (i.e., CAUs 261/266/500)	Existence and characteristics of differing permeability zones	Collect and analyze geotechnical sample for each site
	Biological degradation factors	Potential hydrocarbons release	Presence of biomass; biological parameters to evaluate natural biological process	No specific data collection anticipated; bioassessment samples may be collected based on site conditions
	Radioactive decay	Radionuclides were intentionally discharged or released to the CAS 26-05-01 leachfield and 26-03-01 reservoir. Previous sampling efforts identified radioactive COPCs for several CAU 271 septic systems. Record of radioactivity discharged per unit volume to CAS 26-03-01 reservoir was located. Significant radioactive decay of short-lived radionuclides has occurred at CAS 26-03-01	Presence and type of radionuclides	Establish background; field screen for radiation using alpha/beta scintillometer (i.e., Electra) to guide collection of samples for radiological COPCs analysis based on field-screening results; additional measurement techniques may be employed as feasible

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

Decision	Input	Existing Data	Data Gap	Strategy
Data sufficient to support closure options?	No further action	Historical evidence that COPCs were released to the environment at several CASs; assume no actions	Presence, concentration, and extent of COPCs	Insufficient evidence to proceed without investigation; collect field and laboratory samples; compare results to PALs; if no COPCs above PALs, prepare CADD/Closure Report
	Closure in place	Potential for radiological, RCRA, and/or TPH constituents; PALs are isotope-specific, maximum background radioactivity levels, Industrial PRGs, and 100 parts per million (ppm) TPH per NAC 445A (NAC, 2000); assume use restrictions	Presence, concentration, and extent of COPCs; volume and total activity of radiologically contaminated material above PALs	Collect field and laboratory samples; compare results to PALs; if no COPCs above PALs, prepare CADD/Closure Report; otherwise prepare CADD
	In situ bioremediation	Potential for RCRA, and TPH constituents; Industrial PRGs, and 100 ppm TPH per NAC 445A (NAC, 2000)	Presence, concentration, and extent of COPCs; biodegradation parameters	Collect field and laboratory samples; compare results to PALs; if no COPCs above PALs, prepare CADD/Closure Report; otherwise prepare CADD
	Clean closure by contaminant removal	Potential for radiological, RCRA, and TPH constituents; PALs are isotope-specific, maximum background radioactivity levels, Industrial PRGs, and 100 ppm TPH per NAC 445A (NAC, 2000)	Presence, concentration, and extent of COPCs; volume of contaminated material above PALs	Collect field and laboratory samples; compare results to PALs; if no COPCs above PALs, prepare CADD/Closure Report; otherwise prepare CADD

A.5.0 Investigation Strategy

The CAU 271 septic systems and leachfields will be investigated using the basic technical approach provided in the Leachfield Work Plan, with site-specific modifications as required. The Port Gaston Training Area water reservoir will be investigated using a site-specific approach.

All soil and sediment/sludge samples will be field screened for VOCs and radioactivity. Soil samples may be screened for TPH if mixed waste is not generated during the procedure. Samples will be analyzed according to Section A.3.0. Samples will be collected from septic tanks, distribution structures, access points in collection systems (if appropriate, accessible, and adequate material is present), and from soil underlying the leachrock/native soil interface in leachfields. In accordance with the Leachfield Work Plan, soil samples will be collected from both the outfall and inlet ends of septic tanks and the outlet end of distribution structures. Soil samples may also be collected from the upstream end of known breaks in discharge or outfall lines. Septic tank contents will be tested in the field for coliform bacteria. If testing confirms the presence of fecal coliforms, limited addition testing may be warranted.

The investigation strategy for septic/leachfield systems is dependent on the COPCs and several leachfield characteristics. The characteristics include leachfield size and design, availability of engineering plans for the leachfields, and radiological posting status. Based on COPCs and leachfield characteristics, individual septic/leachfield CASs were categorized and then grouped into either simple or complex systems as shown in Table A.5-1.

Complex systems were further categorized as radiologically posted or nonradiologically posted leachfields. Complex systems with radiologically posted leachfields will be investigated using an initial phase of *in situ* radiation measurement at the leachfields followed by biased and random sample collection using excavation, with drilling as a contingency. Complex systems without radiologically posted leachfields will be investigated by biased and random sampling using excavation. Simple systems will be investigated by biased sampling using excavation. Drilling may be used to augment excavation throughout the investigation if required to determine the maximum vertical extent of potential contamination. Contingencies will be developed in the

Table A.5-1
CAU 271 CAS Grouping Summary

Group	CAS	Leachfield Size	Radiological Postings	Leachfield Configuration
Simple	25-04-01	Small	No	Known
	25-04-08	Small	No	Known
	26-04-01	Intermediate	No	Known
	26-04-02	Intermediate	No	Known
	27-05-02	Intermediate	No	Known
Complex	25-04-03	Large	No	Perimeter Only
	25-04-04	Large	No	Known
	25-04-09	Large	No	Known
	25-04-10	Large	No	Perimeter Only
	25-04-11	Large	No	Perimeter Only
	26-05-04	Large	No	Known
	26-05-05	Large	No	Uncertain
Complex Radiologically Posted	26-05-01	Large	Yes	Known
	26-05-03	Intermediate	Yes	Known
Dry Reservoir	26-03-01	Not Applicable	No	Not Applicable

Leachfield Size:

Small - less than 200 linear feet of leachfield pipe, with 5 or fewer laterals
Intermediate - between 200 and 600 linear feet of leachfield pipe
Large - greater than 600 linear feet of leachfield pipe

Leachfield Configuration:

Known - Engineering drawings, in most cases as-builts, showing the dimensions and construction details of the leachfield system are available.
Perimeter Only - Only the location and size of the leachfield are shown on available drawings.
Uncertain - Fenced area assumed to represent leachfield perimeter is significantly larger than leachfield shown on as-built engineering drawing.

CAIP to address the possibility of leachfield configurations differing from the configurations shown on engineering drawings. This sampling strategy will ensure that contamination in the soil has been adequately located, identified, and quantified.

The Port Gaston Training Area water reservoir (CAS 26-03-01) will be investigated using a combination of surface soil sampling above the plastic liner and shallow subsurface soil sample collection using drilling or direct-push technology below the liner.

A.5.1 Sampling Complex Radiologically Posted Systems

Based on data identified during the preliminary assessment, the Project Pluto leachfield (CAS 26-05-01) and Project Pluto Test Bunker septic system (CAS 26-05-03) may contain significant radiological contamination. The radioactivity of soil to be sampled will be determined using *in situ* radiation measurements. Sample collection from these CASs is contingent upon the radioactivity of the soil to be sampled. Samples that are too radioactive to practically handle, transport, or submit for analysis may not be collected. The total number of samples submitted for off-site quantitative analysis may be significantly reduced based on these considerations.

Excavation, with drilling as a contingency, will be used to collect samples from CASs 26-05-01 and 26-05-03. Biased and random sampling will be conducted during the field investigation to assess the presence and extent of COPCs and to determine if COPC concentrations exceed PALs for each site. At selected locations sampled by excavation, *in situ* evaluation of subsurface radioactivity levels will occur prior to excavation. Contingencies will be developed to address uncertainties in radioactivity levels and the impact on the intrusive investigation.

Biased sampling will ensure that samples are collected from locations with the greatest potential for contamination. Biased sampling locations will include the following:

- Below the base of the septic tank, at the inlet and outfall ends (CAS 26-05-03 only)
- Below the base of distribution structures, at the outlet end
- Initial discharge points in the two proximal leachfield distribution lines
- Four corners of the leachfield
- Area between the distribution manifold ends

- Center of the leachfield
- Center of each half of the leachfield

Additional locations will be selected randomly within the area of the leachfield to ensure adequate sampling locations have been considered. The number of random locations is addressed in Section A.7.2. Drilling will be conducted if excavation sampling fails to determine the maximum vertical extent of potential contamination.

Sampling of materials within the septic tank at CAS 26-05-03 and the distribution structures present at both CASs will follow the approach presented in Section A.5.2 for complex sanitary systems.

A.5.2 Sampling Complex Systems

Seven CASs (Table A.5-1) were grouped as complex systems without radiologically posted leachfields. They were categorized as complex systems because of a relatively large leachfield and, in some cases, an unknown leachfield configuration (i.e., documentation and field observation could not determine the leachfield extent and exact location).

Excavation will be the primary sampling method for complex septic systems. Biased and random sampling will be conducted during the field investigation to assess the presence and extent of COPCs and determine if COPC concentrations exceed PALs for each site. Excavations will be located based on system dynamics and statistical analysis. Biased excavation locations will include the following:

- Below the base of the septic tank, at the inlet and outfall ends
- Below the base of distribution structures, at the outlet end
- Initial discharge points in the two proximal distribution lines
- Area between the distribution manifold ends
- Four corners of the leachfield
- Center of the leachfield
- Center of each half of the leachfield

Additional locations will be selected randomly within the area of the leachfield to ensure adequate sampling locations have been considered. The number of random locations are addressed in

Section A.7.2. Drilling will be conducted if excavation sampling fails to determine the maximum vertical extent of potential contamination.

At each site, a sample of each distinct phase (i.e., liquid, sludge, or residue) contained within the septic tank will be collected. Samples may also be obtained from distribution structures and access points in collection systems, provided materials are accessible and present in adequate volumes. Material such as rodent droppings or gravel that is clearly not related to the operation of the system will not be sampled.

A.5.3 Sampling Simple Systems

Five CASs (Table A.5-1) were categorized as simple systems because the leachfields are relatively small-sized and their configurations are known from engineering plans. Overall, the investigative approach is very similar to that described in Section A.5.2 for complex systems. However, because the leachfields are relatively small and the configurations are known from engineering drawings, characterization of simple systems does not require sampling at random locations.

Excavation will be the primary sampling method for simple septic systems. Biased sampling will be conducted during the field investigation to assess the presence and extent of COPCs and determine if COPC concentrations exceed PALs for each site. Drilling will be conducted if excavation sampling fails to determine the maximum vertical extent of potential contamination.

Excavations will be located based on system dynamics. Biased excavation locations for CASs 26-04-01 and 26-04-02 will include the following:

- Below the base of the septic tank, at the inlet and outfall ends
- Below the base of distribution structures, at the outlet end
- Initial discharge points in the two proximal distribution lines
- Area between the distribution manifold ends
- Four corners of each leachfield
- Center of each leachfield
- Center of each half of the leachfield

The design of leachfields at CASs 25-04-01, 25-04-08, and 27-05-02 are not typical compared to other CAU 271 septic systems. Engineering drawings show that the leachfield at CAS 25-04-01 consists of a single distribution line. Biased excavation locations for this site will include the following:

- Below the base of the septic tank, at the inlet and outfall ends
- Initial discharge point in the single distribution line
- Midpoint of the single distribution line
- End of the single distribution line

Engineering drawings for CAS 25-04-08 indicate the leachfield consists of three parallel distribution lines emanating from a distribution structure. Biased excavation locations for this CAS will include the following:

- Inlet and outfall ends of the septic tank
- Initial discharge point in each distribution line
- End of each distribution line
- Center of the leachfield

Engineering drawings for CAS 27-05-02 indicate the leachfield consists of five parallel distribution lines emanating from a distribution structure. Leachfield soil sampling will focus on three of the five distribution lines. Biased excavation locations for this CAS will include the following:

- Inlet and outfall ends of the septic tank
- Initial discharge point in three distribution lines (center line and line on each edge of leachfield)
- End of three distribution lines (center line and line on each edge of leachfield)
- Center of the leachfield

Because the CAS 27-05-02 leachfield is adjacent to a small wash (Table A.2-2), at least one sediment sample will be collected from the wash near the downstream edge of the leachfield.

At each site, a sample of each distinct phase (i.e., liquid, sludge, or residue) contained within the septic tank will be collected. Samples may also be obtained from distribution structures and access points in collection systems, provided materials are accessible and present in adequate volumes. Material such as rodent droppings or gravel that is clearly not related to the operation of the system will not be sampled.

A.5.4 Sampling Port Gaston Training Area Water Reservoir

Corrective Action Site 26-03-01 is a lined water reservoir in the Port Gaston Training Area of Area 26. The reservoir is presently dry; a layer of soil covers the black plastic liner.

Biased sampling locations at CAS 26-03-01 will include: (1) the lowest point in the reservoir, and (2) the approximate location of the maximum radiological measurement observed by ITLV personnel during a driveover survey of the reservoir (IT, 2000). The location of the lowest point will be determined visually by the Site Supervisor. Biased samples may also be collected from locations where staining or other indication of potential contamination is observed.

Additional locations will be selected randomly within the reservoir to ensure adequate sampling locations have been considered. The number of random locations is addressed in Section A.7.2.

At each sampling location, a minimum of two samples will be collected: (1) a surface soil sample from the material above the liner, and (2) subsurface soil sample below the liner. Surface soil samples may be collected by hand; subsurface soil samples will be collected by drilling or direct-push technology.

A.5.5 Limited Collection System Pipe Inspections

The CAU 271 field investigation will be conducted in a phased manner to utilize data from septic tank sampling to support decisions regarding the inspection of collection systems. The strategy for inspection of collection systems is the following:

- For all septic system CASs (except CASs 26-05-01 and 26-05-03), portions of collection system lines may be inspected using a video survey. Access points will be via cleanouts and manholes, whenever possible. If access points are not available, the lines may be excavated at strategic locations such as the midpoint. If sediment is present at inspection locations in sufficient volume, it may be sampled and analyzed for the chemical and radiological parameters provided in Section A.3.0, at the discretion of the Site Supervisor. Where possible, inspection of collection system lines will include field screening for radioactivity. Swipes may also be obtained for radiological characterization.

- Portions of the Project Pluto posted leachfield collection system (CAS 26-05-01) may be inspected using a video survey and/or *in situ* radiation measurements, as described in Section 4.1.1.4 of the Leachfield Work Plan. The *in situ* radiation measurements are designed to determine if the pipes meet free-release criteria. Available access points are the floor drain at the railcar washdown building (Building 2202) and four manholes located along the collection line. If sediment is present at inspection locations in sufficient volume, it may be sampled and analyzed for the chemical and radiological parameters provided in Section A.3.0, at the discretion of the Site Supervisor. Swipes may also be obtained for radiological characterization.

- Portions of the collection lines for the Pluto Test Bunker sanitary system (CAS 26-05-03) may be inspected using a video survey and/or *in situ* radiation measurements as described in Section 4.1.1.4 of the Leachfield Work Plan. The *in situ* radiation measurements are designed to determine if the pipes meet free-release criteria. Access points are a small manhole near the Test Bunker (Building 2203) and possibly the distribution structure. If sediment is present at inspection locations in sufficient volume, it may be sampled and analyzed for the chemical and radiological parameters provided in Section A.3.0, at the discretion of the Site Supervisor. Swipes may also be obtained for radiological characterization.

A.5.6 Additional Sampling

If field-screening levels are exceeded at a location along the edge of a leachfield, stepout boreholes or excavations may be required to define the lateral extent of contamination. A location along the edge of a leachfield is defined as any soil sample location within 15 ft of a leachfield boundary, as delineated by the four corner sampling locations. Stepouts would be located 15 ft horizontally from the original location where field-screening levels were exceeded. The stepout locations would be arranged in a triangular pattern, with the original location as one corner of the triangle. Sample depths at stepouts would be at least as deep as the depth of the sample interval exceeding field-screening levels.

Development of background concentration ranges may be required for certain metal and radiological COPCs. However, it is expected that site-specific background data will not be required, because PALs are available for comparison to site sampling results. The PALs are based on regulatory limits or have been developed from NTS-region background data. However, if required, background samples may be collected as part of this investigation.

Bioassessment samples may be collected according to the Leachfield Work Plan at the Site Supervisor's discretion. Need for bioassessment samples will be based on the nature of contamination established during the field investigation (i.e., extensive VOC contamination).

At least one geotechnical sample will be collected from soil underlying each of the leachfields and the CAS 26-03-01 reservoir according to Section 3.2.1 of the Leachfield Work Plan. Additional samples may be collected at the discretion of the Site Supervisor. Geotechnical samples will be analyzed using the methods in Table 3-2 of the Leachfield Work Plan to measure the following parameters:

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

A.6.0 Decision Rules

The following decision rules will be used to guide the investigation and subsequent data evaluation for CAU 271:

- If, in the course of the investigation, either of the following occur, then the investigation will be halted and rescoped, as necessary:
  - The conceptual model fails to such a degree that rescoping is required
  - Sufficient data are collected to support evaluation of corrective actions
- If field screening indicates no COPCs above FSLs, then a sample at the next prescribed subsurface location will be field screened. If no COPCs are indicated, a confirmatory laboratory sample will be submitted. The submitted sample will be the initial (or uppermost) interval with no field screening indication of COPCs.
- If field screening indicates the presence of COPCs above FSLs, then the investigation will continue to determine extent of COPCs until two consecutive samples are recovered with field-screening results below FSLs. One of these two samples will be submitted for confirmatory laboratory analysis. Sample depth may be limited by maximum practicable excavation or drilling depth. At the discretion of the Site Supervisor, a sample from the subsurface interval representing the worst-case, field-screening result will also be submitted for laboratory analysis. Some worst-case samples may not be submitted due to transportation or laboratory limitations. Additional samples may be required for waste management purposes.
- If laboratory results indicate the presence of contaminants of concern above PALs, then a CADD will be prepared. Potential corrective actions may be CAS-specific.
- If no COPCs are identified above PALs, then a CADD/Closure Report will be prepared according to the outline agreed upon by NDEP and DOE/NV. This type of CADD incorporates the elements of the regular CADD and the corrective action plan and serves as the closure report for the site. Recommendations of no further action may be CAS-specific.

For the Port Gaston Training Area water reservoir (CAS 26-03-01), surface soil samples from all locations will be collected and analyzed by on-site gamma spectrometry. Subsurface soil sampling and field screening will follow the decision rules described above, and all samples collected for analysis will undergo on-site gamma spectrometry. As indicated in Section A.3.0, 25 percent of the total samples collected for analysis from CAS 26-03-01 will be submitted for off-site confirmatory analysis.

Table A.6-1 provides additional decision points and rules.

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

Investigation Activity	Decision Point	Decision Result	Decision Rule
Locate System Components	Are septic tank, distribution structure, and collection system manhole(s) identified and accessible?	Yes	No additional exploration required.
		No	Excavate to locate component. Excavate as required to provide access to component. Assess impact of not sampling component, and obtain sample from alternate location, if possible. Justification for any omissions will be provided in the CADD.
Sampling	Can required samples be recovered?	Yes	Collect samples as required.
		No	Justification for any omissions will be provided in the CADD. For septic tanks and distribution structures, obtain swipes from interior for radiological characterization. Samples or swipes may not be taken from a tank or distribution structure that is filled with soil, concrete, or other material unrelated to system operation.
	Are field data above FSLs?	Yes	Submit samples (e.g., highest FSL and confirmatory clean sample) to laboratory for confirmation as required. Collect additional samples from depths not exceeding 50 ft bgs or using stepouts as required. If contamination extends below 50 ft bgs, DOE/NV and NDEP will be notified and a suitable course of action will be negotiated.
		No	Submit at least one sample from each sampling location to laboratory for confirmation as required.
	Is sample too radioactive for feasible transportation or analysis?	Yes	Collect sample from similar depth or location that can be feasibly transported and analyzed. Note field-screening measurements of original sample.
		No	Submit sample to laboratory as planned.
	Do COPCs exceed PALs?	Yes	Prepare CADD. Additional sampling may be required. Potential corrective actions may be CAS-specific.
		No	Prepare CADD/CR. Recommendations of no further action may be CAS-specific.

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

Investigation Activity	Decision Point	Decision Result	Decision Rule
Leachfield Investigation	Can the leachfield be located?	Yes	Sample soil underlying leachfield via excavation (with drilling as a contingency). Collect biased soil samples from all leachfields. Additionally, at leachfields categorized as complex, collect soil samples from random locations.
		In Part	Configuration or dimensions are not as anticipated. Sample soil underlying known leachfield. Conduct an intrusive investigation (excavation or drilling, as required) at known or assumed leachfield perimeter to visually confirm absence/presence of installed leachfield material.
		No	Leachfield may never have existed. Resume intrusive investigation, as required, if existence of leachfield is confirmed and configuration and dimensions are established. Justification for any omissions will be provided in the CADD.
Collection System Pipe Investigation	Can the collection system pipes be located?	Yes	Conduct inspection of collection system pipes in accordance with strategy provided in Section A.5.5.
		No	Justification for any omissions will be provided in the CADD.
	Is pipe sediment sample or swipe collection practical?	Yes, sediment is present	Collect sediment samples.
		Yes, sediment not present	Collect swipes for radiological characterization.
		No	COPCs detected in the septic tank, distribution structure, or leachfield will be attributed to the contents of piping.
	Do inspected collection system pipes meet free-release criteria? (CASs 26-05-01 and 26-05-03).	Yes	Discuss rationale for free-release determination in CADD.
		No	Continued free-release determination is unnecessary for portions of the collection system known to exceed free-release criteria. Disposition of pipes will be addressed in CADD.

A.7.0 Decision Error

As described in Section A.5.0, biased or a combination of random and biased sampling strategy will be employed for the CAU 271 sites. Biased sampling is appropriate because the system component locations are either known, will be located through exploratory surveys, or can be reasonably assumed. Random sampling, in addition to biased, will be conducted for leachfields with large numbers of distribution lines to reduce redundant sampling results while maximizing confidence that the leachfields have been adequately investigated.

Table A.6-1 describes actions if specific component locations cannot be identified.

A.7.1 Biased Sampling Strategies

The biased sampling strategies either require samples associated with distribution lines or target the worst-case contamination by concentrating leachfield system sampling at points with the highest potential for contamination. Biased sampling ensures that the extent of the contamination has been adequately located and identified. At least one sample with field-screening results below FSLs will be obtained from the predetermined sampling locations to define the lower limit of the impact (if any) on soils produced by effluent disposal. Field-screening results will be confirmed by off-site laboratory analysis of samples as described in Section A.6.0. Biased samples will be collected from all CASs addressed by CAU 271.

A.7.2 Random Sampling Strategy

This section presents the random sampling strategies developed for complex leachfields and the Port Gaston Training Area water reservoir (CAS 26-03-01).

A.7.2.1 Leachfields

Random sampling will be employed for investigation of leachfields categorized as complex (see Section A.5.0). The methodology developed for random sampling of CAU 262 leachfields will also be used for this investigation. The random sampling approach will ensure coverage of the potentially contaminated areas at leachfields where soil samples are not directly associated with each distribution line. The number of samples required to characterize the sites to a predetermined level of confidence were calculated using Equation 8 from Chapter 9 of SW-846 (EPA, 1996), with a confidence level and acceptable sampling error agreed to by the DOE/NV and the NDEP.

The equation below, modified from Equation 8, Chapter 9 of SW-846, gives the number of samples, n, required to determine the mean value of a given parameter to within a specified relative percent error, e_r, with a confidence limit of 90 percent, using an analytical method with a specified coefficient of variation (CV), as:

$$n = \left(t_{0.90,\, n-1} \frac{CV}{e_r} \right)^2$$

where “t” is the one-tailed 90 percent Student’s “t” value for the appropriate number of degrees of freedom (n-1).

The CV in the above equation refers to the variability of the specific parameter in the medium being sampled. Its value cannot be determined until sufficient samples from the site have been analyzed. However, in the absence of sufficient data regarding the soil variability of COPCs at CAU 271, some assumptions must be made:

- The variability of the analytical method may be used as a first approximation of the variability of the contaminant distribution in the soil. This is probably a reasonable assumption for chemical contaminants, which are likely to have been deposited from a solution, thus leading to a somewhat uniform distribution.

- Table A.7-1 shows the average CVs for several chemical methods, as determined from the individual procedures in SW-846.

- For radiological contaminants, higher average CVs should be considered. Radiological contaminants are typically particulate in nature and are thus likely to be less uniformly distributed in the medium under investigation, leading to high variability.

Table A.7-1
Average Coefficients of Variation

SW-846 Method	Parameter Measured	% CV
6010B	Metals	21.3
7470A/7471A	Mercury	69.5
8260B	VOCs	7.5
8270C	SVOCs	9.1
8081A	Pesticides	70.1
8082	PCBs	29.7

For CAU 271, a CV of 50 percent will be assumed. This figure represents a compromise between the very high CVs of the pesticides and the extremely low CVs of the VOCs and SVOCs. It is an acceptable starting point for the purposes of Equation 8.

A relative error of 10 to 20 percent from the true mean at a confidence limit of 90 percent is considered acceptable for planned removal and remedial response studies (EPA, 1989). A relative error of 15 percent will be specified for this site. Substituting the appropriate values for "t" (Taylor, 1990), CV (50 percent) and e_r (15 percent) into this equation and iterating the equation several times gives n = 20. Twenty random sample locations will be sampled in addition to the biased sample locations.

A.7.2.2 Port Gaston Training Area Water Reservoir

The number of random samples required to characterize COPC concentrations at the CAS 26-03-01 reservoir was calculated using statistical methodology developed in *Statistical Methods for Environmental Pollution Monitoring* (Gilbert, 1987). Equation 4.11 of Gilbert (1987) gives the number of samples, n, required to determine the mean value of a given parameter to within a specified relative percent error, e_r, with a confidence limit of 90 percent as:

$$n = \left(Z_{0.90,\, n-1}\frac{\eta}{e_r}\right)^2$$

where $\eta = \delta/\mu$ is the standard deviation, δ, of the COPC concentration divided by the mean, μ, and "Z" is the standard normal deviate at the 90 percent confidence level for the appropriate number of degrees of freedom (n-1).

The η term is similar to the CV discussed in Section A.7.2.1 and is a measure of the variability of COPCs in reservoir soils. A site-specific value for η was calculated using the radiological measurement data collected during the May 2000 driveover survey of CAS 26-03-01 (IT, 2000). Adams (2000) calculated η = 12.5 percent for the survey results. Assuming a relative standard error of 10 percent, n = 5 is calculated (rounding up the actual result) from Equation 4.11 of Gilbert (1987). This indicates that five random soil samples will ensure a 90 percent probability that the "true" mean concentration of a COPC lies within the interval of the measured mean ± 10 percent. Thus, at CAS 26-03-01, five random locations will be sampled in addition to two biased sampling locations (Section A.5.4).

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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 DOE/NV Task Manager assigned to CAU 271 is Kevin Cabble, and his telephone number is (702) 295-5000.

The names of the project Health and Safety Officer and the Quality Assurance Officer can be found in the appropriate DOE/NV plan. However, personnel are subject to change, and it is suggested that the Project Manager be contacted for further information.

Appendix C

Facility Drawings

CAS 25-04-01 (2 pages)

CAS 25-04-03 (4 pages)

CAS 25-04-04 (6 pages)

CAS 25-04-08 (2 pages)

CAS 25-04-09 (2 pages)

CAS 25-04-10 (2 pages)

CAS 25-04-11 (2 pages)

CAS 26-03-01 (1 page)

CAS 26-04-01 (2 pages)

CAS 26-04-02 (2 pages)

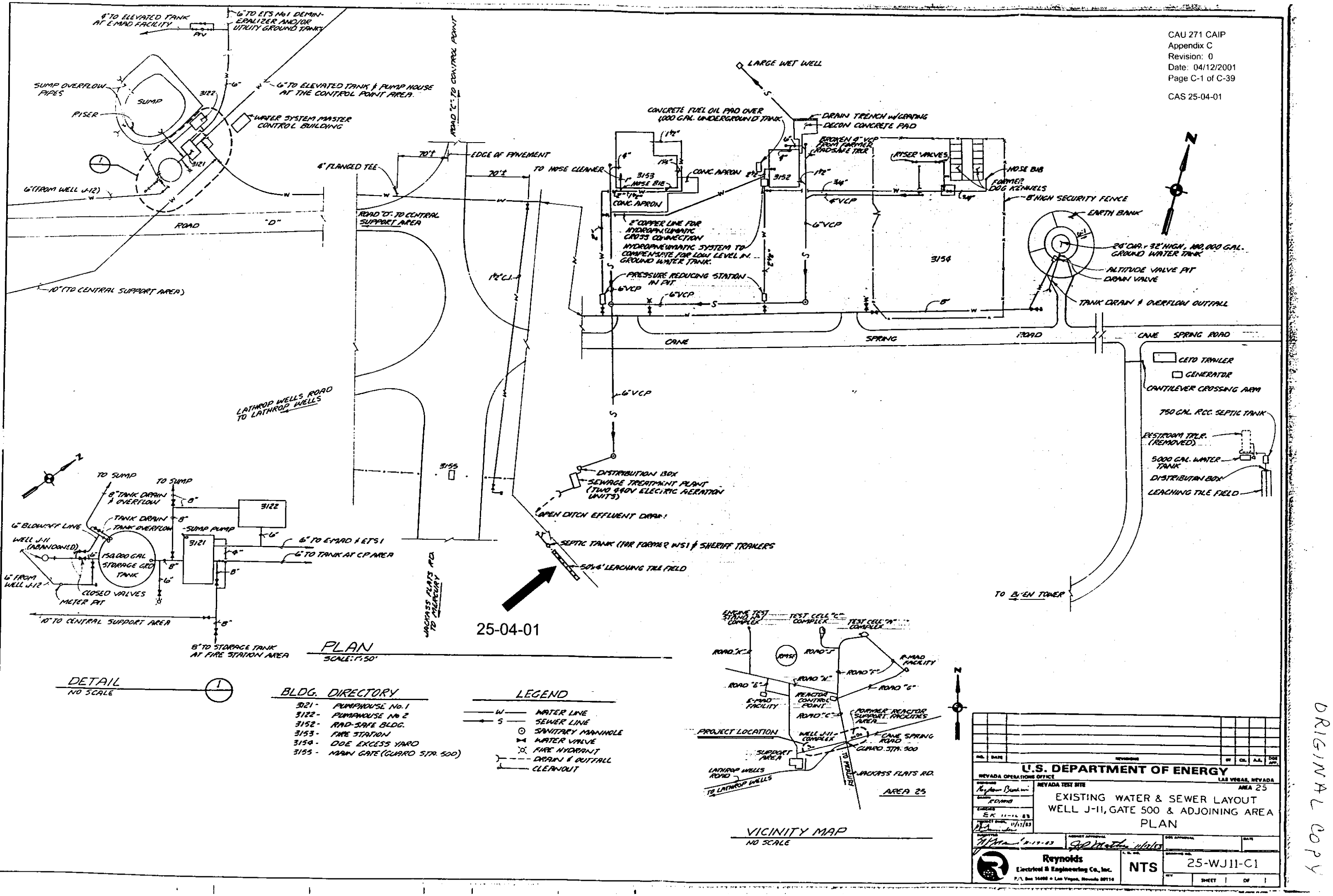
CAS 26-05-01 (3 pages)

CAS 26-05-03 (3 pages)

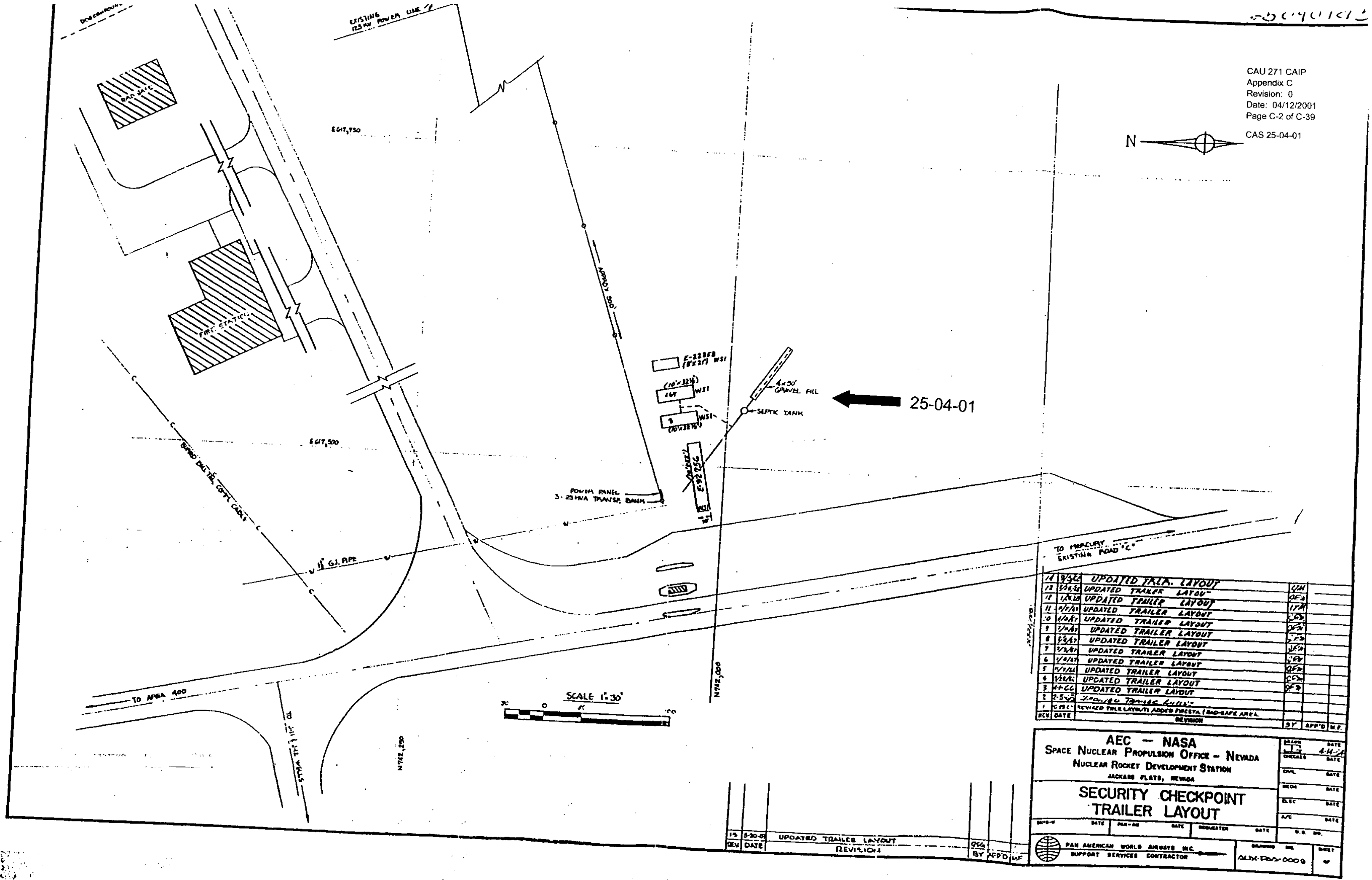
CAS 26-05-04 (3 pages)

CAS 26-05-05 (3 pages)

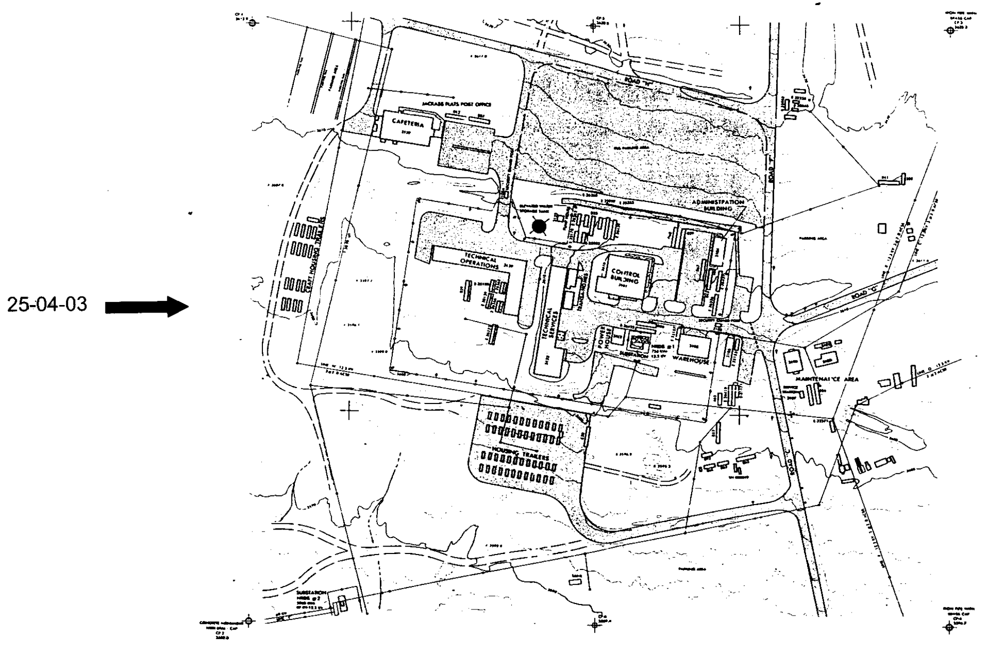
CAS 27-05-02 (2 pages)

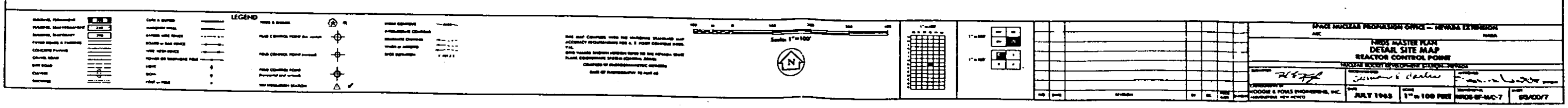

4" TO ELEVATED TANK AT E-MAD FACILITY
6" TO ETS No1 DEMINERALIZER AND/OR UTILITY GROUND TANKS
SUMP OVERFLOW PIPES
SUMP
RISER
6" TO ELEVATED TANK & PUMP HOUSE AT THE CONTROL POINT AREA.
WATER SYSTEM MASTER CONTROL BUILDING
ROAD "C" TO CONTROL POINT
6" (FROM WELL J-12)
4" FLANGED TEE
EDGE OF PAVEMENT
TO HOSE CLEANER
ROAD "D"
ROAD "D" TO CENTRAL SUPPORT AREA
10" (TO CENTRAL SUPPORT AREA)
LARGE WET WELL
CONCRETE FUEL OIL PAD OVER 1000 GAL. UNDERGROUND TANK
DRAIN TRENCH w/GRATING
DECON CONCRETE PAD
BROKEN 4" VCP FROM FORMER RADSAFE TRLR
RISER VALVES
HOSE BIB
FORMER DOG KENNELS
8' HIGH SECURITY FENCE
EARTH BANK
3153
HOSE BIB
CONC. APRON
3152
2" COPPER LINE FOR HYDROPNEUMATIC CROSS CONNECTION
HYDROPNEUMATIC SYSTEM TO COMPENSATE FOR LOW LEVEL IN GROUND WATER TANK.
PRESSURE REDUCING STATION IN PIT
6" VCP
4" VCP
3154
24' DIA. x 32' HIGH, 100,000 GAL. GROUND WATER TANK
ALTITUDE VALVE PIT
DRAIN VALVE
TANK DRAIN & OVERFLOW OUTFALL
CANE SPRING ROAD
CETO TRAILER
GENERATOR
CANTILEVER CROSSING ARM
750 GAL. RCC. SEPTIC TANK
RESTROOM TRLR. (REMOVED)
5000 GAL. WATER TANK
DISTRIBUTION BOX
LEACHING TILE FIELD
LATHROP WELLS ROAD TO LATHROP WELLS
3155
DISTRIBUTION BOX
SEWAGE TREATMENT PLANT (TWO 440V ELECTRIC AERATION UNITS)
OPEN DITCH EFFLUENT DRAIN
SEPTIC TANK (FOR FORMER WS1 & SHERIFF TRAILERS
50'x4' LEACHING TILE FIELD
JACKASS FLATS RD. TO MERCURY
25-04-01
TO B/EN TOWER
TO SUMP
8" TANK DRAIN & OVERFLOW
6" BLOWOFF LINE
TANK DRAIN TANK OVERFLOW
SUMP PUMP
3122
3121
WELL J-11 (ABANDONED)
150,000 GAL STORAGE GRD TANK
6" TO E-MAD & ETS1
6" TO TANK AT CP AREA
6" FROM WELL J-12
CLOSED VALVES
METER PIT
10" TO CENTRAL SUPPORT AREA
8" TO STORAGE TANK AT FIRE STATION AREA
PLAN
SCALE: 1"=50'
DETAIL
NO SCALE
BLDG. DIRECTORY
3121 - PUMPHOUSE No. 1
3122 - PUMPHOUSE No 2
3152 - RAD-SAFE BLDG.
3153 - FIRE STATION
3154 - DOE EXCESS YARD
3155 - MAIN GATE (GUARD STA. 500)
LEGEND
WATER LINE
SEWER LINE
SANITARY MANHOLE
WATER VALVE
FIRE HYDRANT
DRAIN & OUTFALL
CLEANOUT
ENGINE TEST STAND #1 COMPLEX
TEST CELL "C" COMPLEX
TEST CELL "A" COMPLEX
E-MAD FACILITY
ROAD "J"
ROAD "F"
ROAD "G"
ROAD "H"
ROAD "K"
ROAD "E"
E-MAD FACILITY
REACTOR CONTROL POINT
ROAD "C"
FORMER REACTOR SUPPORT FACILITIES AREA
PROJECT LOCATION
WELL J-11 COMPLEX
CANE SPRING ROAD
GUARD STA. 500
SUPPORT AREA
LATHROP WELLS ROAD
TO LATHROP WELLS
TO MERCURY
JACKASS FLATS RD.
AREA 25
VICINITY MAP
NO SCALE
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
NEVADA TEST SITE
AREA 25
EXISTING WATER & SEWER LAYOUT
WELL J-11, GATE 500 & ADJOINING AREA
PLAN
Reynolds Electrical & Engineering Co., Inc.
NTS
25-WJ11-C1
ORIGINAL COPY

CAS 25-04-01

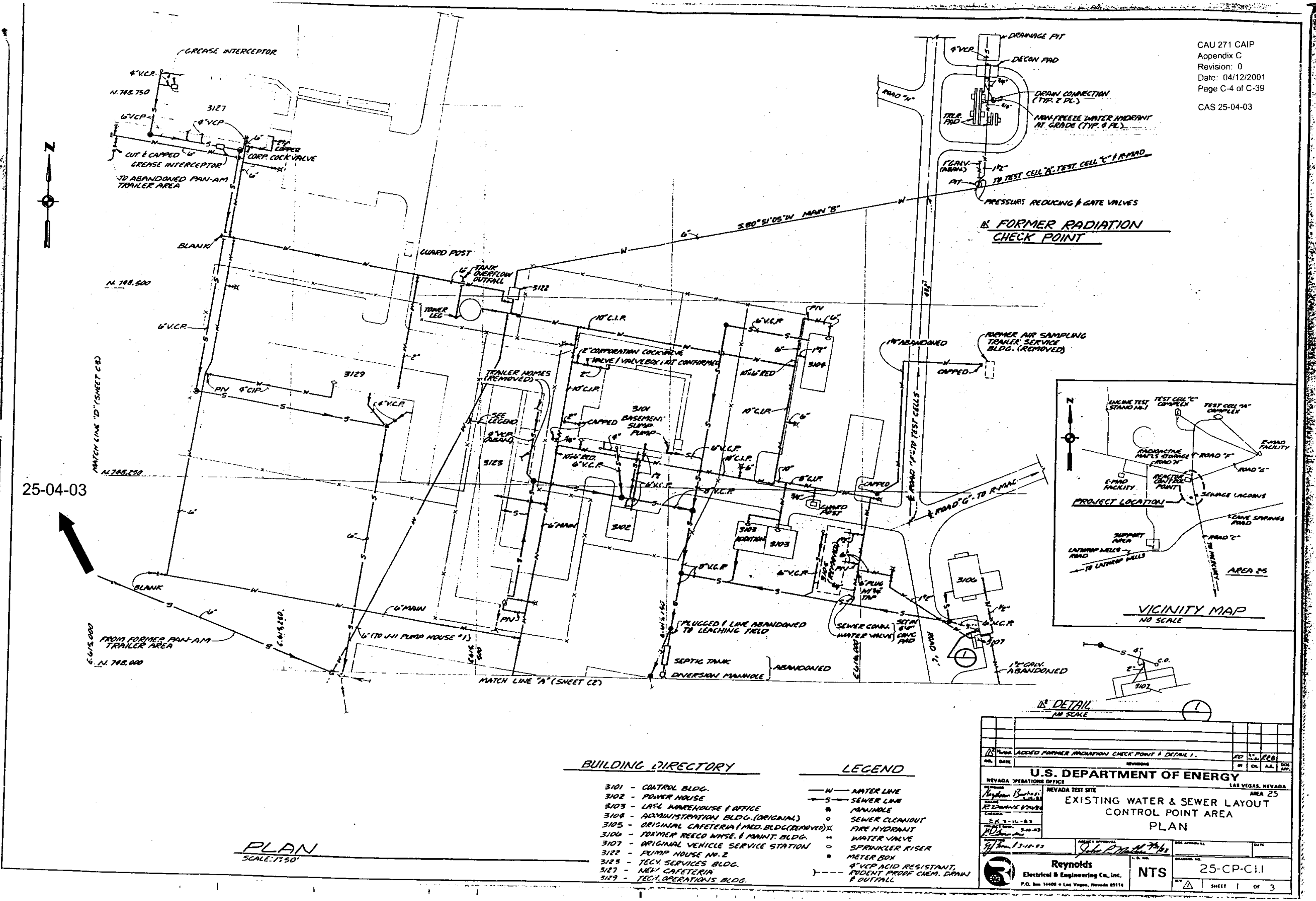

N
25-04-01
EXISTING 12.5 KV POWER LINE
FIRE STATION
E617,750
E617,500
APPROX 300'
4 x 50' GRAVEL FILL
SEPTIC TANK
WSI
POWER PANEL
3 - 25 KVA TRANSF. BANK
GI PIPE
TO MERCURY
EXISTING ROAD "C"
TO AREA 400
N742,000
N742,250
SCALE 1"=30'
14 | UPDATED TRLR. LAYOUT
13 | UPDATED TRAILER LAYOUT
12 | UPDATED TRAILER LAYOUT
11 | UPDATED TRAILER LAYOUT
10 | UPDATED TRAILER LAYOUT
9 | UPDATED TRAILER LAYOUT
8 | UPDATED TRAILER LAYOUT
7 | UPDATED TRAILER LAYOUT
6 | UPDATED TRAILER LAYOUT
5 | UPDATED TRAILER LAYOUT
4 | UPDATED TRAILER LAYOUT
3 | UPDATED TRAILER LAYOUT
1 | REVISED TRLR LAYOUT, ADDED FIESTA / RAD-SAFE AREA
REV | DATE | REVISION | BY | APP'D | M.F.
15 | 5-20-69 | UPDATED TRAILER LAYOUT
AEC — NASA
SPACE NUCLEAR PROPULSION OFFICE – NEVADA
NUCLEAR ROCKET DEVELOPMENT STATION
JACKASS FLATS, NEVADA
SECURITY CHECKPOINT
TRAILER LAYOUT
PAN AMERICAN WORLD AIRWAYS INC.
SUPPORT SERVICES CONTRACTOR
DRAWING NO.
SHEET

CAS 25-04-03

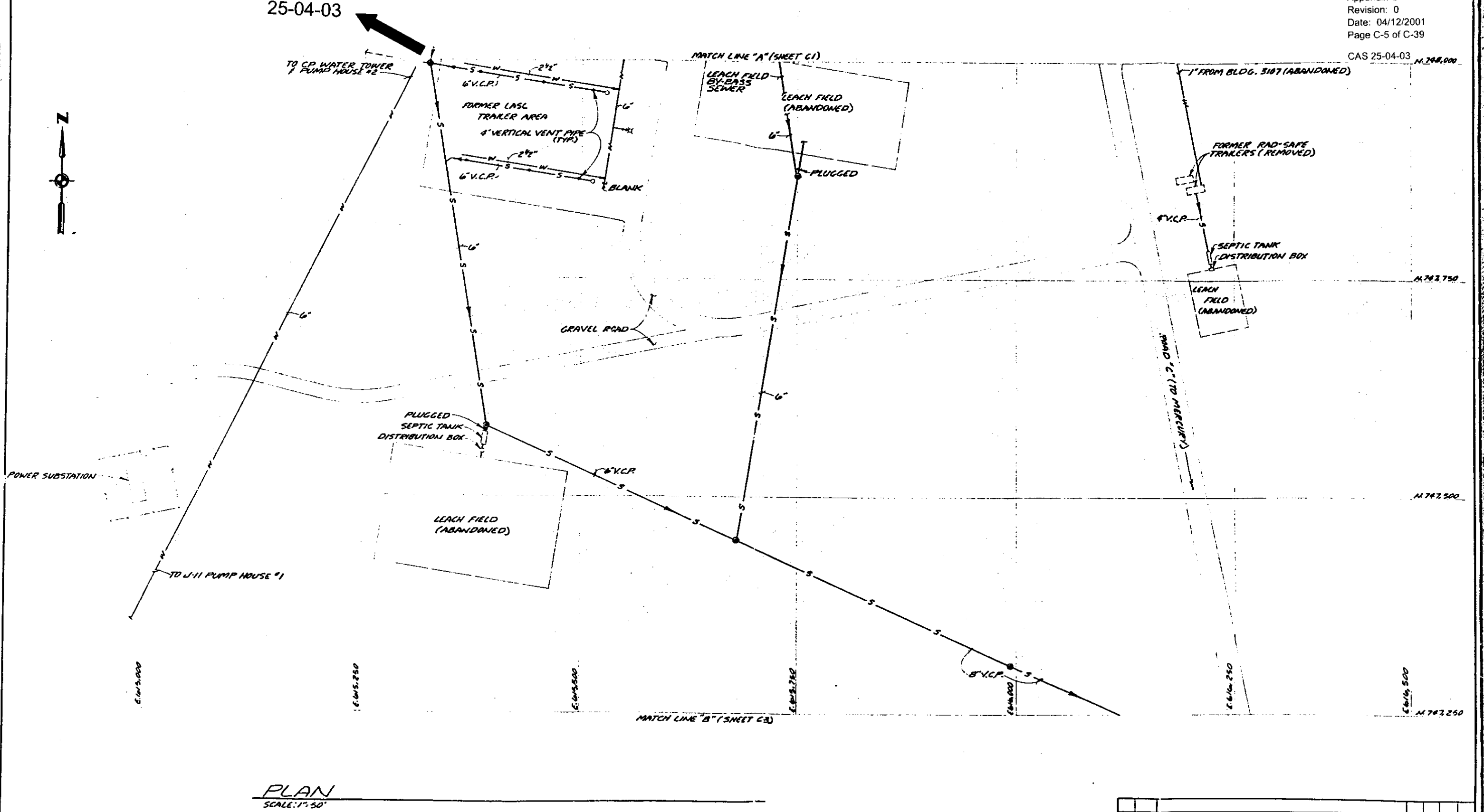

25-04-03
CAFETERIA
ADMINISTRATION BUILDING
TECHNICAL OPERATIONS
CONTROL BUILDING
TECHNICAL SERVICES
POWER HOUSE
WAREHOUSE
MAINTENANCE AREA
HOUSING TRAILERS
ROAD "C"
SUBSTATION


LEGEND
SPACE NUCLEAR PROPULSION OFFICE — NEVADA EXTENSION
AEC
NASA
NRDS MASTER PLAN
DETAIL SITE MAP
REACTOR CONTROL POINT
NUCLEAR ROCKET DEVELOPMENT STATION—NEVADA
HOLMES & NARVER ENGINEERING, INC.
JULY 1965
1" = 100 FEET
65/00/7

CAS 25-04-03


25-04-03
N
GREASE INTERCEPTOR
4" V.C.P.
N. 748,750
3127
6" VCP
4" VCP
CUT & CAPPED GREASE INTERCEPTOR
CORP. COCK VALVE
TO ABANDONED PAN-AM TRAILER AREA
BLANK
GUARD POST
TANK OVERFLOW OUTFALL
3122
TOWER LEG
N. 748,500
6" V.C.P.
S.80°51'05"W MAIN "B"
FORMER RADIATION CHECK POINT
DRAINAGE PIT
DECON PAD
DRAIN CONNECTION (TYP. 2 PL.)
NON-FREEZE WATER HYDRANT AT GRADE (TYP. 4 PL.)
TO TEST CELL "A", TEST CELL "C" & R-MAD
PRESSURE REDUCING & GATE VALVES
ROAD "H"
10" C.I.P.
2" CORPORATION COCK VALVE
VALVE / VALVEBOX NOT CONFIRMED
3129
TRAILER HOMES (REMOVED)
3101 BASEMENT SUMP PUMP
3104
1½" ABANDONED
FORMER AIR SAMPLING TRAILER SERVICE BLDG. (REMOVED)
CAPPED
ROAD "F" TO TEST CELLS
ROAD "G" TO R-MAD
MATCH LINE "D" (SHEET C3)
N. 748,250
SEE LEGEND
3123
3102
3103 ADDITION
3103
3105 (REMOVED)
GUARD POST
3106
3107
BLANK
6" MAIN
FROM FORMER PAN-AM TRAILER AREA
N. 748,000
6" (TO U-11 PUMP HOUSE #1)
PLUGGED & LINE ABANDONED TO LEACHING FIELD
SEPTIC TANK
DIVERSION MANHOLE
ABANDONED
SEWER CONN. & WATER VALVE
SET IN 4'x4' CONC PAD
1½" GALV. ABANDONED
MATCH LINE "A" (SHEET C2)
ROAD "L"
VICINITY MAP
NO SCALE
ENGINE TEST STAND NO. 1
TEST CELL "C" COMPLEX
TEST CELL "A" COMPLEX
E-MAD FACILITY
R-MAD FACILITY
RADIOACTIVE MAT'LS STORAGE
ROAD "F"
ROAD "G"
REACTOR CONTROL POINT
PROJECT LOCATION
SEWAGE LAGOONS
SUPPORT AREA
LATHROP WELLS ROAD
TO LATHROP WELLS
CANE SPRINGS ROAD
TO MERCURY
AREA 25
DETAIL
NO SCALE
C.O.
3107
PLAN
SCALE: 1"=50'
BUILDING DIRECTORY
3101 - CONTROL BLDG.
3102 - POWER HOUSE
3103 - LASL WAREHOUSE & OFFICE
3104 - ADMINISTRATION BLDG. (ORIGINAL)
3105 - ORIGINAL CAFETERIA / MED. BLDG. (REMOVED)
3106 - FORMER REECO WHSE. & MAINT. BLDG.
3107 - ORIGINAL VEHICLE SERVICE STATION
3122 - PUMP HOUSE NO. 2
3123 - TECH. SERVICES BLDG.
3127 - NEW CAFETERIA
3129 - TECH. OPERATIONS BLDG.
LEGEND
W — WATER LINE
S — SEWER LINE
MANHOLE
SEWER CLEANOUT
FIRE HYDRANT
WATER VALVE
SPRINKLER RISER
METER BOX
4" VCP ACID RESISTANT, RODENT PROOF CHEM. DRAIN & OUTFALL
ADDED FORMER RADIATION CHECK POINT & DETAIL 1.
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
NEVADA TEST SITE
AREA 25
EXISTING WATER & SEWER LAYOUT
CONTROL POINT AREA
PLAN
Reynolds Electrical & Engineering Co., Inc.
P.O. Box 14400 • Las Vegas, Nevada 89114
NTS
25-CP-C1.1
SHEET 1 OF 3
ORIGINAL COPY

CAS 25-04-03



NO.	DATE	REVISIONS	BY	CK.	A.E.	DOE APP.

U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE — LAS VEGAS, NEVADA

NEVADA TEST SITE — AREA 25

EXISTING WATER & SEWER LAYOUT
CONTROL POINT AREA
PLAN

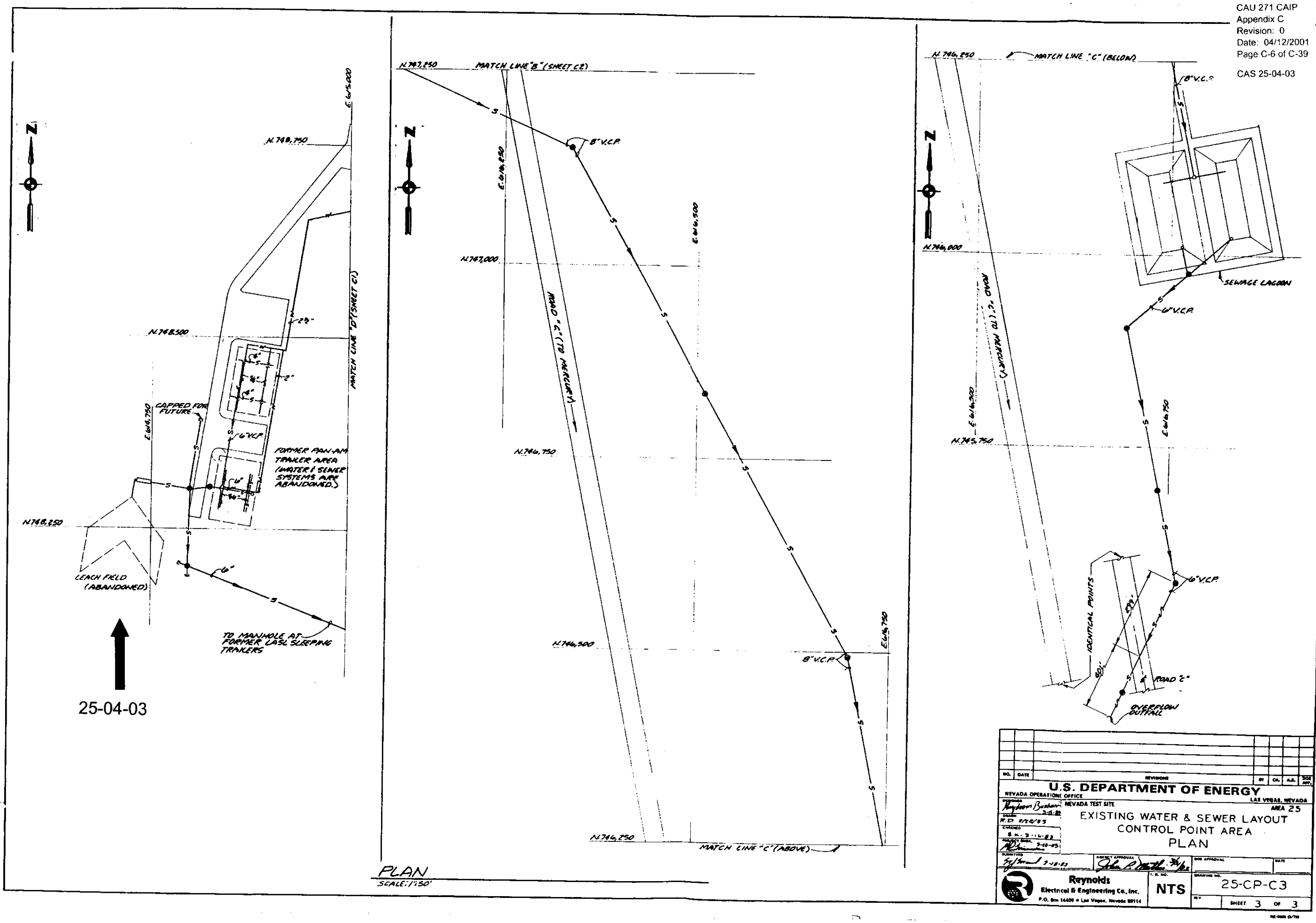
R.D. 2-22-83

Reynolds Electrical & Engineering Co., Inc.
P.O. Box 14400 • Las Vegas, Nevada 89114

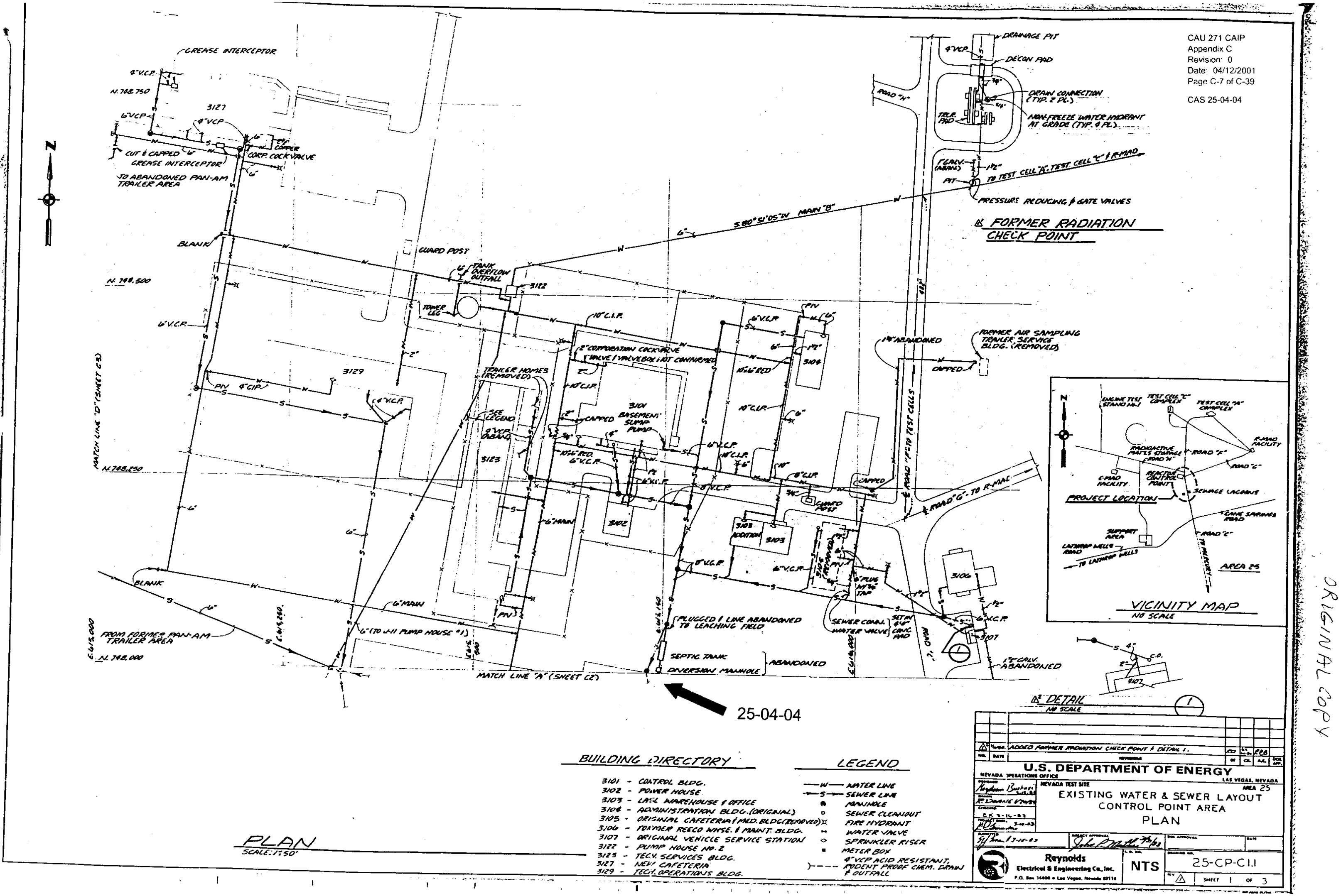
NTS

25-CP-C2

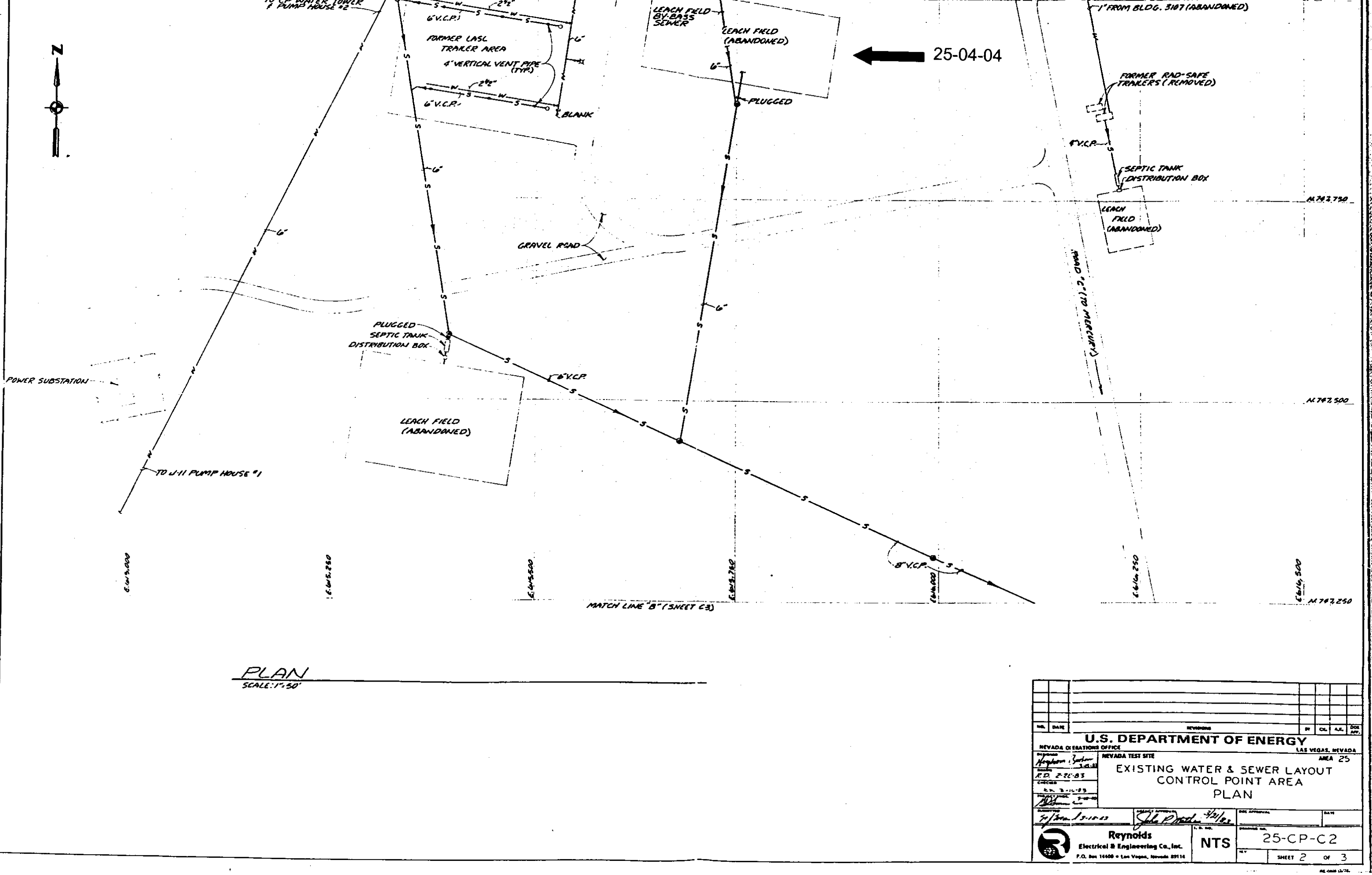
SHEET 2 OF 3


N.748,750
E.615,000
N.748,500
MATCH LINE "D" (SHEET C1)
CAPPED FOR FUTURE
6" V.C.P.
FORMER PAN-AM TRAILER AREA (WATER & SEWER SYSTEMS ARE ABANDONED.)
N.748,250
LEACH FIELD (ABANDONED)
TO MANHOLE AT FORMER LASL SLEEPING TRAILERS
E.614,750
25-04-03
N.747,250
MATCH LINE "B" (SHEET C2)
8" V.C.P.
E.616,250
E.616,500
N.747,000
ROAD "C" (TO MERCURY)
N.746,750
N.746,500
8" V.C.P.
E.616,750
N.746,250
MATCH LINE "C" (ABOVE)
PLAN
SCALE: 1"=50'
N.746,250
MATCH LINE "C" (BELOW)
8" V.C.P.
N.746,000
SEWAGE LAGOON
6" V.C.P.
E.616,500
E.616,750
N.745,750
IDENTICAL POINTS
6" V.C.P.
ROAD "Z"
OVERFLOW OUTFALL
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
NEVADA TEST SITE
LAS VEGAS, NEVADA
AREA 25
EXISTING WATER & SEWER LAYOUT
CONTROL POINT AREA
PLAN
Reynolds Electrical & Engineering Co., Inc.
P.O. Box 14400 • Las Vegas, Nevada 89114
NTS
25-CP-C3
SHEET 3 OF 3

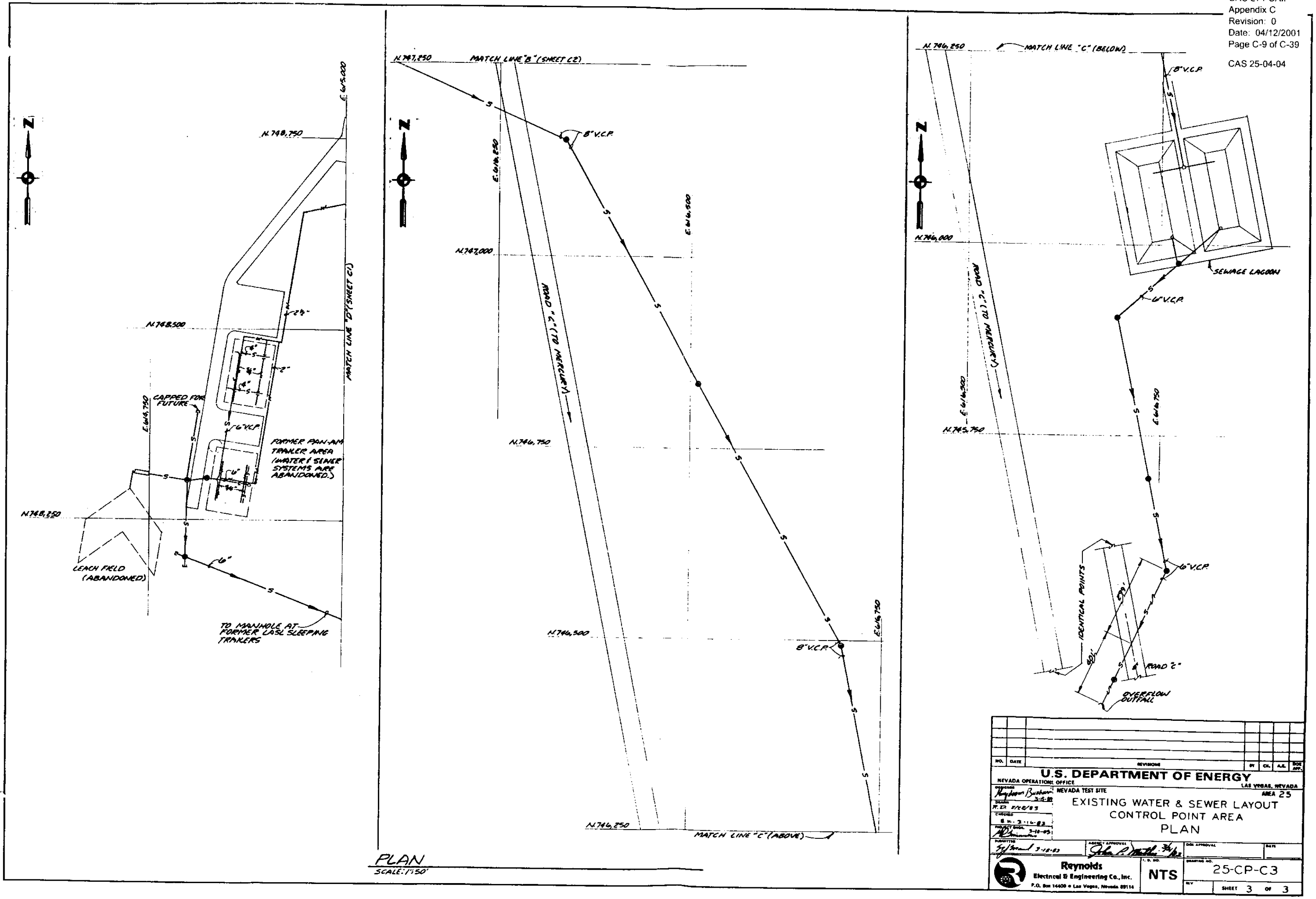
CAS 25-04-04

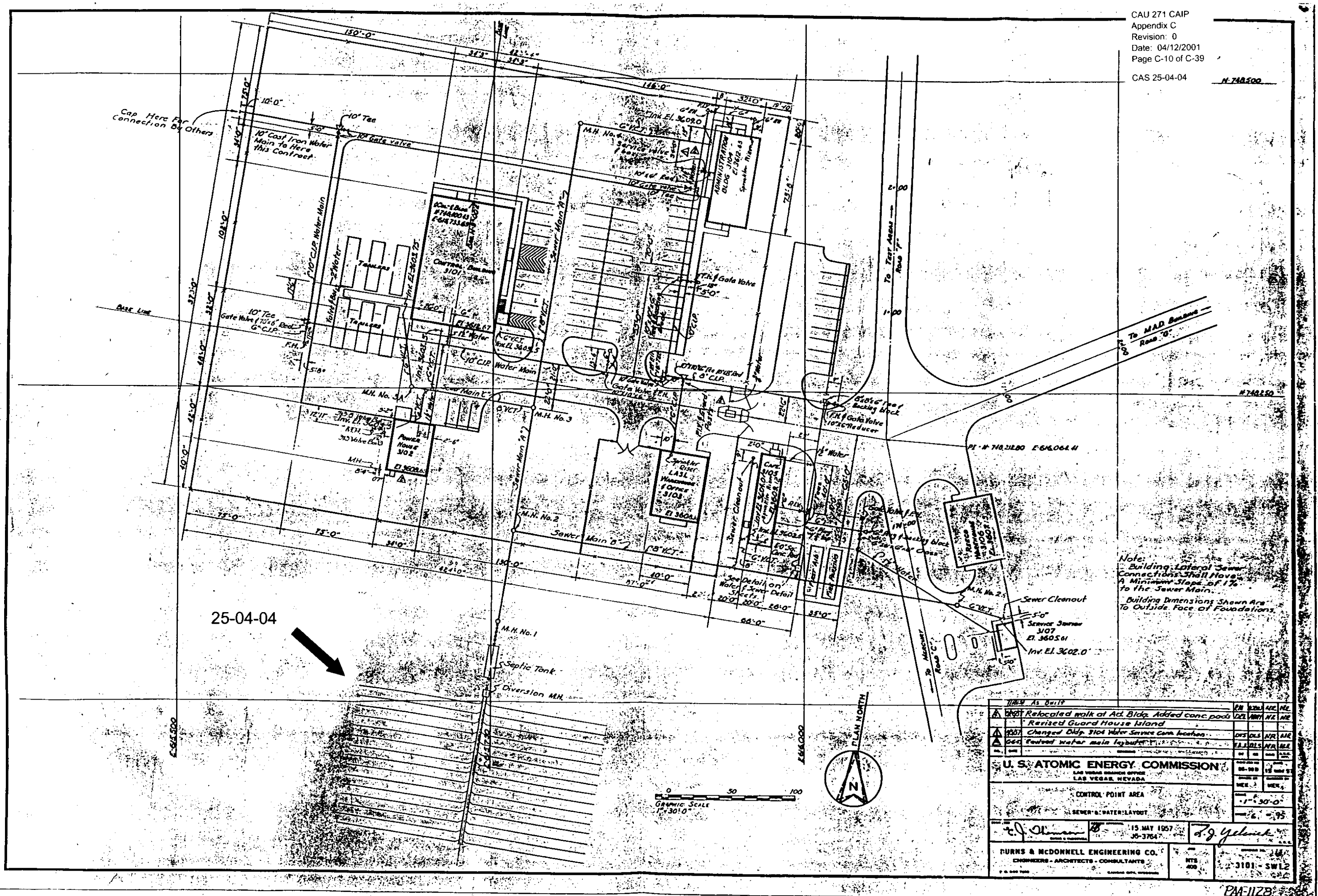

GREASE INTERCEPTOR
N. 748,750
3127
CUT & CAPPED
GREASE INTERCEPTOR
CORP. COCK VALVE
TO ABANDONED PAN-AM TRAILER AREA
BLANK
GUARD POST
TANK OVERFLOW OUTFALL
3122
N. 748,500
TOWER LEG
3129
TRAILER HOMES (REMOVED)
2" CORPORATION COCK VALVE
VALVE / VALVEBOX NOT CONFIRMED
3101 BASEMENT SUMP PUMP
3104
3123
3102
3103 ADDITION
3103
3105
3106
3107
N. 748,250
MATCH LINE "D" (SHEET C3)
FROM FORMER PAN-AM TRAILER AREA
N. 748,000
6" (TO J-11 PUMP HOUSE #1)
PLUGGED & LINE ABANDONED TO LEACHING FIELD
SEPTIC TANK
DIVERSION MANHOLE
ABANDONED
MATCH LINE "A" (SHEET C2)
25-04-04
SEWER CONN.
WATER VALVE
SET IN 4'x4' CONC PAD
1½" GALV. ABANDONED
DRAINAGE PIT
DECON PAD
DRAIN CONNECTION (TYP. 2 PL.)
NON-FREEZE WATER HYDRANT AT GRADE (TYP. 4 PL.)
TO TEST CELL "A", TEST CELL "C" & R-MAD
PRESSURE REDUCING & GATE VALVES
S.80°51'05"W MAIN "B"
FORMER RADIATION CHECK POINT
FORMER AIR SAMPLING TRAILER SERVICE BLDG. (REMOVED)
CAPPED
ROAD "F" TO TEST CELLS
ROAD "G" TO R-MAD
ROAD "C"
VICINITY MAP
NO SCALE
PROJECT LOCATION
AREA 25
DETAIL 1
NO SCALE
PLAN
SCALE: 1"=50'
BUILDING DIRECTORY
3101 - CONTROL BLDG.
3102 - POWER HOUSE.
3103 - LASL WAREHOUSE & OFFICE
3104 - ADMINISTRATION BLDG. (ORIGINAL)
3105 - ORIGINAL CAFETERIA / MED. BLDG (REMOVED)
3106 - FORMER REECO WHSE. & MAINT. BLDG.
3107 - ORIGINAL VEHICLE SERVICE STATION
3122 - PUMP HOUSE NO. 2
3123 - TECH. SERVICES BLDG.
3127 - NEW CAFETERIA
3129 - TECH. OPERATIONS BLDG.
LEGEND
W — WATER LINE
S — SEWER LINE
MANHOLE
SEWER CLEANOUT
FIRE HYDRANT
WATER VALVE
SPRINKLER RISER
METER BOX
4" VCP ACID RESISTANT, RODENT PROOF CHEM. DRAIN & OUTFALL
ADDED FORMER RADIATION CHECK POINT & DETAIL 1.
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
NEVADA TEST SITE
AREA 25
EXISTING WATER & SEWER LAYOUT
CONTROL POINT AREA
PLAN
Reynolds Electrical & Engineering Co., Inc.
NTS
25-CP-C1.1
SHEET 1 OF 3
ORIGINAL COPY

CAS 25-04-04

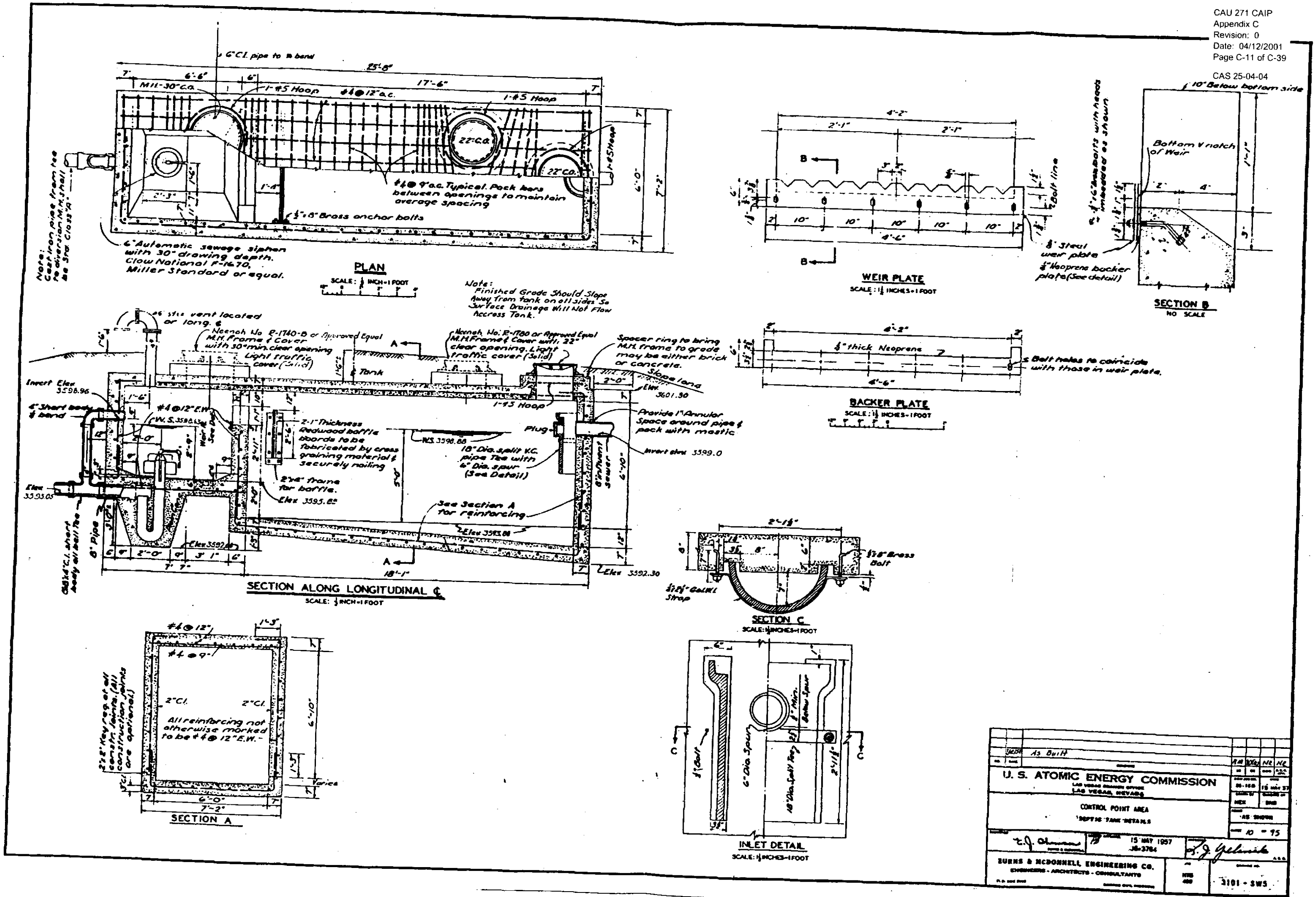

25-04-04
N
TO CP WATER TOWER & PUMP HOUSE #2
6" V.C.P.
2½"
FORMER LASL TRAILER AREA
4" VERTICAL VENT PIPE (TYP.)
BLANK
MATCH LINE "A" (SHEET C1)
LEACH FIELD BY-PASS SEWER
LEACH FIELD (ABANDONED)
PLUGGED
1" FROM BLDG. 3107 (ABANDONED)
FORMER RAD-SAFE TRAILERS (REMOVED)
4" V.C.P.
SEPTIC TANK DISTRIBUTION BOX
LEACH FIELD (ABANDONED)
GRAVEL ROAD
ROAD "C" (TO MERCURY)
6"
PLUGGED
SEPTIC TANK
DISTRIBUTION BOX
POWER SUBSTATION
6" V.C.P.
LEACH FIELD (ABANDONED)
TO J-11 PUMP HOUSE #1
8" V.C.P.
N 748,000
N 747,750
N 747,500
N 747,250
E 615,000
E 615,250
E 615,500
E 615,750
E 616,000
E 616,250
E 616,500
MATCH LINE "B" (SHEET C3)
PLAN
SCALE: 1"=50'
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
NEVADA TEST SITE
AREA 25
EXISTING WATER & SEWER LAYOUT
CONTROL POINT AREA
PLAN
Reynolds Electrical & Engineering Co., Inc.
NTS
25-CP-C2
SHEET 2 OF 3
ORIGINAL COPY

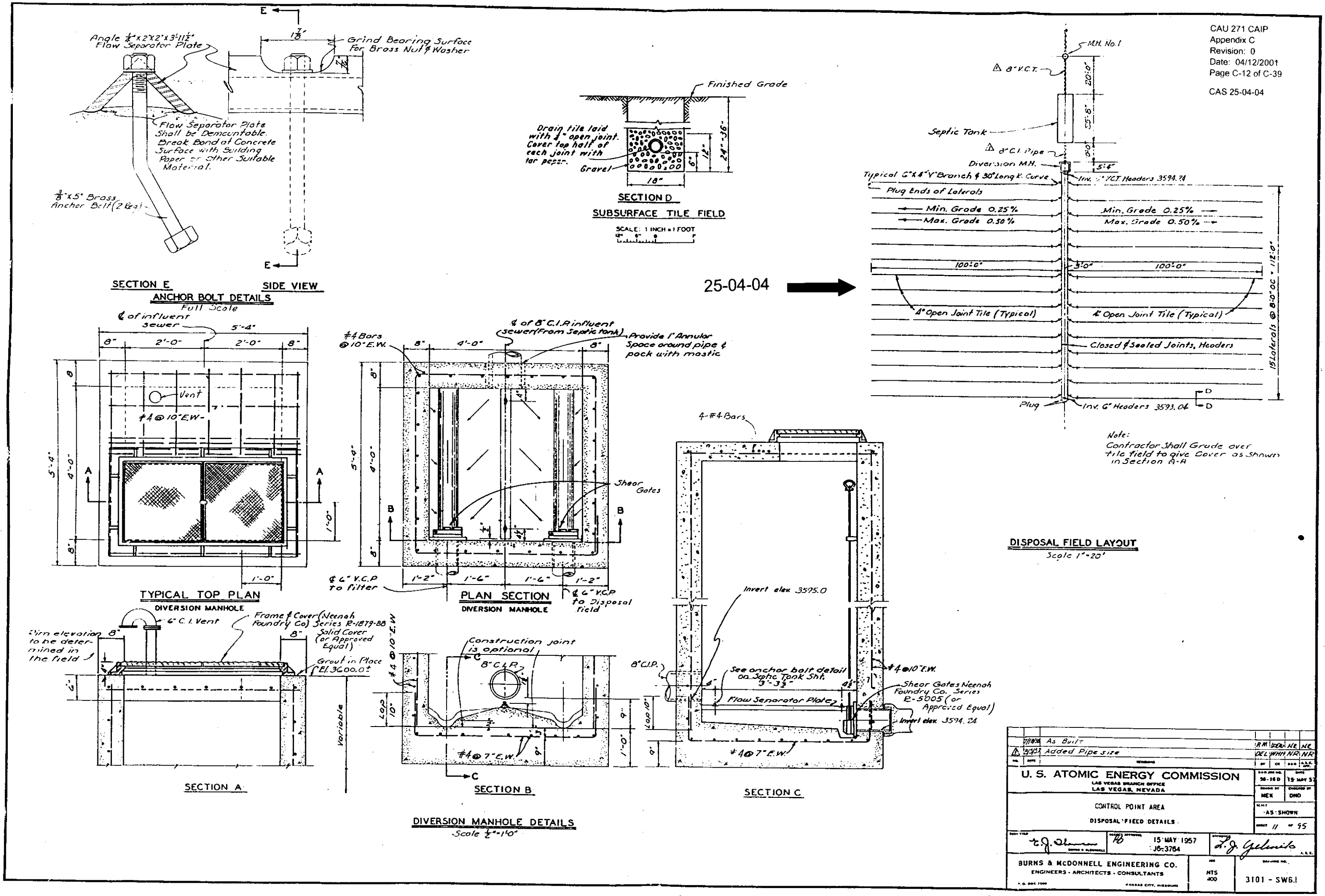
CAS 25-04-04


N
E.615,000
N.748,750
N.748,500
N.748,250
MATCH LINE "D" (SHEET C1)
2½"
2"
6"V.C.P.
E.614,750
CAPPED FOR FUTURE
FORMER PAN-AM TRAILER AREA (WATER & SEWER SYSTEMS ARE ABANDONED.)
LEACH FIELD (ABANDONED)
6"
TO MANHOLE AT FORMER LASL SLEEPING TRAILERS
N.747,250
MATCH LINE "B" (SHEET C2)
8"V.C.P.
E.616,250
E.616,500
N.747,000
ROAD "C" (TO MERCURY)
N.746,750
N.746,500
8"V.C.P.
E.616,750
N.746,250
MATCH LINE "C" (ABOVE)
PLAN
SCALE: 1"=50'
N.746,250
MATCH LINE "C" (BELOW)
8"V.C.P.
N.746,000
SEWAGE LAGOON
6"V.C.P.
E.616,500
ROAD "C" (TO MERCURY)
E.616,750
N.745,750
6"V.C.P.
IDENTICAL POINTS
ROAD "C"
OVERFLOW OUTFALL
NO.
DATE
REVISIONS
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
NEVADA TEST SITE
AREA 25
EXISTING WATER & SEWER LAYOUT
CONTROL POINT AREA
PLAN
Reynolds Electrical & Engineering Co., Inc.
P.O. Box 14400 • Las Vegas, Nevada 89114
NTS
25-CP-C3
SHEET 3 OF 3

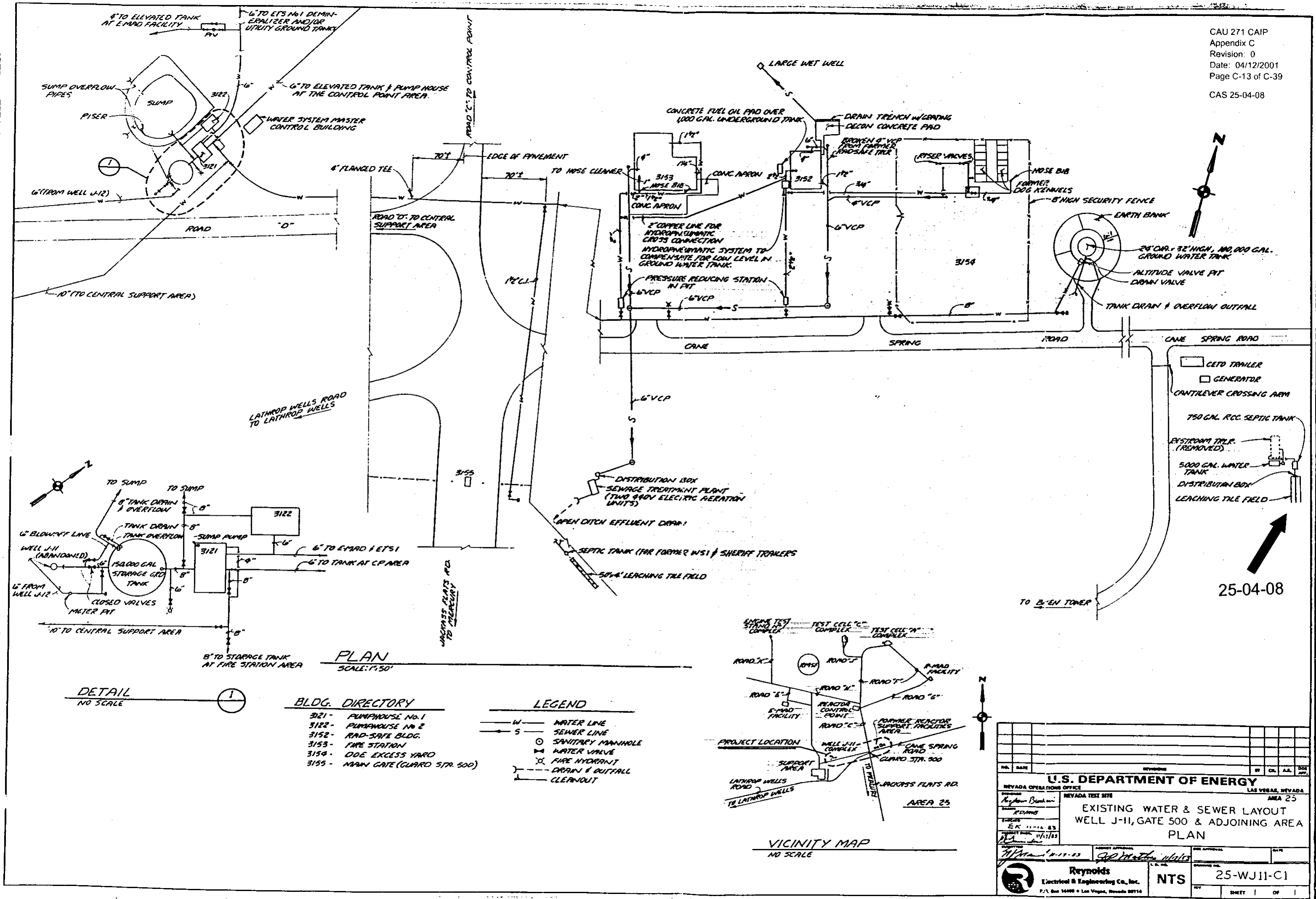

25-04-04
Cap Here For Connection By Others
10" Cast Iron Water Main to Here this Contract
10" Tee
10" Gate Valve
10" C.I.P. Water Main
Base Line
Trailers
Control Bldg. 3101
Power House 3102
M.H. No. 1
M.H. No. 2
M.H. No. 3
M.H. No. 3A
M.H. No. 4
Sewer Main "A"
Sewer Main "B"
Sewer Main "C"
Septic Tank
Diversion M.H.
Administration Bldg. 3104
LASL Warehouse & Offices 3103
Sprinkler Riser
Sewer Cleanout
Service Station 3107
Inv. El. 3602.0'
To Test Areas Road "F"
To M.A.D. Building Road "G"
To Mercury Road "C"
Plan North
Graphic Scale 1" = 30'-0"
0 50 100
N-748500
N-748250
E-615500
E-616000
Note:
Building Lateral Sewer Connections Shall Have A Minimum Slope of 1% to the Sewer Main.
Building Dimensions Shown Are To Outside Face of Foundations.
As Built
Relocated walk at Ad. Bldg. Added conc. pads
Revised Guard House Island
Changed Bldg. 3104 Water Service Conn. location
Revised water main layout
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS BRANCH OFFICE
LAS VEGAS, NEVADA
CONTROL POINT AREA
SEWER & WATER LAYOUT
1" = 30'-0"
15 MAY 1957
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
3101 - SW1.2
PAA-1128

CAS 25-04-04

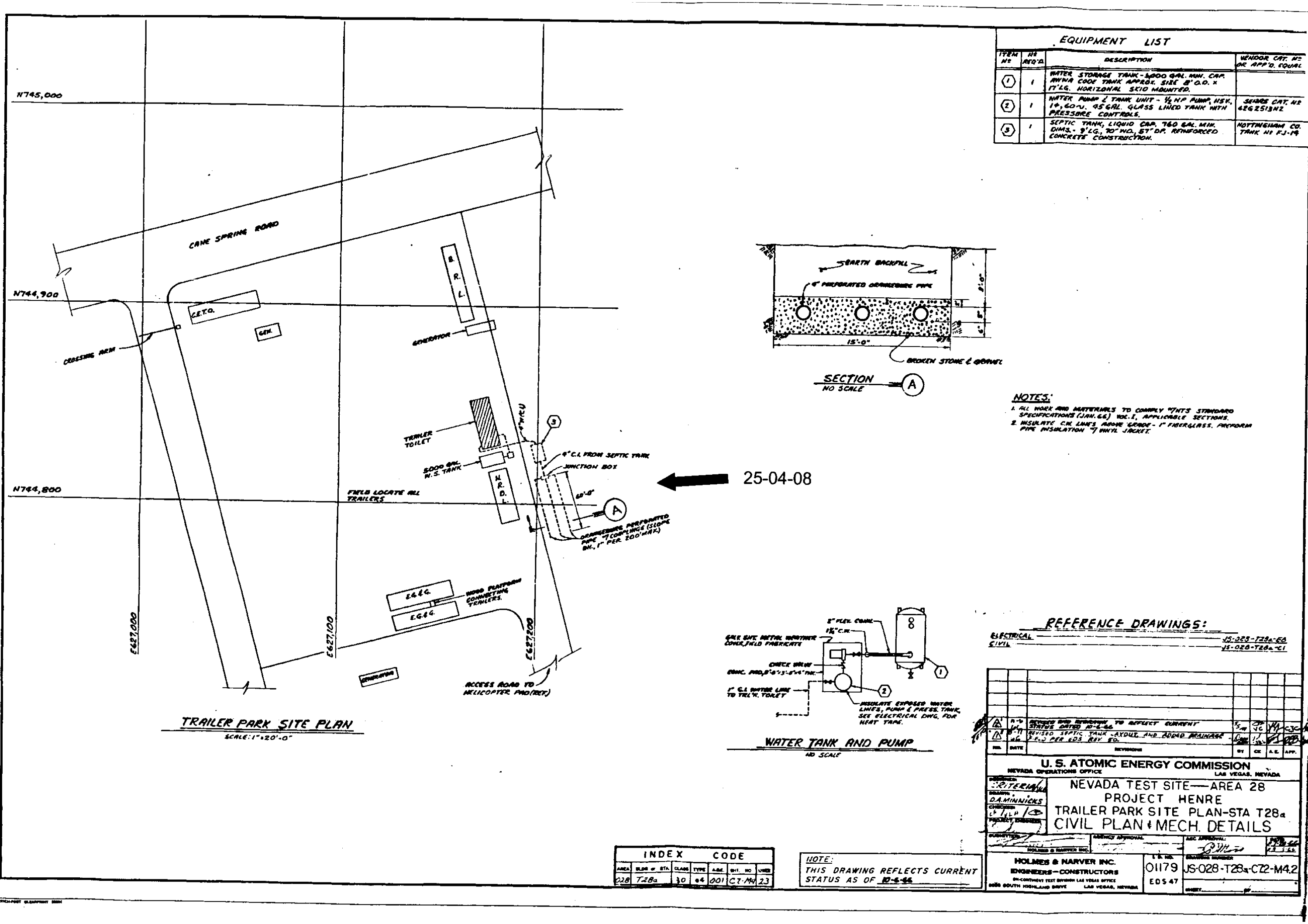

PLAN
SCALE: 1/4 INCH=1 FOOT
WEIR PLATE
SCALE: 1 1/2 INCHES=1 FOOT
SECTION B
NO SCALE
BACKER PLATE
SCALE: 1 1/2 INCHES=1 FOOT
SECTION ALONG LONGITUDINAL ℄
SCALE: 1/4 INCH=1 FOOT
SECTION C
SCALE: 1 1/2 INCHES=1 FOOT
SECTION A
INLET DETAIL
SCALE: 1 1/2 INCHES=1 FOOT
6" Automatic sewage siphon with 30" drawing depth. Clow National F-1670, Miller Standard or equal.
#4 @ 9" o.c. Typical. Rack bars between openings to maintain average spacing
Note: Finished Grade Should Slope Away from tank on all sides So Surface Drainage Will Not Flow Across Tank.
Spacer ring to bring M.H. frame to grade may be either brick or concrete.
Provide 1" Annular Space around pipe & pack with mastic
2-1" Thickness Redwood baffle boards to be fabricated by cross graining material & securely nailing
18" Dia. split V.C. pipe Tee with 6" Dia. spur (See Detail)
See Section A for reinforcing
1/8" thick Neoprene
All reinforcing not otherwise marked to be #4 @ 12" E.W.
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS, NEVADA
CONTROL POINT AREA
SEPTIC TANK DETAILS
15 MAY 1957
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
3101 - SWS

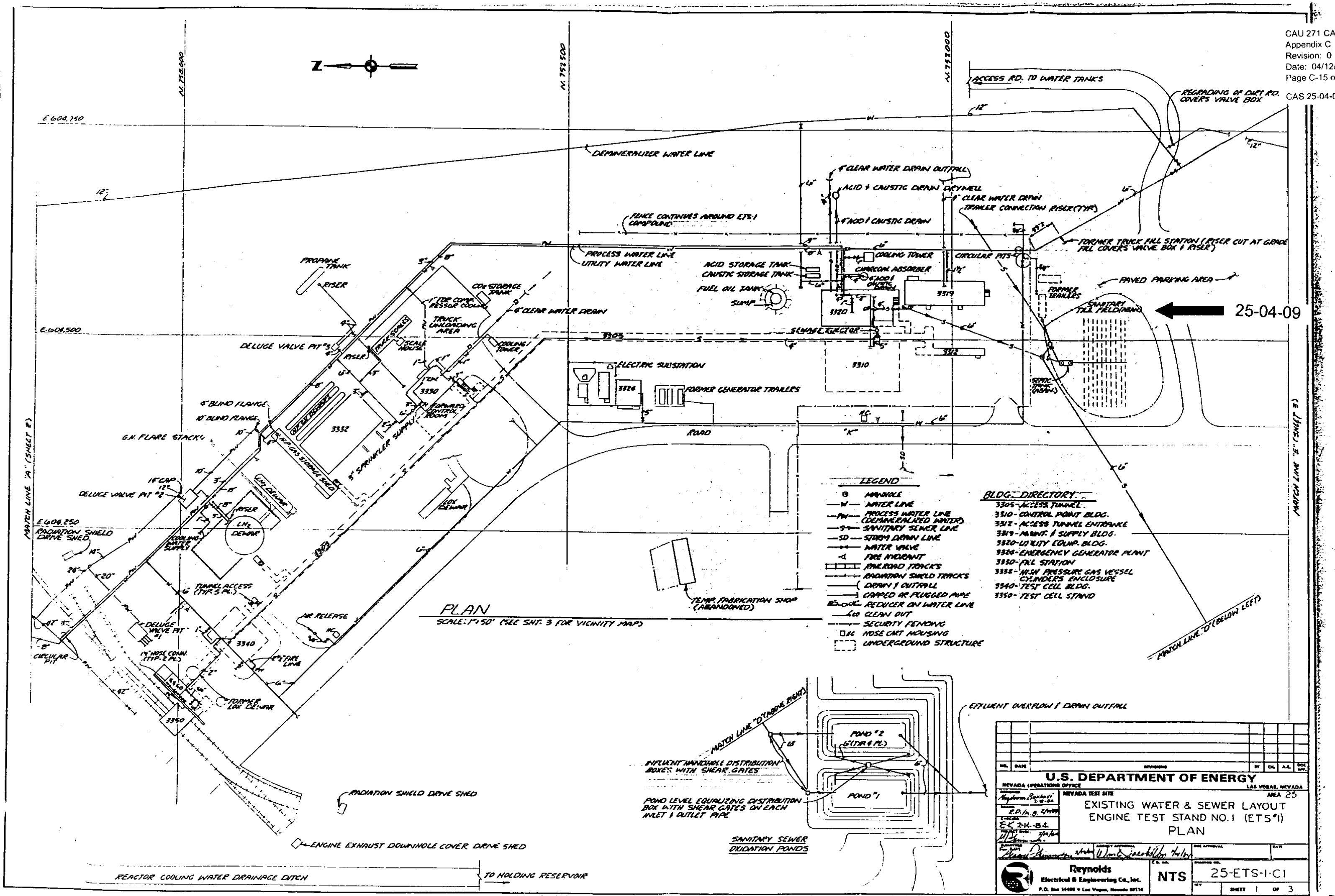

Angle 1/4"x2"x2"x3-11 1/2" Flow Separator Plate
Grind Bearing Surface For Brass Nut & Washer
Flow Separator Plate Shall be Demountable. Break Bond at Concrete Surface with Building Paper or Other Suitable Material.
3/8"x5" Brass Anchor Bolt (2 Req)
SECTION E
SIDE VIEW
ANCHOR BOLT DETAILS
Full Scale
Finished Grade
Drain tile laid with 1/4" open joint. Cover top half of each joint with tar paper.
Gravel
18"
SECTION D
SUBSURFACE TILE FIELD
SCALE: 1 INCH = 1 FOOT
25-04-04
M.H. No.1
8" V.C.T.
Septic Tank
8" C.I. Pipe
Diversion M.H.
Typical 6"x4" Y Branch & 30° Long R. Curve
Inv. 6" V.C.T. Headers 3594.24
Plug Ends of Laterals
Min. Grade 0.25%
Max. Grade 0.50%
100'-0"
4" Open Joint Tile (Typical)
Closed & Sealed Joints, Headers
15 Laterals @ 8'-0" OC = 112'-0"
Plug
Inv. 6" Headers 3593.04
Note: Contractor Shall Grade over tile field to give Cover as Shown in Section A-A
DISPOSAL FIELD LAYOUT
Scale 1"=20'
℄ of influent sewer
Vent
#4 @ 10" E.W.
TYPICAL TOP PLAN
DIVERSION MANHOLE
#4 Bars @ 10" E.W.
℄ of 8" C.I.P. influent sewer (From Septic tank)
Provide 1" Annular Space around pipe & pack with mastic
Shear Gates
℄ 6" V.C.P. To filter
℄ 6" V.C.P. to Disposal field
PLAN SECTION
DIVERSION MANHOLE
4-#4 Bars
Invert elev 3595.0
See anchor bolt detail on Septic Tank Sht.
Flow Separator Plate
#4 @ 10" E.W.
Shear Gates Neenah Foundry Co. Series R-5005 (or Approved Equal)
Invert elev 3594.24
#4 @ 7" E.W.
6" C.I. Vent
Frame & Cover (Neenah Foundry Co) Series R-1879-B8 Solid Cover (or Approved Equal)
Grout in Place El. 3600.0±
Rim elevation to be determined in the field
Variable
SECTION A
Construction joint is optional
8" C.I.P.
SECTION B
SECTION C
DIVERSION MANHOLE DETAILS
Scale 1/2"=1'-0"
As Built
Added Pipe size
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS BRANCH OFFICE
LAS VEGAS, NEVADA
CONTROL POINT AREA
DISPOSAL FIELD DETAILS
AS SHOWN
11 of 95
15 MAY 1957
J6-3764
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
KANSAS CITY, MISSOURI
3101 - SW6.1

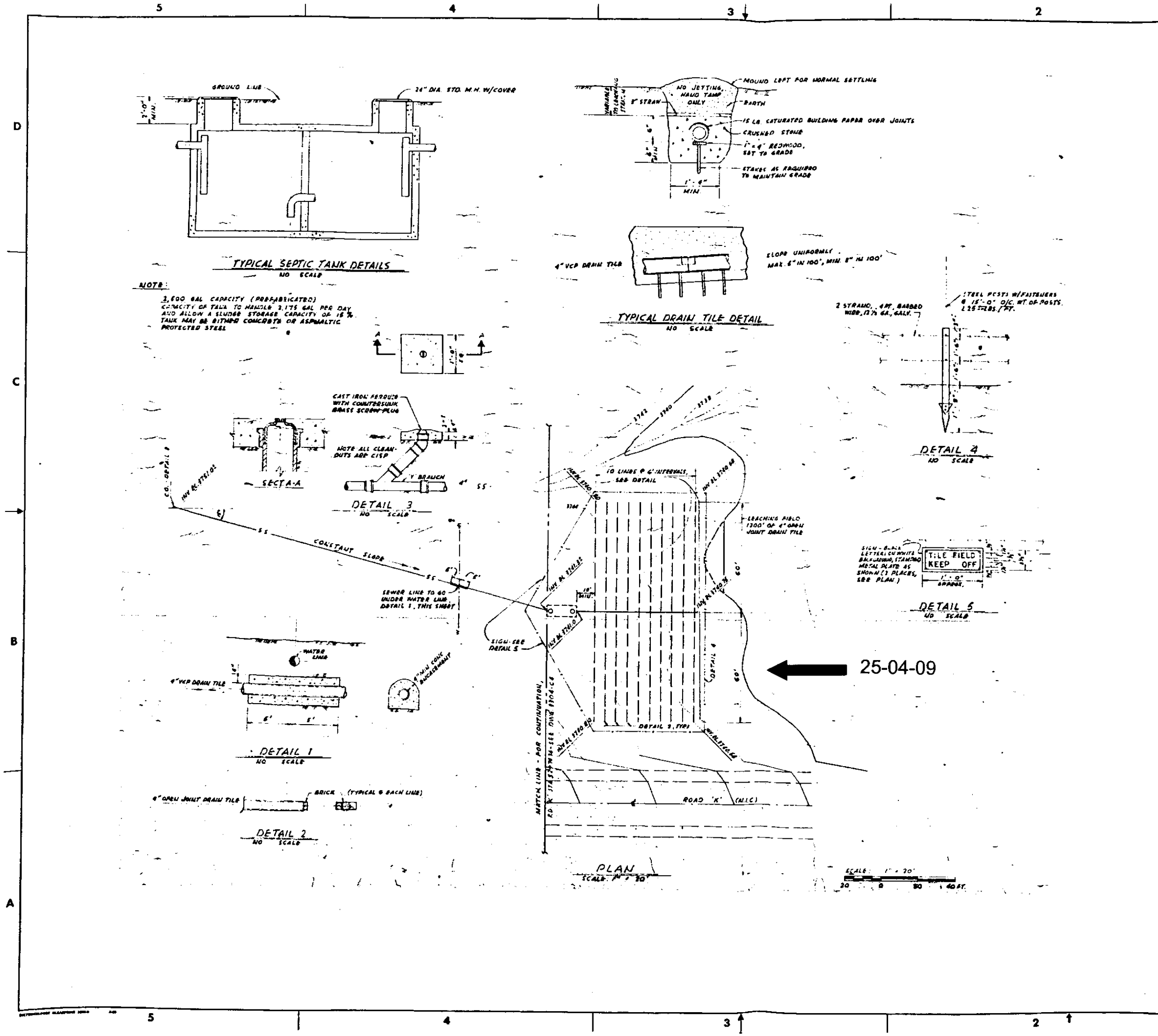
CAS 25-04-08



ORIGINAL COPY


EQUIPMENT LIST
ITEM No. | No. REQ'D | DESCRIPTION | VENDOR CAT. No. OR APP'D. EQUAL
1 | 1 | WATER STORAGE TANK-5000 GAL. MIN. CAP. AWWA CODE TANK APPROX. SIZE 8' O.D. x 17' LG. HORIZONAL SKID MOUNTED.
2 | 1 | WATER PUMP & TANK UNIT - ½ HP PUMP, HSK, 1φ, 60~. 45 GAL. GLASS LINED TANK WITH PRESSURE CONTROLS. | SEARS CAT. No. 42G2513N2
3 | 1 | SEPTIC TANK, LIQUID CAP. 760 GAL. MIN. DIMS. - 9' LG., 70" WD., 57" DP. REINFORCED CONCRETE CONSTRUCTION. | NOTTINGHAM CO. TANK No. FJ-14
N745,000
N744,900
N744,800
CANE SPRING ROAD
C.E.T.O.
GEN.
CROSSING ARM
B.R.L.
GENERATOR
TRAILER TOILET
5000 GAL. W.S. TANK
N.R.D.L.
4" C.I. FROM SEPTIC TANK
JUNCTION BOX
FIELD LOCATE ALL TRAILERS
60'-0"
25-04-08
E.G.&G.
E.G.&G.
WOOD PLATFORM CONNECTING TRAILERS.
GENERATOR
ACCESS ROAD TO HELICOPTER PAD(REF.)
E627,000
E627,100
E627,200
TRAILER PARK SITE PLAN
SCALE: 1"=20'-0"
EARTH BACKFILL
4" PERFORATED DRAINGRADE PIPE
15'-0"
BROKEN STONE & GRAVEL
SECTION A
NO SCALE
NOTES:
1. ALL WORK AND MATERIALS TO COMPLY W/NTS STANDARD SPECIFICATIONS (JAN. 66) VOL. I, APPLICABLE SECTIONS.
2. INSULATE C.W. LINES ABOVE GRADE - 1" FIBERGLASS, PREFORM PIPE INSULATION W/ VINYL JACKET.
CHECK VALVE
1" C.I. WATER LINE TO TRL'R. TOILET
INSULATE EXPOSED WATER LINES, PUMP & PRESS. TANK. SEE ELECTRICAL DWG. FOR HEAT TAPE.
WATER TANK AND PUMP
NO SCALE
REFERENCE DRAWINGS:
ELECTRICAL JS-028-T28a-E6
CIVIL JS-028-T28a-C1
U. S. ATOMIC ENERGY COMMISSION
NEVADA OPERATIONS OFFICE LAS VEGAS, NEVADA
NEVADA TEST SITE—AREA 28
PROJECT HENRE
TRAILER PARK SITE PLAN-STA T28a
CIVIL PLAN & MECH. DETAILS
HOLMES & NARVER INC.
ENGINEERS—CONSTRUCTORS
01179
EDS 47
JS-028-T28a-C72-M4.2
INDEX CODE
028 | T28a | 30 | 04 | 001 | C7-M4 | 23
NOTE:
THIS DRAWING REFLECTS CURRENT STATUS AS OF 10-6-66

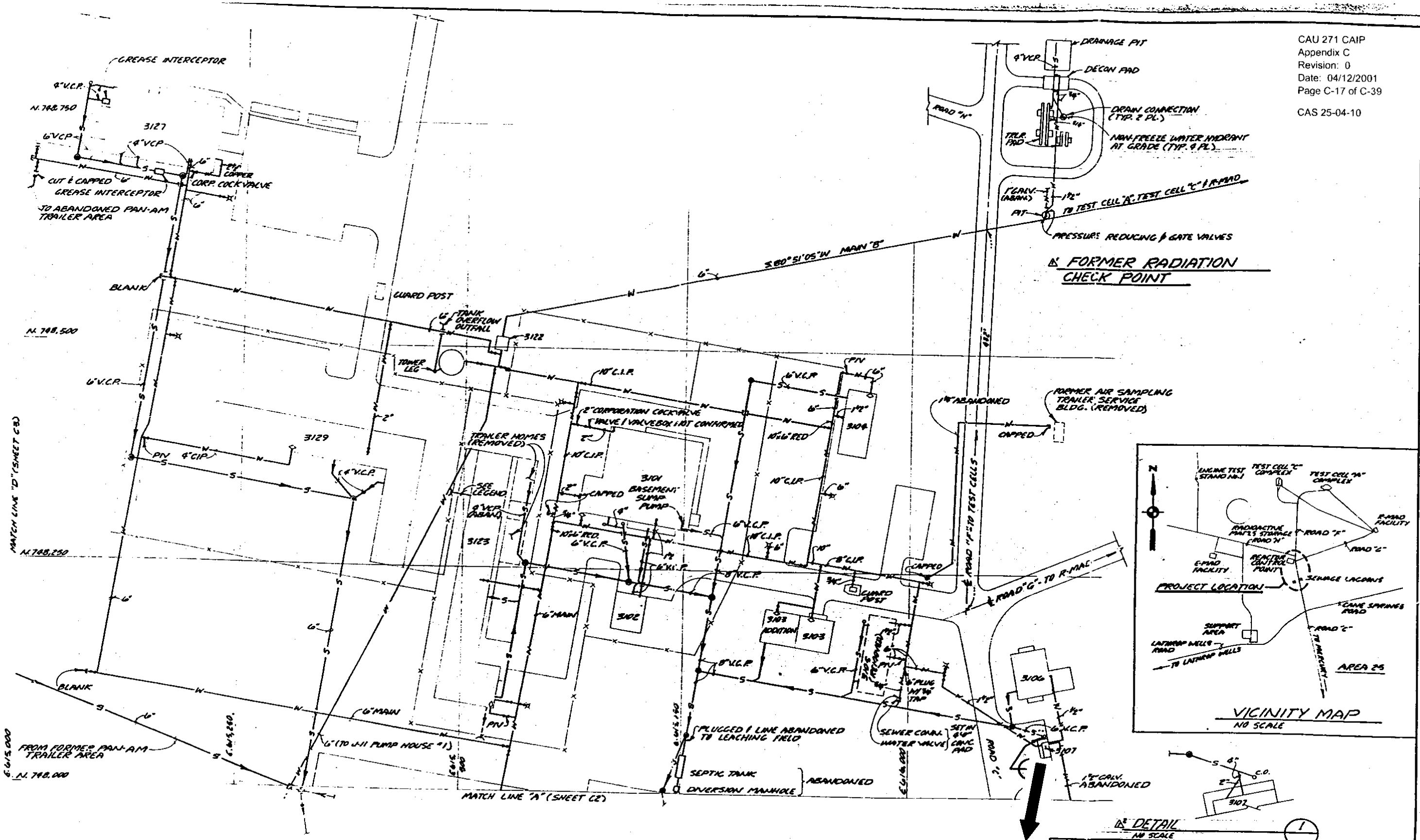

25-04-09
PLAN
SCALE: 1"=50' (SEE SHT. 3 FOR VICINITY MAP)
ACCESS RD. TO WATER TANKS
REGRADING OF DIRT RD. COVERS VALVE BOX
DEMINERALIZER WATER LINE
FENCE CONTINUES AROUND ETS-1 COMPOUND
PROCESS WATER LINE
UTILITY WATER LINE
ACID STORAGE TANK
CAUSTIC STORAGE TANK
FUEL OIL TANK
SUMP
COOLING TOWER
CHARCOAL ABSORBER
CIRCULAR PITS
FORMER TRUCK FILL STATION (RISER CUT AT GRADE FILL COVERS VALVE BOX & RISER)
PAVED PARKING AREA
FORMER TRAILERS
SANITARY TILE FIELD (ABAND)
SEWAGE EJECTOR
ELECTRIC SUBSTATION
FORMER GENERATOR TRAILERS
PROPANE TANK
RISER
CO2 STORAGE TANK
TRUCK UNLOADING AREA
DELUGE VALVE PIT #3
DELUGE VALVE PIT #2
G.H. FLARE STACK
RADIATION SHIELD DRIVE SHED
TUNNEL ACCESS (TYP. 5 PL.)
AIR RELEASE
CIRCULAR PIT
FORMER LOX DEWAR
LOX DEWAR
LH2 DEWAR
ROAD
TEMP. FABRICATION SHOP (ABANDONED)
LEGEND
MANHOLE
WATER LINE
PROCESS WATER LINE (DEMINERALIZED WATER)
SANITARY SEWER LINE
STORM DRAIN LINE
WATER VALVE
FIRE HYDRANT
RAILROAD TRACKS
RADIATION SHIELD TRACKS
DRAIN / OUTFALL
CAPPED OR PLUGGED PIPE
REDUCER ON WATER LINE
CLEAN OUT
SECURITY FENCING
HOSE CART HOUSING
UNDERGROUND STRUCTURE
BLDG. DIRECTORY
3305 - ACCESS TUNNEL
3310 - CONTROL POINT BLDG.
3312 - ACCESS TUNNEL ENTRANCE
3319 - MAINT. / SUPPLY BLDG.
3320 - UTILITY EQUIP. BLDG.
3324 - EMERGENCY GENERATOR PLANT
3330 - FILL STATION
3332 - HIGH PRESSURE GAS VESSEL CYLINDERS ENCLOSURE
3340 - TEST CELL BLDG.
3350 - TEST CELL STAND
EFFLUENT OVERFLOW / DRAIN OUTFALL
INFLUENT HANDHOLE DISTRIBUTION BOXES WITH SHEAR GATES
POND LEVEL EQUALIZING DISTRIBUTION BOX WITH SHEAR GATES ON EACH INLET & OUTLET PIPE
SANITARY SEWER OXIDATION PONDS
POND #2
POND #1
ENGINE EXHAUST DOWNHOLE COVER DRIVE SHED
REACTOR COOLING WATER DRAINAGE DITCH
TO HOLDING RESERVOIR
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
NEVADA TEST SITE
AREA 25
EXISTING WATER & SEWER LAYOUT
ENGINE TEST STAND NO. 1 (ETS#1)
PLAN
Reynolds Electrical & Engineering Co., Inc.
NTS
25-ETS-1-C1
SHEET 1 OF 3
ORIGINAL COPY



NOTE:
1. WORK WITH THESE DWGS.
620-3300-C-002
620-3300-C-003
620-3300-C-004

ETS-1
SEWAGE DISPOSAL DETAILS

620-3300-C-001



25-04-10

BUILDING DIRECTORY

3101 - CONTROL BLDG.
3102 - POWER HOUSE
3103 - LASL WAREHOUSE & OFFICE
3104 - ADMINISTRATION BLDG. (ORIGINAL)
3105 - ORIGINAL CAFETERIA & MED. BLDG (REMOVED)
3106 - FORMER REECO WHSE. & MAINT. BLDG.
3107 - ORIGINAL VEHICLE SERVICE STATION
3122 - PUMP HOUSE No. 2
3123 - TECH. SERVICES BLDG.
3127 - NEW CAFETERIA
3129 - TECH. OPERATIONS BLDG.

LEGEND

- —W— WATER LINE
- —S— SEWER LINE
- MANHOLE
- SEWER CLEANOUT
- FIRE HYDRANT
- WATER VALVE
- SPRINKLER RISER
- METER BOX
- 4" VCP ACID RESISTANT, RODENT PROOF CHEM. DRAIN & OUTFALL

ADDED FORMER RADIATION CHECK POINT & DETAIL 1.

U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE — LAS VEGAS, NEVADA
NEVADA TEST SITE — AREA 25

EXISTING WATER & SEWER LAYOUT
CONTROL POINT AREA
PLAN

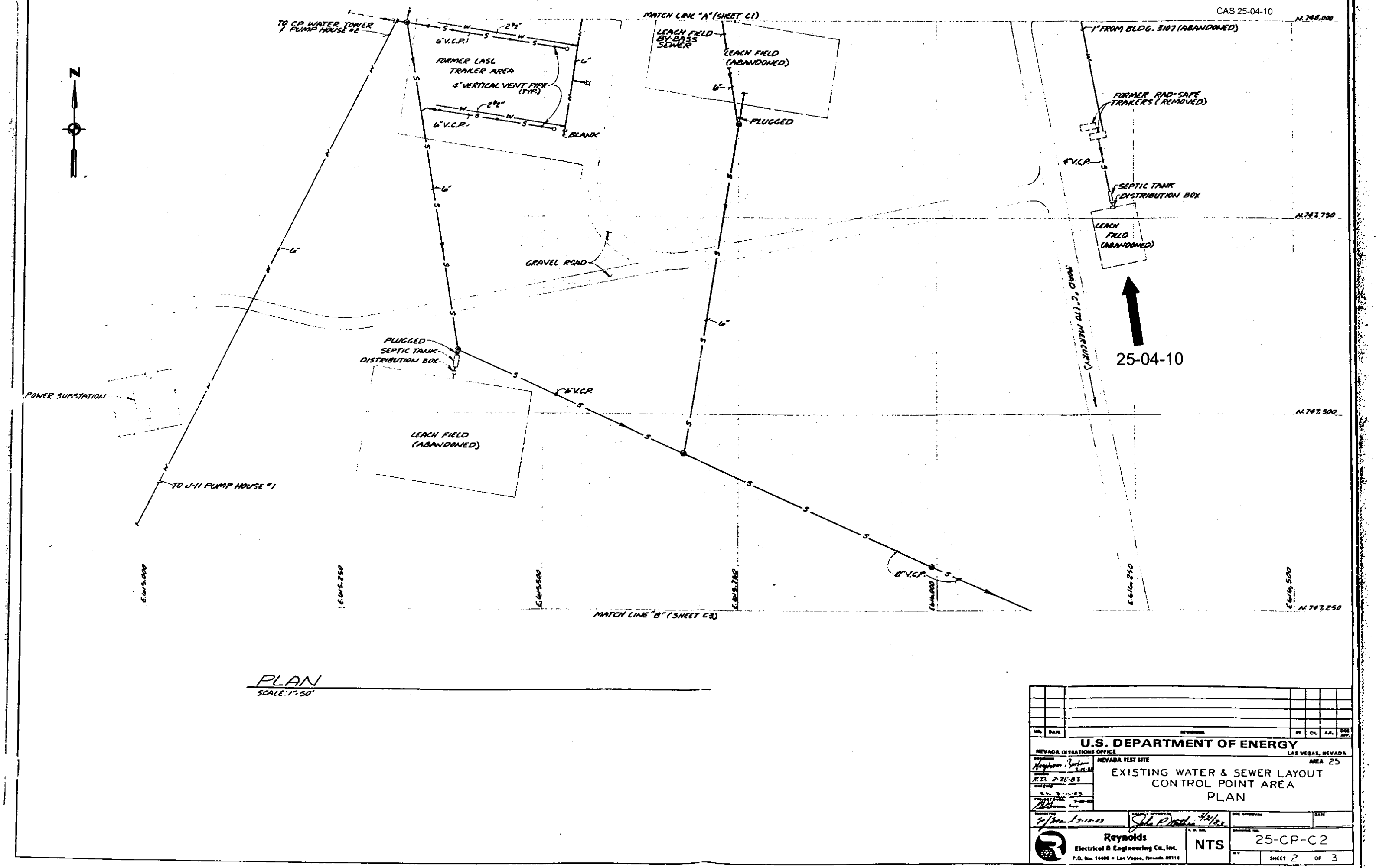
Reynolds Electrical & Engineering Co., Inc.
P.O. Box 14400 • Las Vegas, Nevada 89114

NTS

25-CP-C1.1

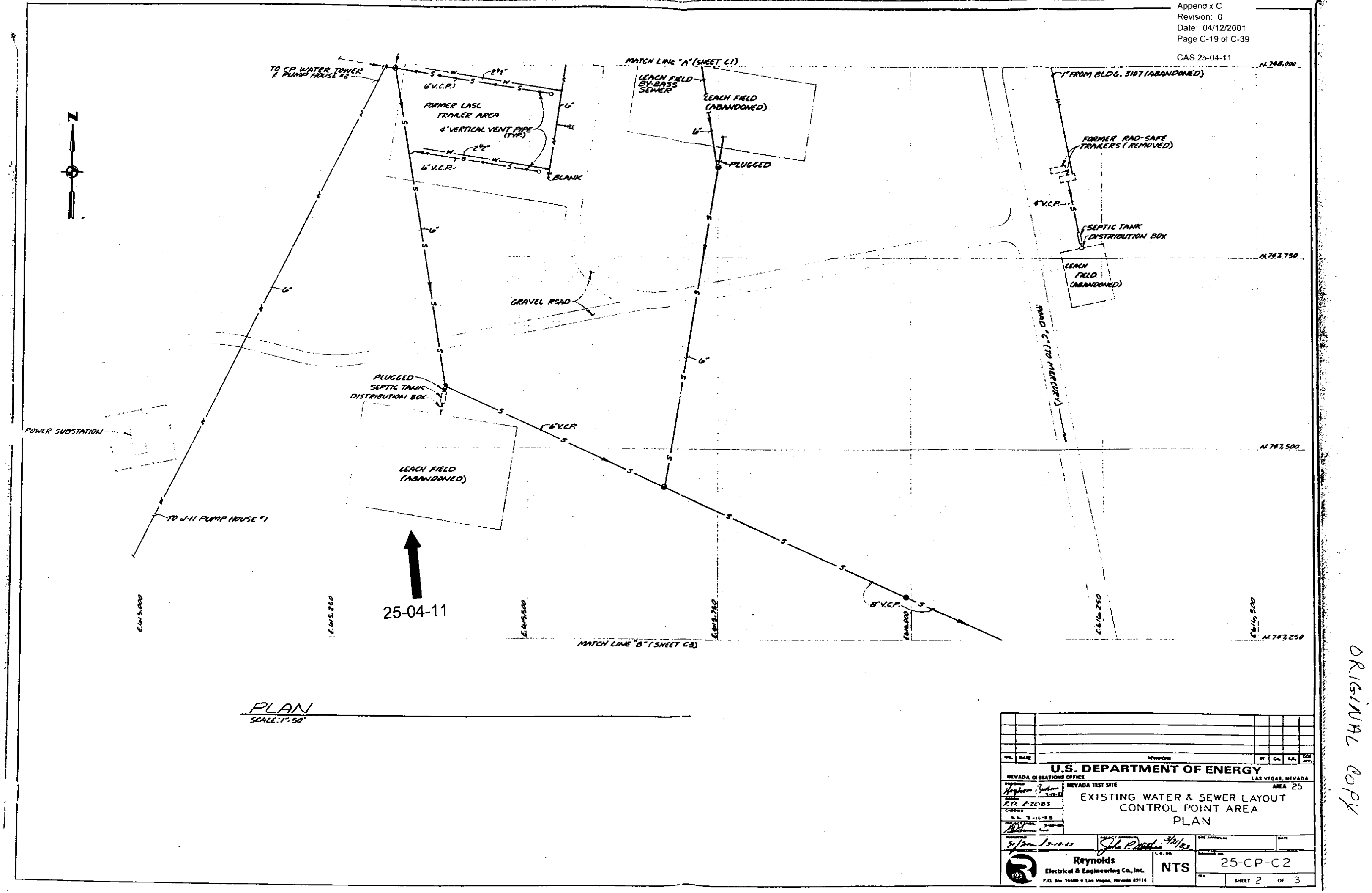
SHEET 1 OF 3

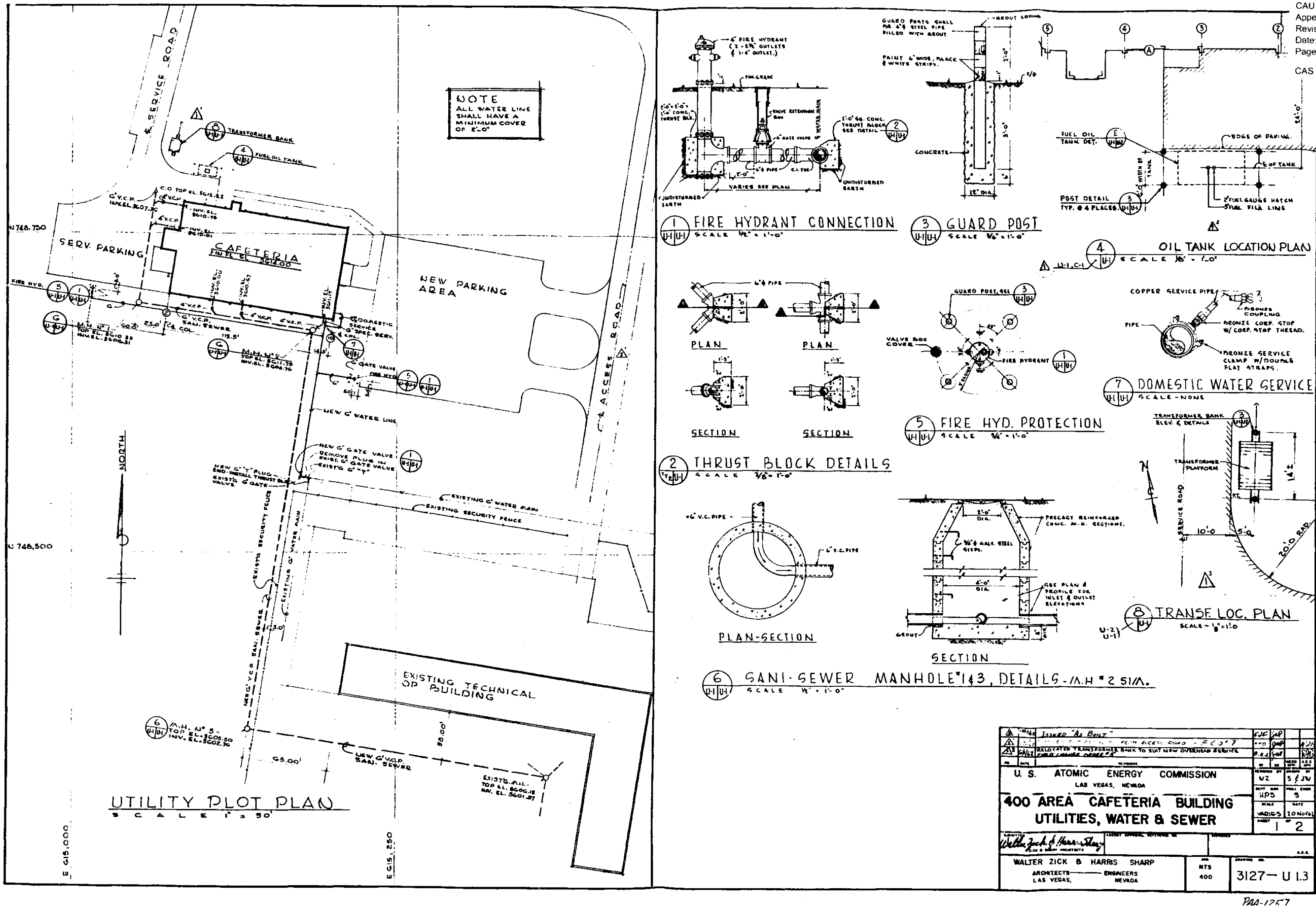
CAS 25-04-10

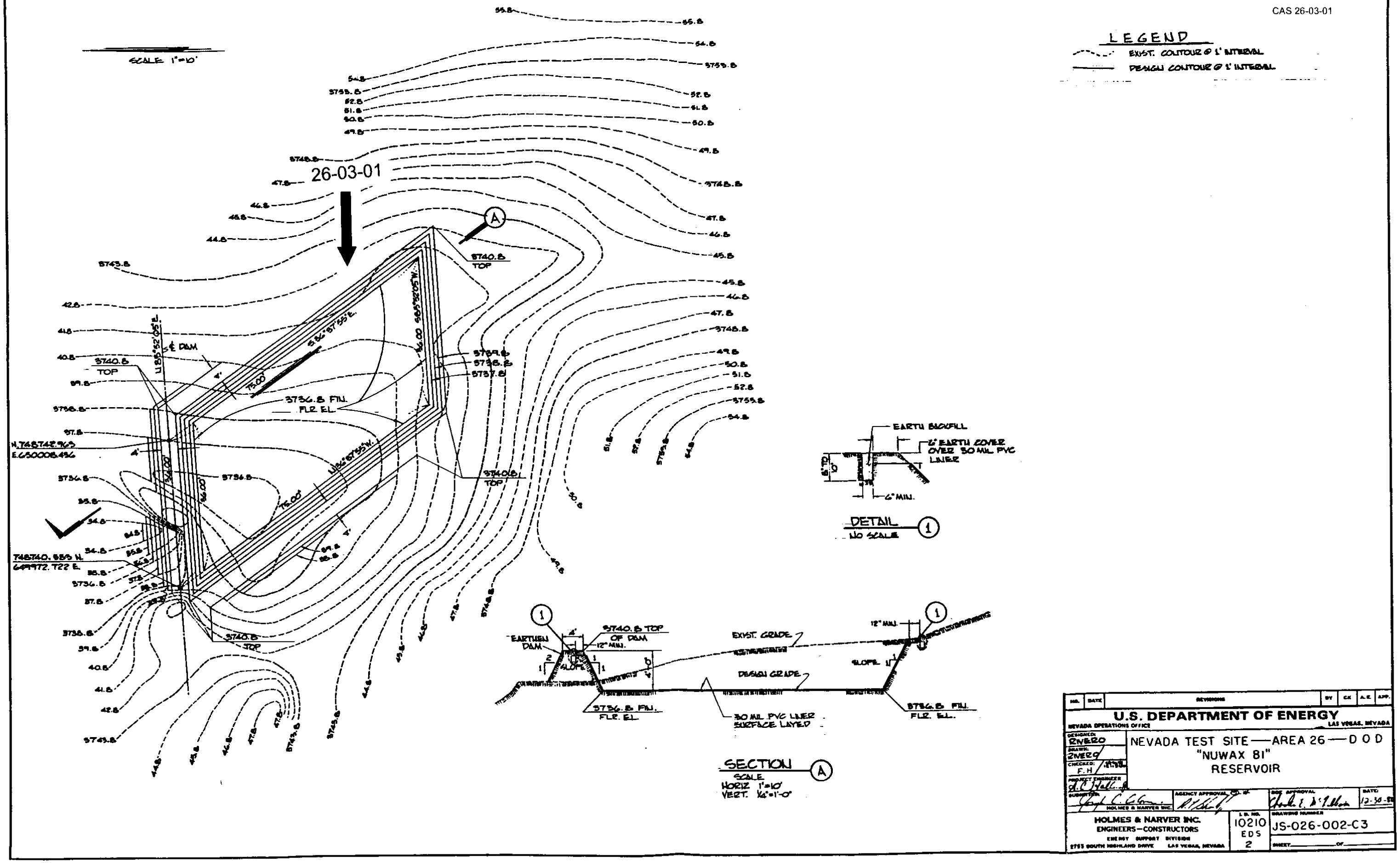


ORIGINAL COPY

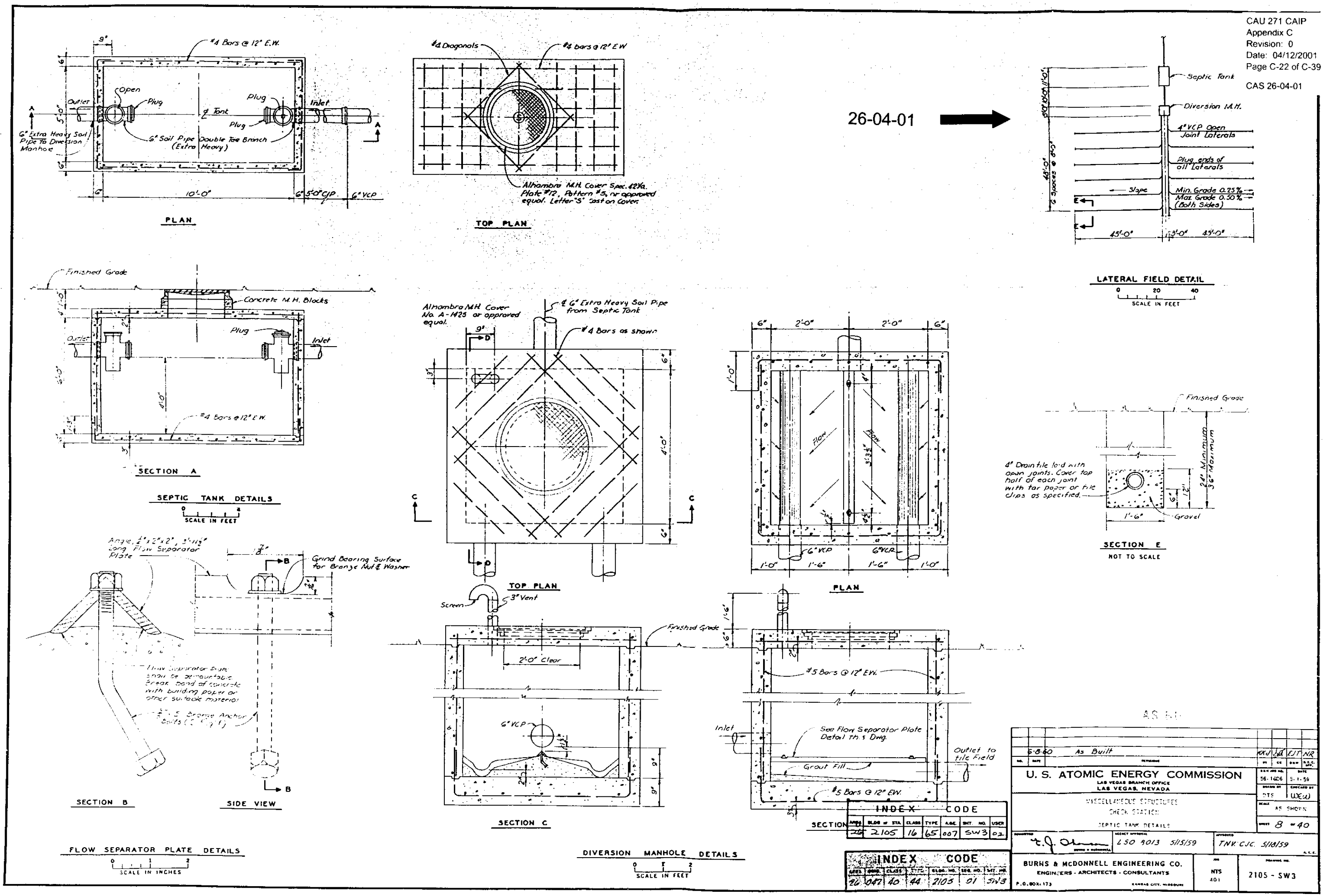
CAS 25-04-11

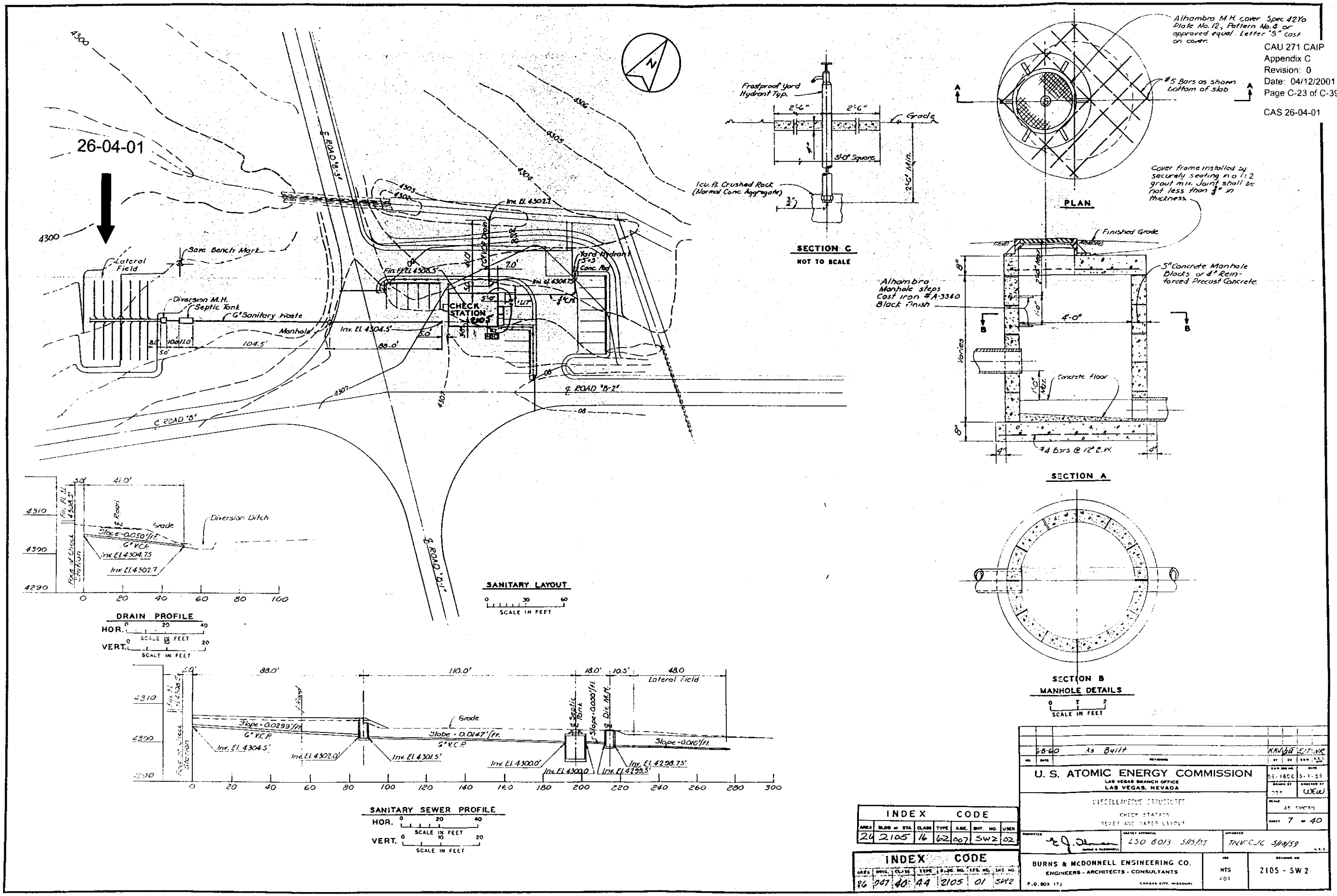

MATCH LINE "A" (SHEET C1)
TO CP WATER TOWER & PUMP HOUSE #2
6" V.C.P.
FORMER LASL TRAILER AREA
4" VERTICAL VENT PIPE (TYP.)
BLANK
LEACH FIELD BY-PASS SEWER
LEACH FIELD (ABANDONED)
PLUGGED
1" FROM BLDG. 3107 (ABANDONED)
FORMER RAD-SAFE TRAILERS (REMOVED)
SEPTIC TANK DISTRIBUTION BOX
LEACH FIELD (ABANDONED)
GRAVEL ROAD
ROAD "C" (TO MERCURY)
PLUGGED
SEPTIC TANK
DISTRIBUTION BOX
POWER SUBSTATION
LEACH FIELD (ABANDONED)
TO J-11 PUMP HOUSE #1
8" V.C.P.
25-04-11
N. 748,000
N. 747,750
N. 747,500
N. 747,250
MATCH LINE "B" (SHEET C3)
PLAN
SCALE: 1"=50'
ORIGINAL COPY
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
NEVADA TEST SITE
AREA 25
EXISTING WATER & SEWER LAYOUT
CONTROL POINT AREA
PLAN
Reynolds Electrical & Engineering Co., Inc.
NTS
25-CP-C2
SHEET 2 OF 3

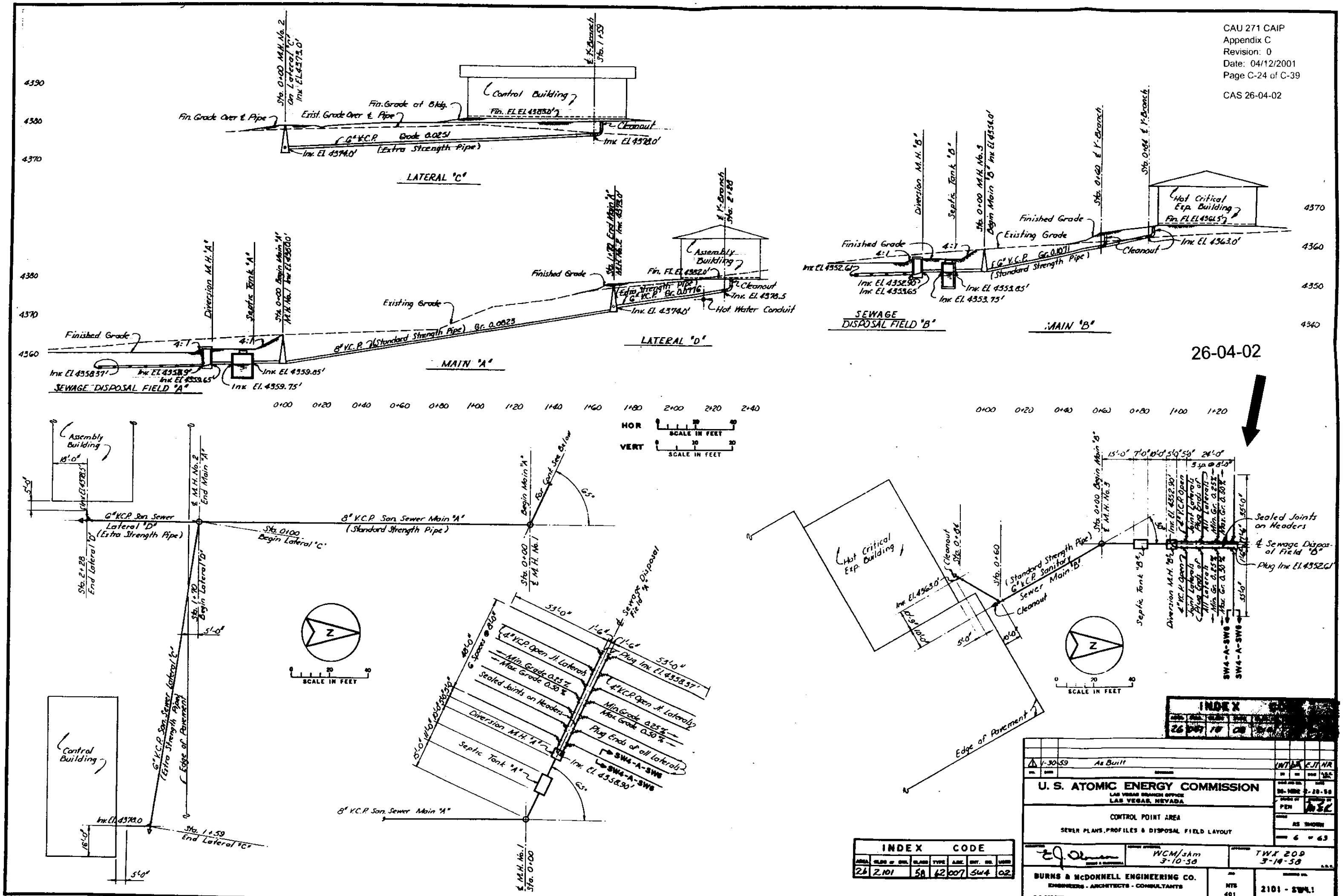

NOTE
ALL WATER LINE SHALL HAVE A MINIMUM COVER OF 2'-0"
SERVICE ROAD
TRANSFORMER BANK
FUEL OIL TANK
SERV. PARKING
CAFETERIA
NEW PARKING AREA
ACCESS ROAD
NEW 6" WATER LINE
EXISTING 6" WATER MAIN
EXISTING SECURITY FENCE
EXISTING TECHNICAL OP BUILDING
NEW 6" V.C.P. SAN. SEWER
NORTH
UTILITY PLOT PLAN
SCALE 1" = 50'
FIRE HYDRANT CONNECTION
GUARD POST
OIL TANK LOCATION PLAN
THRUST BLOCK DETAILS
FIRE HYD. PROTECTION
DOMESTIC WATER SERVICE
TRANSF. LOC. PLAN
PLAN-SECTION
SECTION
SANI-SEWER MANHOLE #1 & 3, DETAILS - M.H. # 2 SIM.
ISSUED "AS BUILT"
RELOCATED TRANSFORMER BANK TO SUIT NEW OVERHEAD SERVICE
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS, NEVADA
400 AREA CAFETERIA BUILDING
UTILITIES, WATER & SEWER
WALTER ZICK & HARRIS SHARP
ARCHITECTS — ENGINEERS
LAS VEGAS, NEVADA
3127— U 1.3
PAA-1257


SCALE 1"=10'
LEGEND
EXIST. CONTOUR @ 1' INTERVAL
DESIGN CONTOUR @ 1' INTERVAL
26-03-01
3740.8 TOP
3736.8 FIN. FLR EL.
℄ DAM
EARTH BACKFILL
6" EARTH COVER OVER 30 MIL PVC LINER
6" MIN.
DETAIL 1
NO SCALE
EARTHEN DAM
3740.8 TOP OF DAM
12" MIN.
SLOPE
EXIST. GRADE
DESIGN GRADE
3736.8 FIN. FLR. EL.
30 MIL PVC LINER SURFACE LAYED
SECTION A
SCALE
HORIZ 1"=10'
VERT. 1/4"=1'-0"
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
NEVADA TEST SITE — AREA 26 — D O D
"NUWAX 81"
RESERVOIR
HOLMES & NARVER INC.
ENGINEERS—CONSTRUCTORS
10210
EDS
2
JS-026-002-C3

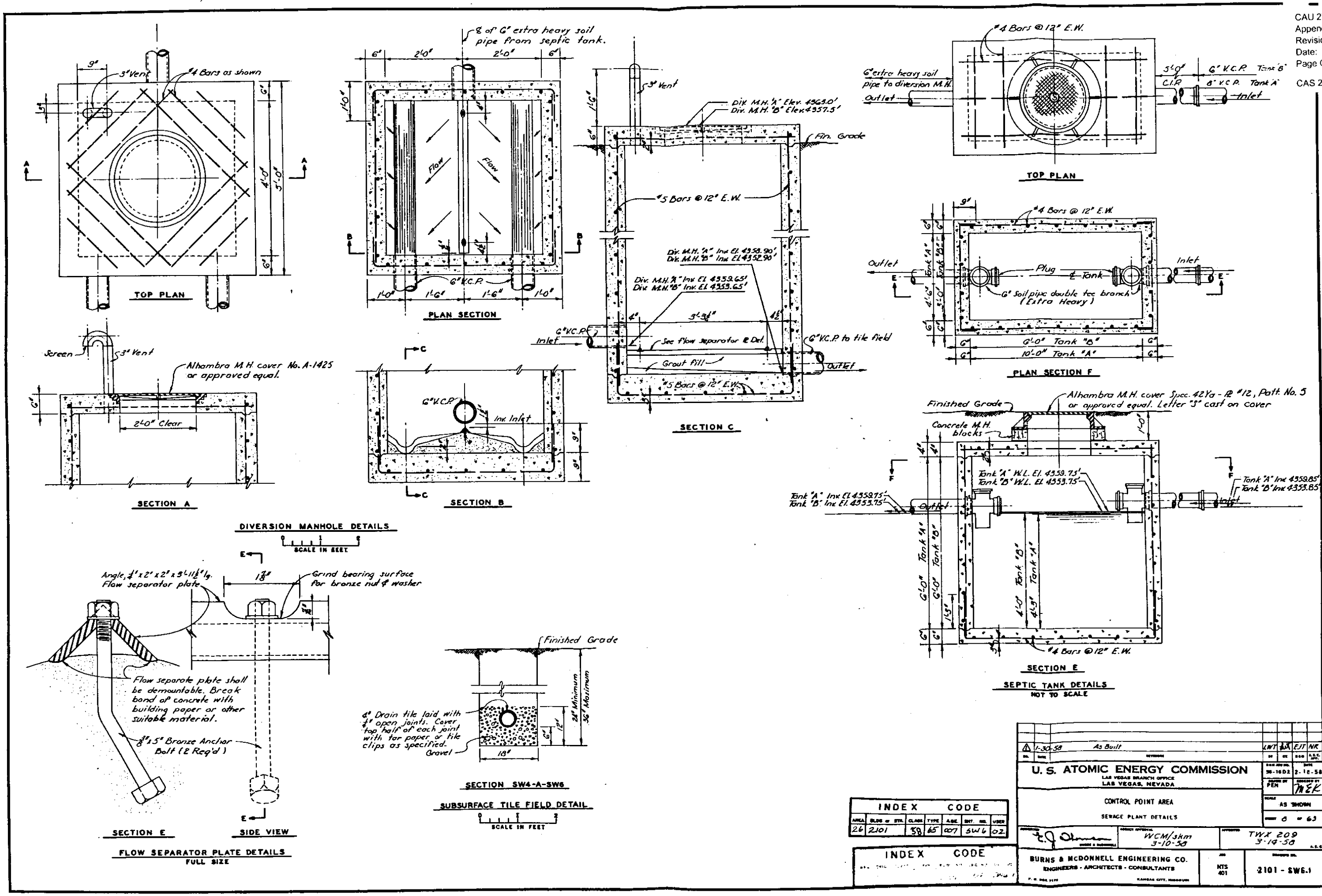
26-04-01


#4 Bars @ 12" E.W.
Open
Plug
Outlet
Inlet
℄ Tank
6" Extra Heavy Soil Pipe To Diversion Manhole
6" Soil Pipe Double Tee Branch (Extra Heavy)
10'-0"
5'-0" C/P
6" VCP
PLAN
#4 Diagonals
#4 bars @ 12" E.W.
Alhambra M.H. Cover Spec. 42Ya. Plate #12, Pattern #5, or approved equal. Letter "S" cast on Cover.
TOP PLAN
Septic Tank
Diversion M.H.
4" VCP Open Joint Laterals
Plug ends of all Laterals
Slope
Min. Grade 0.25%
Max. Grade 0.50%
(Both Sides)
45'-0"
LATERAL FIELD DETAIL
SCALE IN FEET
Finished Grade
Concrete M.H. Blocks
#4 Bars @ 12" E.W.
SECTION A
SEPTIC TANK DETAILS
SCALE IN FEET
Alhambra M.H. Cover No. A-1425 or approved equal.
℄ 6" Extra Heavy Soil Pipe from Septic Tank
#4 Bars as shown
TOP PLAN
Flow
6" VCP
6" VCP
PLAN
Finished Grade
4" Drain tile laid with open joints. Cover top half of each joint with tar paper or tile clips as specified.
24" Minimum
36" Maximum
Gravel
SECTION E
NOT TO SCALE
Angle, 1/4" x 2" x 2", 3'-11 1/2" Long Flow Separator Plate
Grind Bearing Surface for Bronze Nut & Washer
Flow Separator Plate shall be removable. Break bond of concrete with building paper or other suitable material
SECTION B
SIDE VIEW
FLOW SEPARATOR PLATE DETAILS
SCALE IN INCHES
Screen
3" Vent
2'-0" Clear
6" VCP
Finished Grade
#5 Bars @ 12" E.W.
Inlet
See Flow Separator Plate Detail this Dwg.
Grout Fill
Outlet to tile Field
#5 Bars @ 12" E.W.
SECTION C
SECTION D
DIVERSION MANHOLE DETAILS
SCALE IN FEET
AS BUILT
6-8-60 As Built
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS BRANCH OFFICE
LAS VEGAS, NEVADA
MISCELLANEOUS STRUCTURES
CHECK STATION
SEPTIC TANK DETAILS
56-1606
5-1-59
AS SHOWN
8 of 40
LSO 9013 5/15/59
TNV. CJC. 5/18/59
INDEX CODE
2105 16 65 007 SW3 02
INDEX CODE
26 047 40 44 2105 01 SW3
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
KANSAS CITY, MISSOURI
NTS
2105 - SW3


26-04-01
Lateral Field
Sars Bench Mark
Diversion M.H.
Septic Tank
6" Sanitary Waste
Manhole
Inv. El. 4304.5'
104.5'
88.0'
CHECK STATION 2105
Yard Hydrant
Fin. Fl. El. 4308.5'
Inv. El. 4302.7
℄ ROAD "B-2"
℄ ROAD "B"
℄ ROAD "B-3"
℄ ROAD "B-1"
SANITARY LAYOUT
SCALE IN FEET
Frostproof Yard Hydrant Typ.
Grade
5'-0" Square
1 cu. ft. Crushed Rock (Normal Conc. Aggregate)
SECTION C
NOT TO SCALE
Alhambra M.H. cover Spec 4240 Plate No. 12, Pattern No. 4 or approved equal. Letter "S" cast on cover.
#5 Bars as shown bottom of slab
PLAN
Cover frame installed by securely seating in a 1:2 grout mix. Joint shall be not less than 3/8" in thickness.
Finished Grade
5" Concrete Manhole Blocks or 4" Reinforced Precast Concrete.
Alhambra Manhole steps Cast Iron #A-3340 Black Finish
Varies
Concrete floor
#4 Bars @ 12" E.W.
SECTION A
SECTION B
MANHOLE DETAILS
SCALE IN FEET
Diversion Ditch
Slope - 0.050'/ft.
6" V.C.P.
Inv. El. 4304.75
Inv. El. 4302.7
DRAIN PROFILE
HOR.
VERT.
SCALE IN FEET
Slope - 0.0299'/ft.
Slope - 0.0147'/ft.
Slope - 0.010'/ft.
Lateral Field
Septic Tank
Dir. M.H.
Inv. El. 4304.5'
Inv. El. 4302.0'
Inv. El. 4301.5'
Inv. El. 4300.0'
Inv. El. 4298.75'
SANITARY SEWER PROFILE
As Built
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS BRANCH OFFICE
LAS VEGAS, NEVADA
CHECK STATION
AS SHOWN
7 of 40
INDEX CODE
24 2105 16 62 007 SW2 02
INDEX CODE
26 047 40 44 2105 01 SW2
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
KANSAS CITY, MISSOURI
2105 - SW 2

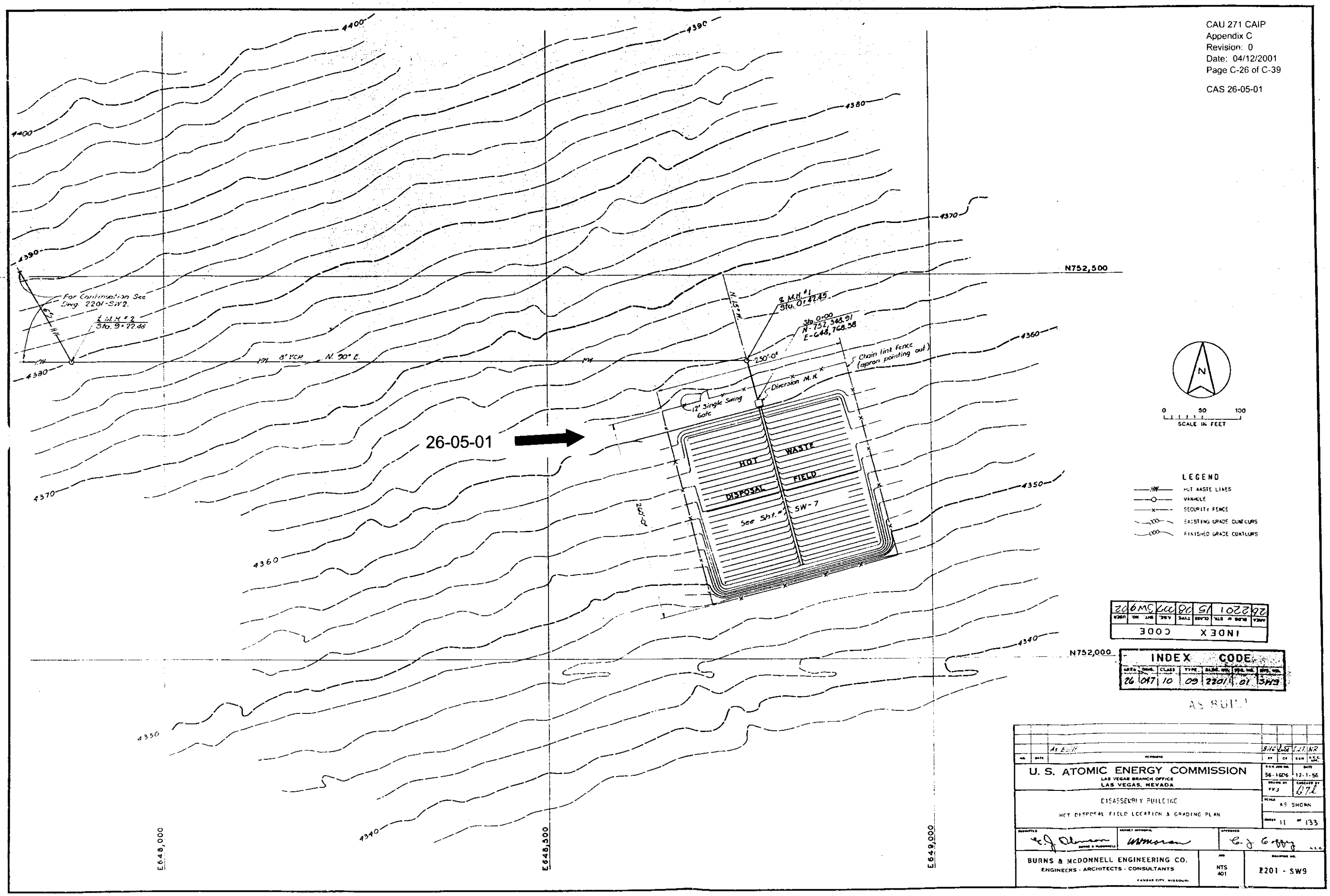


SG-16D2 NTS401 P Sewer Plans Profiles & Disposal Field Layout 2101-SW4

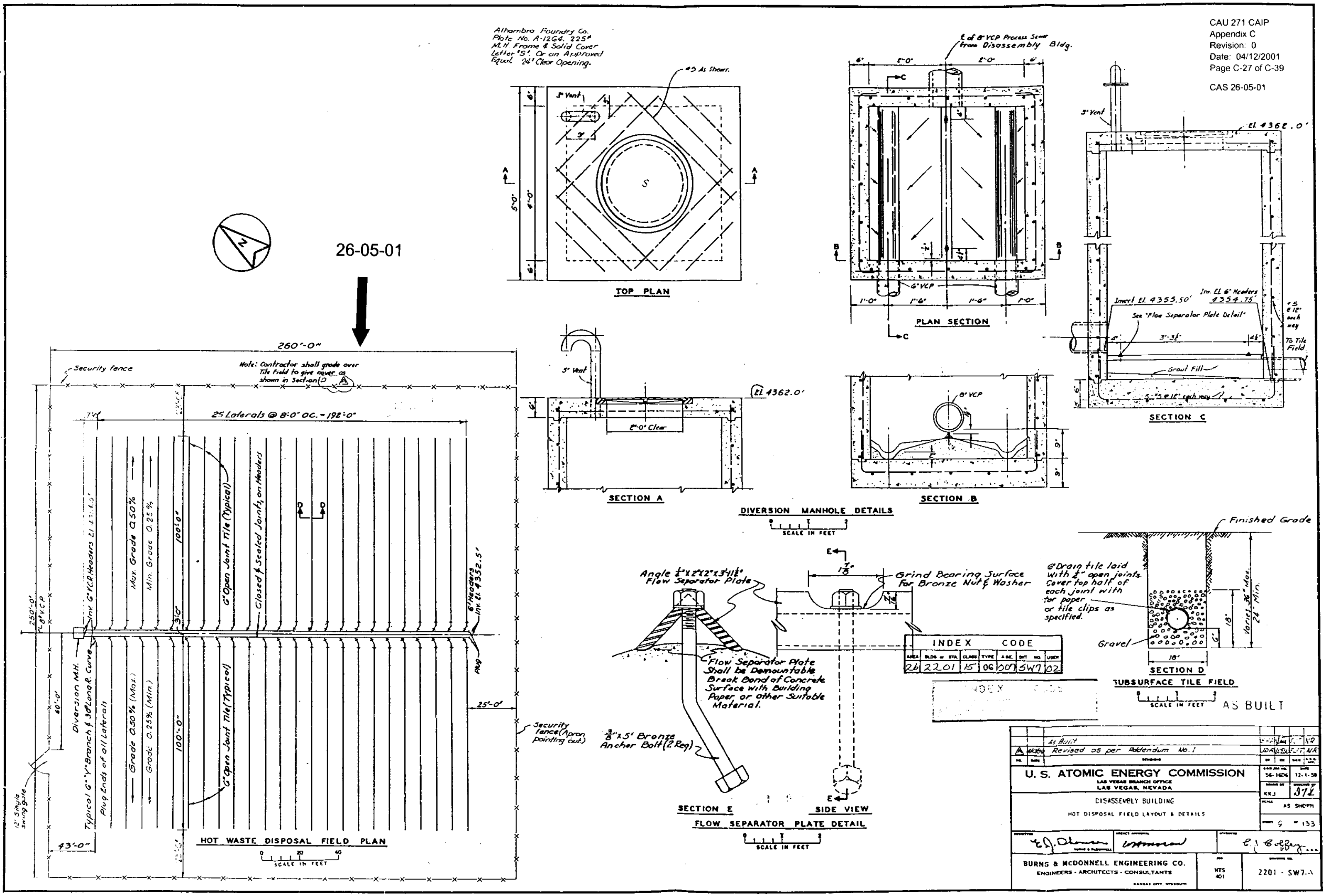


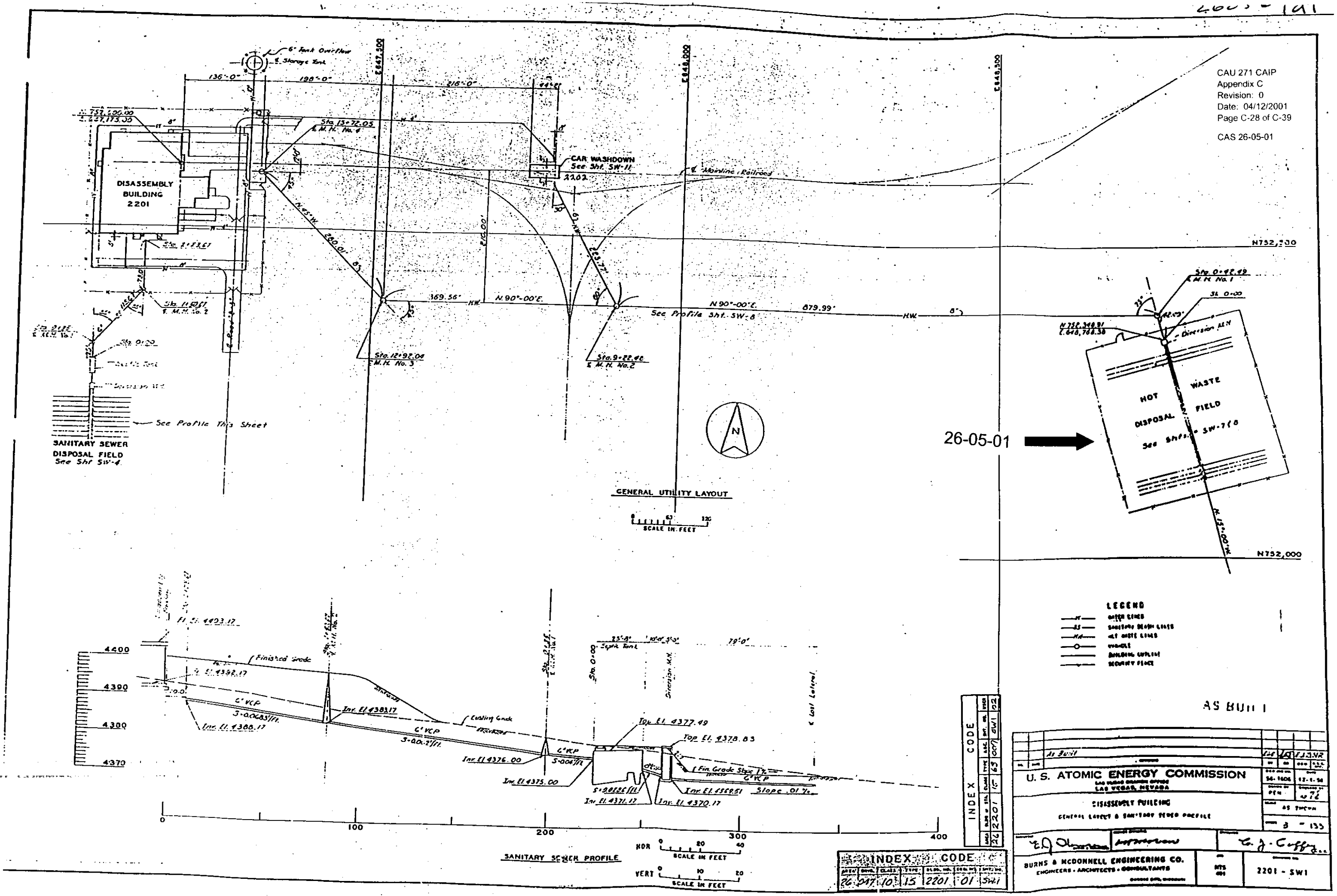
56-16DZ NTS 401 P Sewage Plant Details 2101-SW6

CAS 26-05-01

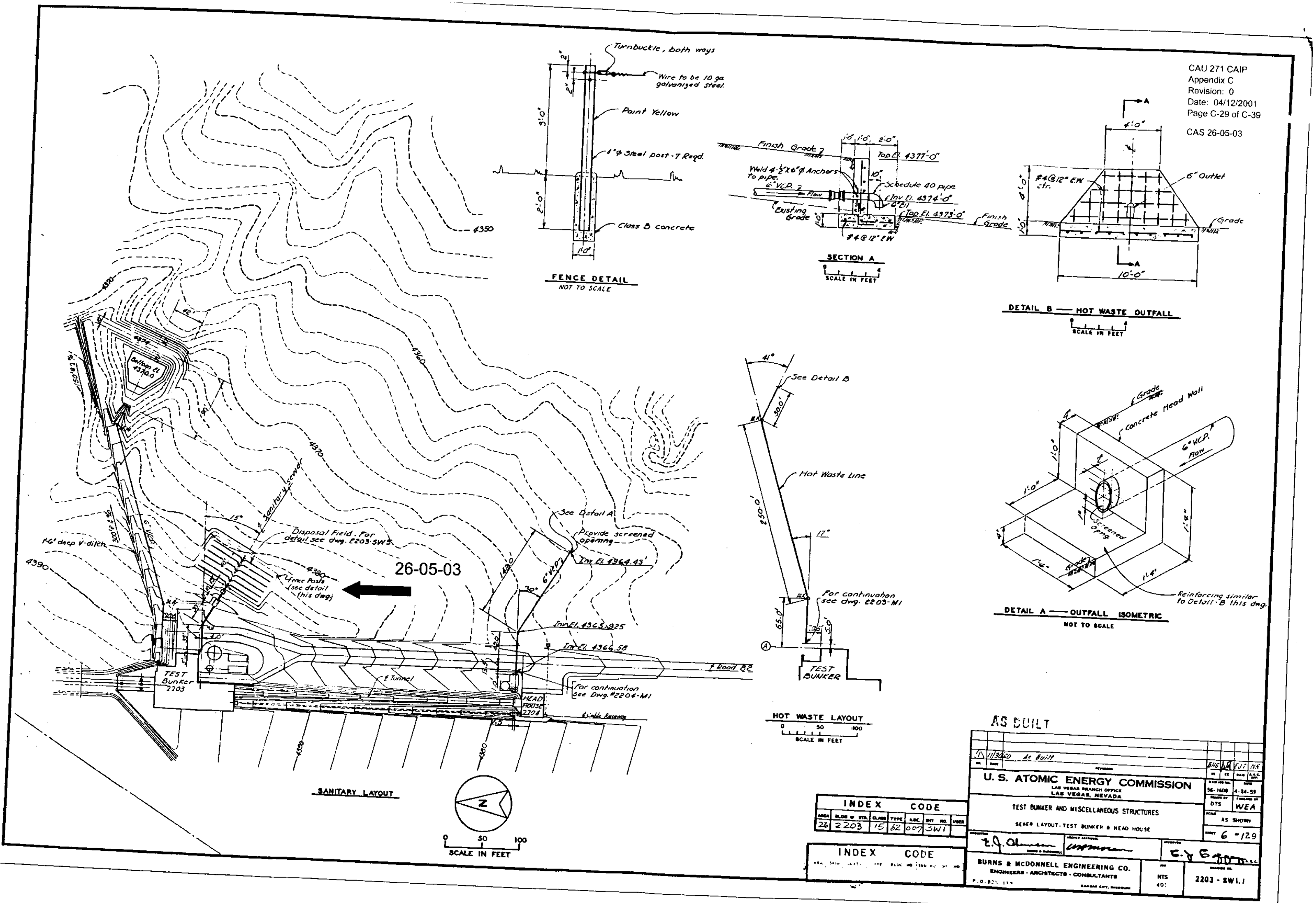

26-05-01
HOT WASTE DISPOSAL FIELD
See Sht. # SW-7
Diversion M.H.
12' Single Swing Gate
Chain link fence (apron pointing out)
℄ M.H. #1 Sta. 0+42.45
Sta. 0+00 N-752,348.91 E-648,768.38
℄ M.H. #2 Sta. 9+22.48
For Continuation See Dwg. 2201-SW2.
8" VCP N. 90° E.
250'-0"
260'-0"
N752,500
N752,000
E648,000
E648,500
E649,000
4400
4390
4380
4370
4360
4350
4340
SCALE IN FEET
0
50
100
LEGEND
HOT WASTE LINES
MANHOLE
SECURITY FENCE
EXISTING GRADE CONTOURS
FINISHED GRADE CONTOURS
INDEX CODE
26 047 10 09 2201 01 SW9
AS BUILT
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS BRANCH OFFICE
LAS VEGAS, NEVADA
DISASSEMBLY BUILDING
HOT DISPOSAL FIELD LOCATION & GRADING PLAN
56-1606
12-1-56
AS SHOWN
11 of 133
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
KANSAS CITY, MISSOURI
NTS 401
2201 - SW9

CAS 26-05-01


26-05-01
Alhambra Foundry Co. Plate No. A-1264. 225# M.H. Frame & Solid Cover Letter "S". Or an Approved Equal. 24" Clear Opening.
TOP PLAN
PLAN SECTION
SECTION A
SECTION B
SECTION C
DIVERSION MANHOLE DETAILS
SCALE IN FEET
El. 4362.0'
Invert El. 4355.50'
Inv. El. 6" Headers 4354.75'
See "Flow Separator Plate Detail"
Grout Fill
To Tile Field
℄ of 8" VCP Process Sewer from Disassembly Bldg.
260'-0"
Security fence
Note: Contractor shall grade over Tile Field to give cover as shown in Section D
25 Laterals @ 8'-0" OC. - 192'-0"
Max. Grade 0.50%
Min. Grade 0.25%
6" Open Joint Tile (Typical)
Closed & Sealed Joints on Headers
6" Headers Inv. El. 4352.5'
Diversion M.H.
Typical 6" "Y" Branch & 30° Long R. Curve
Plug Ends of all Laterals
Security fence (Apron pointing out)
12' Single swing gate
HOT WASTE DISPOSAL FIELD PLAN
Angle 1/4"x2"x2"x3-1/2" Flow Separator Plate
Grind Bearing Surface for Bronze Nut & Washer
Flow Separator Plate Shall be Demountable. Break Bond of Concrete Surface with Building Paper or other Suitable Material.
3/8"x5' Bronze Ancher Bolt (2 Req.)
SECTION E
SIDE VIEW
FLOW SEPARATOR PLATE DETAIL
Finished Grade
6" Drain tile laid with 1/4" open joints. Cover top half of each joint with tar paper or tile clips as specified.
Gravel
Varies 36" Max. 24" Min.
SECTION D
SUBSURFACE TILE FIELD
AS BUILT
INDEX CODE
26 2201 15 06 007 SW7 02
As Built
Revised as per Addendum No. 1
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS BRANCH OFFICE
LAS VEGAS, NEVADA
DISASSEMBLY BUILDING
HOT DISPOSAL FIELD LAYOUT & DETAILS
AS SHOWN
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
KANSAS CITY, MISSOURI
2201 - SW7

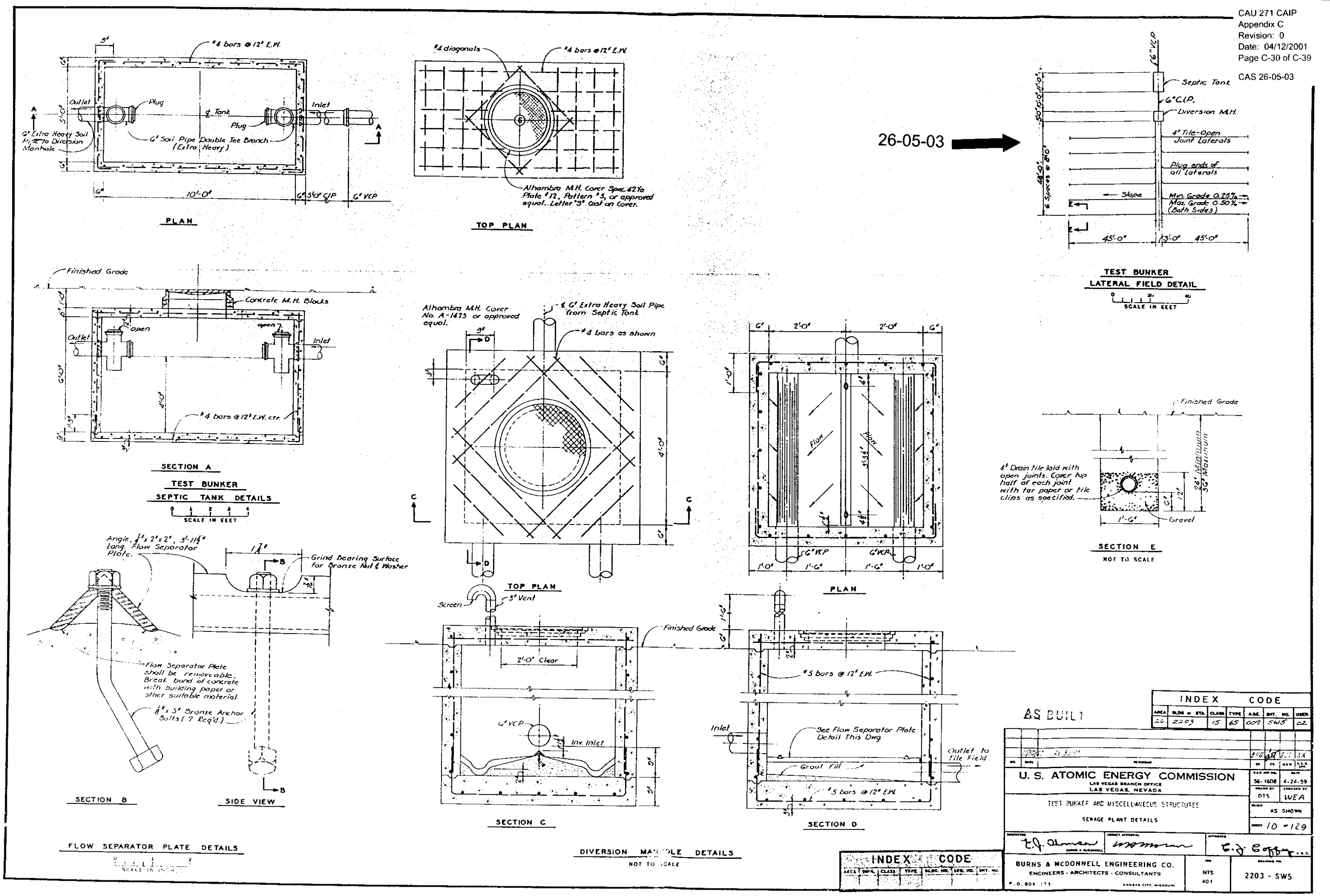

DISASSEMBLY BUILDING 2201
CAR WASHDOWN See Sht. SW-11
2202
Sta. 13+72.05 E M.H. No. 4
N 45° W 280.01'
Sta. 12+92.04 M.H. No. 3
169.56'
N 90°-00' E.
See Profile Sht. SW-8
879.99'
Sta. 9+22.46 M.H. No. 2
Sta. 0+42.49 M.H. No. 1
N752,300
N752,000
HOT WASTE DISPOSAL FIELD See Shts. SW-7 & 8
26-05-01
SANITARY SEWER DISPOSAL FIELD See Sht SW-4
See Profile This Sheet
GENERAL UTILITY LAYOUT
SCALE IN FEET
LEGEND
Finished Grade
Existing Grade
6" VCP
Inv. El. 4383.17
Inv. El. 4376.00
Inv. El. 4375.00
Top El. 4377.49
Top El. 4378.83
Inv. El. 4371.17
Inv. El. 4370.17
Slope .01%
SANITARY SEWER PROFILE
HOR SCALE IN FEET
VERT SCALE IN FEET
AS BUILT
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS, NEVADA
DISASSEMBLY BUILDING
GENERAL LAYOUT & SANITARY SEWER PROFILE
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS · ARCHITECTS · CONSULTANTS
2201 - SW1
INDEX CODE
26 047 10 15 2201 01 SW1

CAS 26-05-03

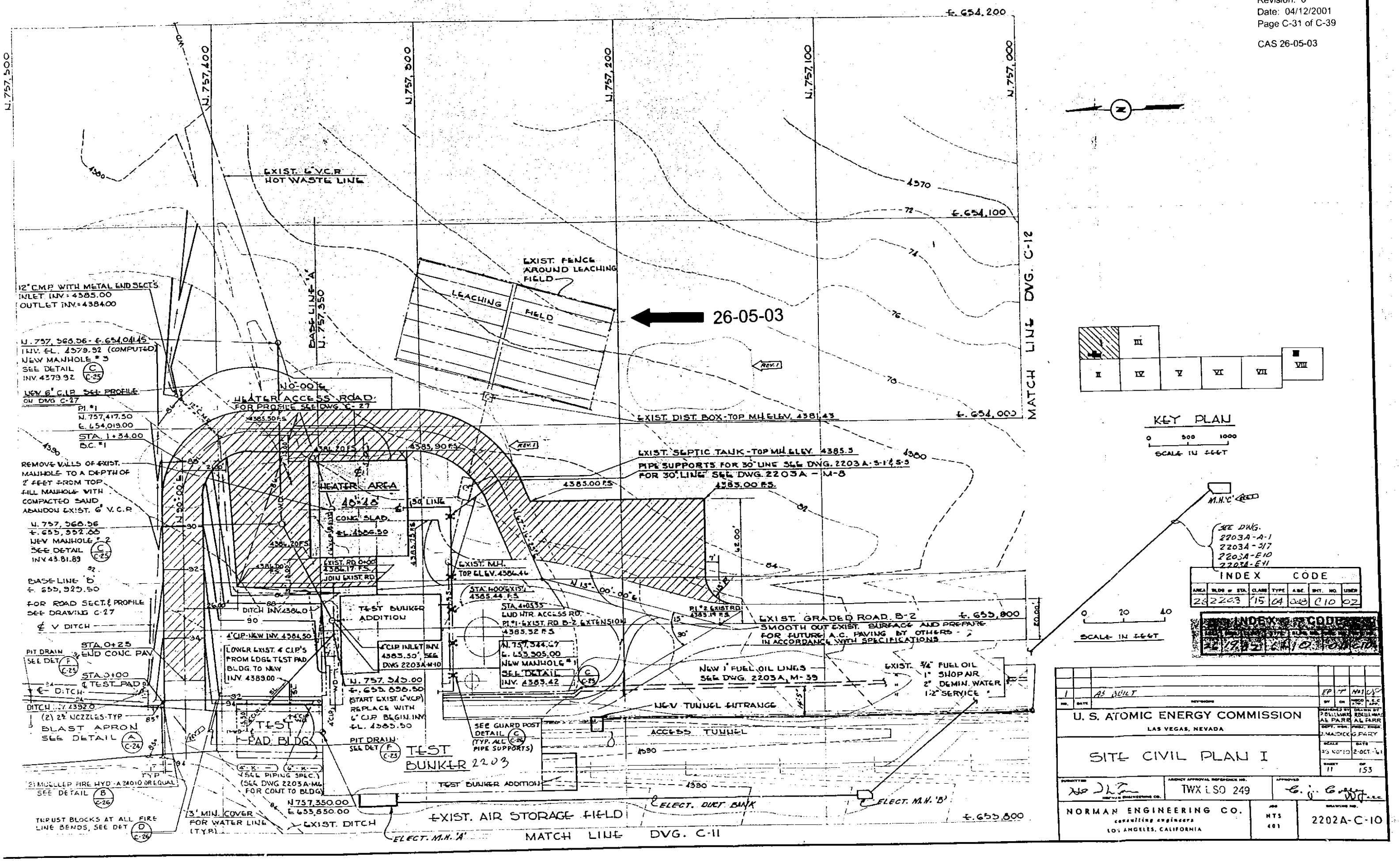


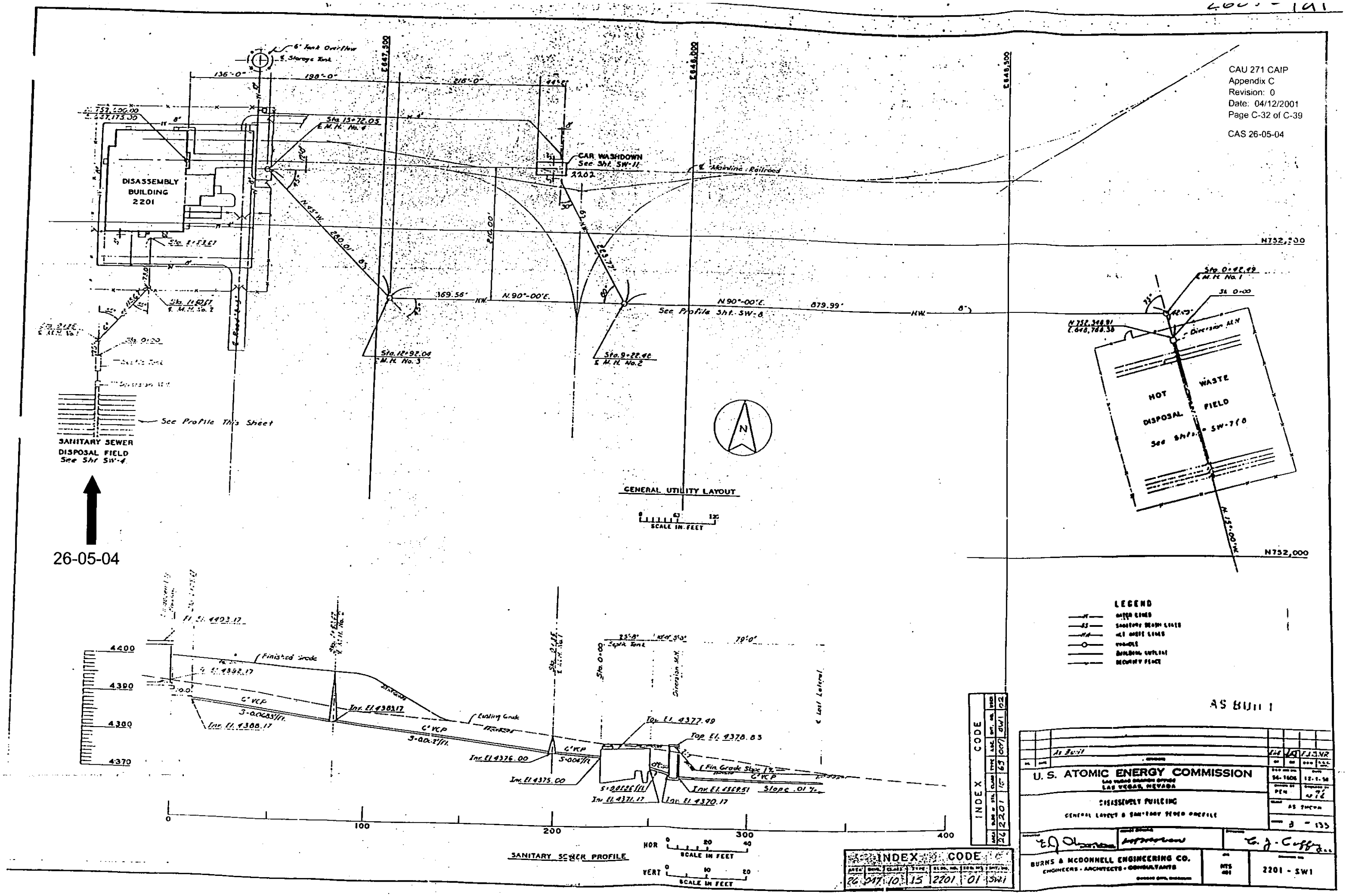
Test Bunker

CAS 26-05-03

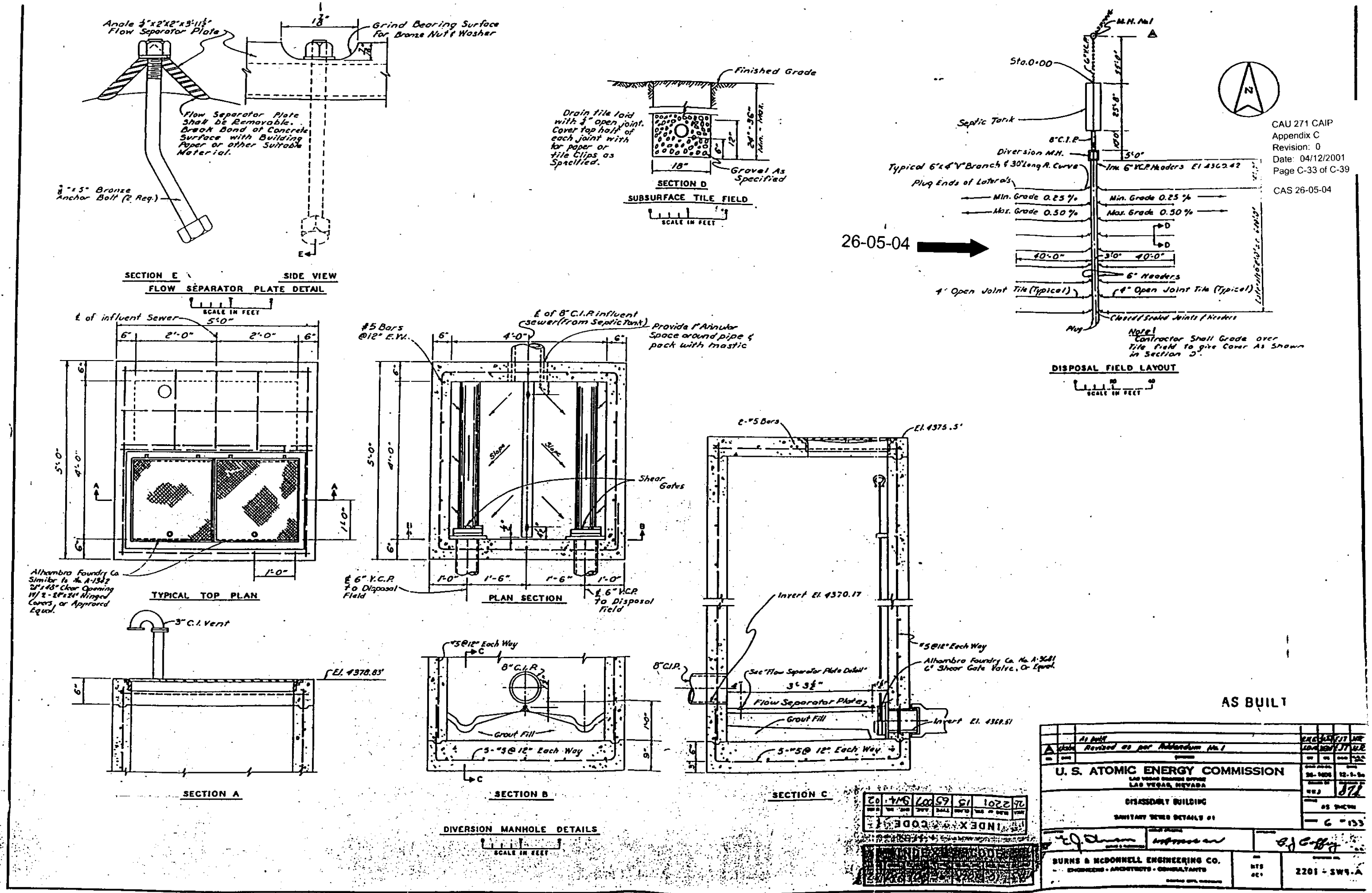

26-05-03
PLAN
#4 bars @ 12" E.W.
Outlet
Inlet
Plug
℄ Tank
6" Soil Pipe Double Tee Branch (Extra Heavy)
6" Extra Heavy Soil Pipe to Diversion Manhole
10'-0"
6" VCP
TOP PLAN
#4 diagonals
Alhambra M.H. Cover Spec. 42Ya Plate #12, Pattern #5, or approved equal. Letter "S" Cast on Cover.
TEST BUNKER
LATERAL FIELD DETAIL
SCALE IN FEET
6" VCP
Septic Tank
6" C.I.P.
Diversion M.H.
4" Tile-Open Joint Laterals
Plug ends of all Laterals
Slope
Min. Grade 0.25%
Max. Grade 0.50%
(Both Sides)
6 Spaces @ 8'-0"
45'-0"
13'-0"
45'-0"
Finished Grade
Concrete M.H. Blocks
open
#4 bars @ 12" E.W. ctr.
SECTION A
TEST BUNKER
SEPTIC TANK DETAILS
SCALE IN FEET
Alhambra M.H. Cover No. A-1425 or approved equal.
℄ 6" Extra Heavy Soil Pipe from Septic Tank
#4 bars as shown
TOP PLAN
PLAN
Flow
6" VCP
4" Drain tile laid with open joints. Cover top half of each joint with tar paper or tile clips as specified.
Gravel
24" Minimum
36" Maximum
SECTION E
NOT TO SCALE
Angle, 1/4" x 2" x 2", 3'-11 1/2" Long, Flow Separator Plate.
Grind Bearing Surface for Bronze Nut & Washer
Flow Separator Plate shall be removeable. Break bond of concrete with building paper or other suitable material.
5/8" x 5" Bronze Anchor Bolts (7 Req'd.)
SECTION B
SIDE VIEW
FLOW SEPARATOR PLATE DETAILS
SCALE IN INCHES
Screen
3" Vent
Finished Grade
2'-0" Clear
6" VCP
Inv. Inlet
SECTION C
Inlet
#5 bars @ 12" E.W.
See Flow Separator Plate Detail This Dwg.
Grout Fill
Outlet to Tile Field
SECTION D
DIVERSION MANHOLE DETAILS
NOT TO SCALE
AS BUILT
INDEX CODE
26 2203 15 65 007 SW5 02
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS BRANCH OFFICE
LAS VEGAS, NEVADA
TEST BUNKER AND MISCELLANEOUS STRUCTURES
SEWAGE PLANT DETAILS
56-1608
4-24-59
DTS
WEA
AS SHOWN
10 - 129
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
KANSAS CITY, MISSOURI
NTS
401
2203 - SW5

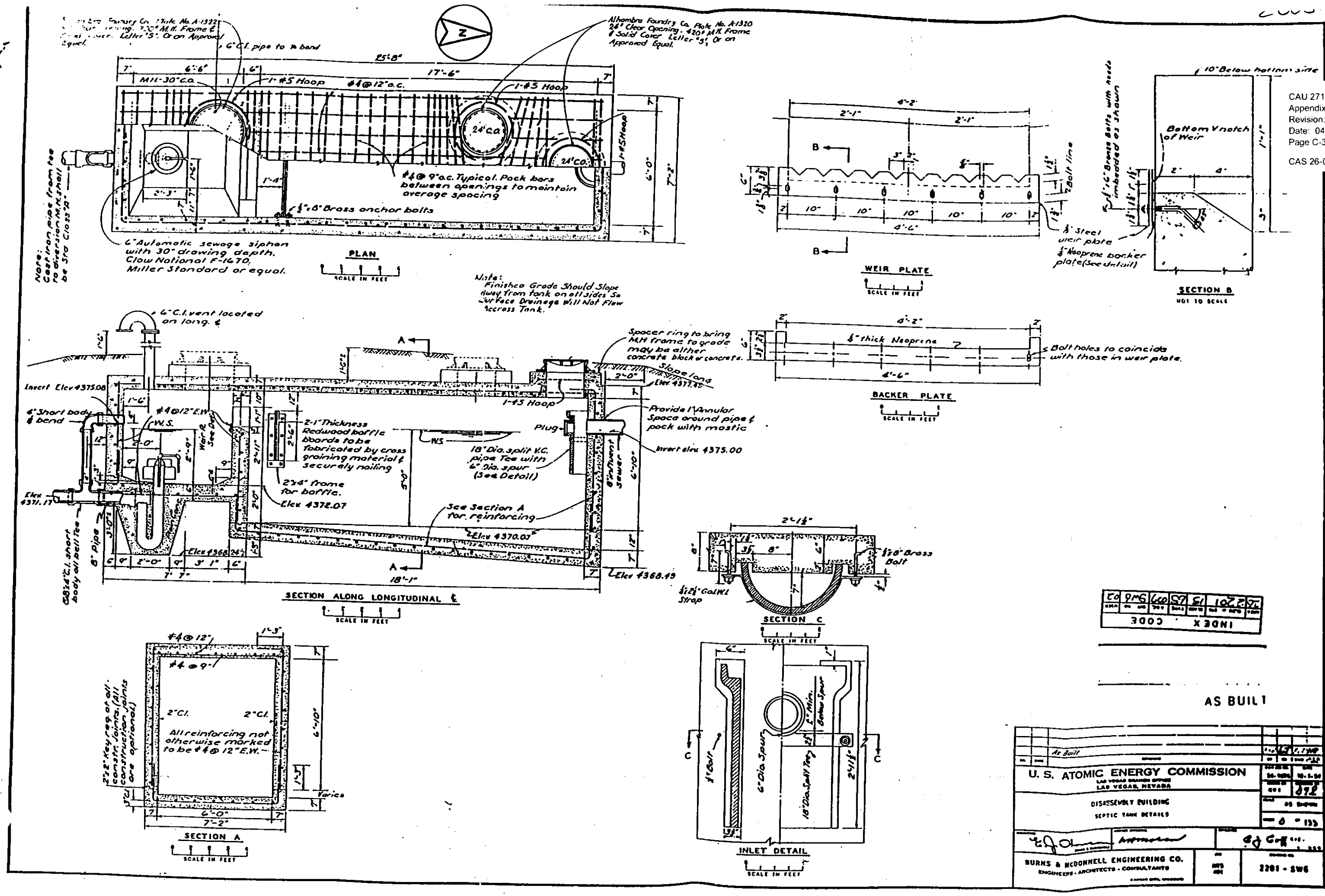
CAS 26-05-03

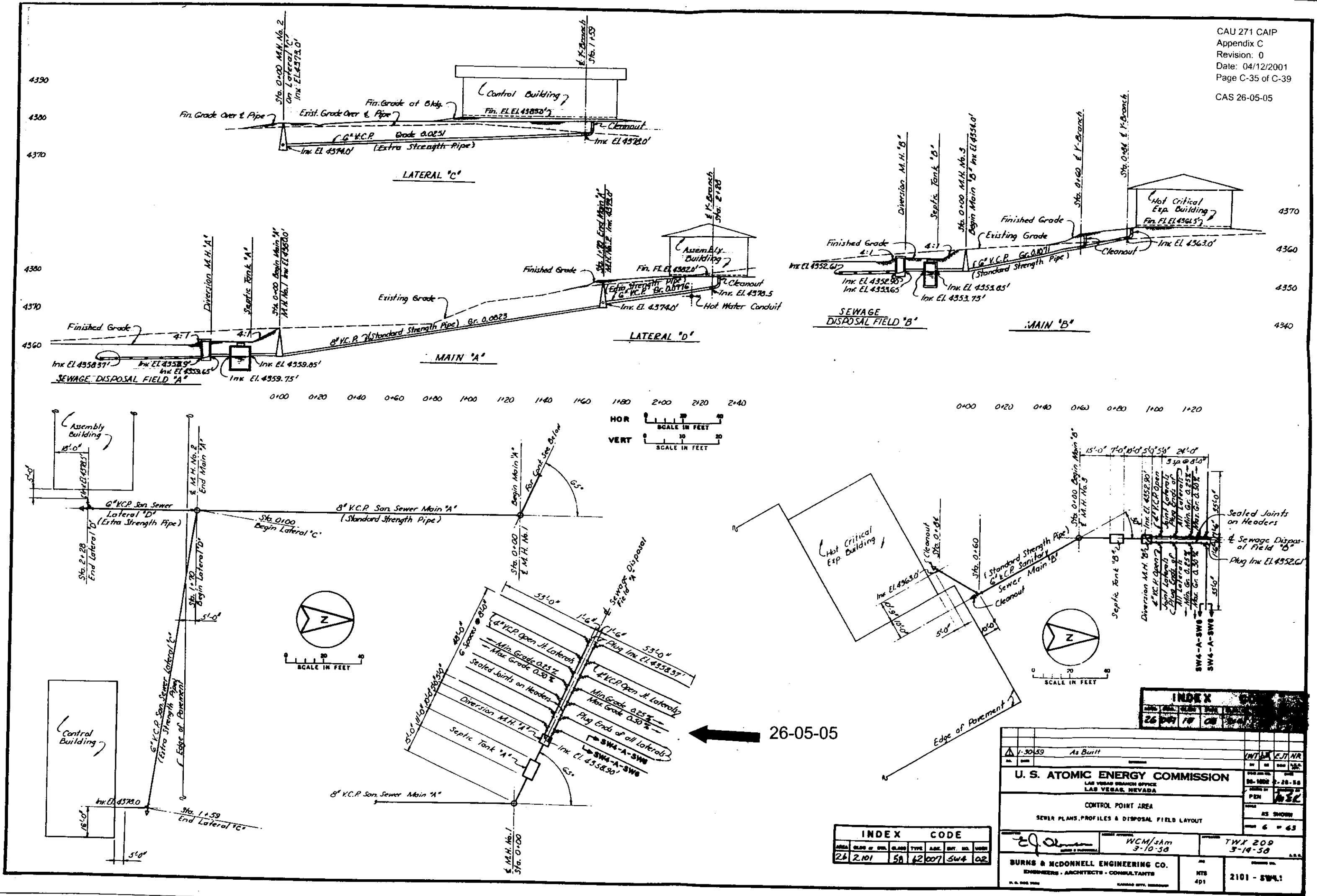

26-05-03
EXIST. FENCE AROUND LEACHING FIELD
LEACHING FIELD
EXIST. 6" V.C.P. HOT WASTE LINE
HEATER ACCESS ROAD
FOR PROFILE SEE DWG. C-27
HEATER AREA
CONC. SLAB
EXIST. DIST. BOX-TOP MH ELEV. 4381.43
EXIST. SEPTIC TANK-TOP MH ELEV. 4385.5
PIPE SUPPORTS FOR 30" LINE SEE DWG. 2203A-S-1 & S-3
FOR 30" LINE SEE DWG. 2203A-M-8
EXIST. GRADED ROAD B-2
SMOOTH OUT EXIST. SURFACE AND PREPARE FOR FUTURE A.C. PAVING BY OTHERS IN ACCORDANCE WITH SPECIFICATIONS
NEW 1" FUEL OIL LINES SEE DWG. 2203A, M-39
NEW TUNNEL ENTRANCE
ACCESS TUNNEL
TEST BUNKER ADDITION
TEST PAD BLDG
TEST BUNKER 2203
EXIST. AIR STORAGE FIELD
EXIST. DITCH
ELECT. DUCT BANK
ELECT. M.H. 'A'
ELECT. M.H. 'B'
MATCH LINE DVG. C-11
MATCH LINE DVG. C-12
12" CMP WITH METAL END SECTS. INLET INV. 4385.00 OUTLET INV. 4384.00
REMOVE WALLS OF EXIST. MANHOLE TO A DEPTH OF 2 FEET FROM TOP. FILL MANHOLE WITH COMPACTED SAND. ABANDON EXIST. 6" V.C.P.
BASE LINE 'B'
FOR ROAD SECT. & PROFILE SEE DRAWING C-27
BLAST APRON SEE DETAIL
THRUST BLOCKS AT ALL FIRE LINE BENDS, SEE DET.
3' MIN. COVER FOR WATER LINE (TYP.)
KEY PLAN
SCALE IN FEET
INDEX CODE
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS, NEVADA
SITE CIVIL PLAN I
AS BUILT
TWX LSO 249
NORMAN ENGINEERING CO.
consulting engineers
LOS ANGELES, CALIFORNIA
2202A-C-10


DISASSEMBLY BUILDING 2201
CAR WASHDOWN See Sht. SW-11
2202
SANITARY SEWER DISPOSAL FIELD See Sht SW-4
See Profile This Sheet
HOT WASTE DISPOSAL FIELD
N752,200
N752,000
E647,500
E648,000
E648,500
Sta. 12+92.04 M.H. No. 3
Sta. 9+22.46 M.H. No. 2
See Profile Sht. SW-8
GENERAL UTILITY LAYOUT
SCALE IN FEET
26-05-04
LEGEND
SANITARY SEWER PROFILE
Finished Grade
Existing Grade
6" VCP
Inv. El. 4375.00
Top El. 4377.49
Top El. 4378.83
HOR SCALE IN FEET
VERT SCALE IN FEET
AS BUILT
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS, NEVADA
DISASSEMBLY BUILDING
GENERAL LAYOUT & SANITARY SEWER PROFILE
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
2201 - SW1
INDEX CODE
26 017 10 15 2201 01 SW1

CAS 26-05-04

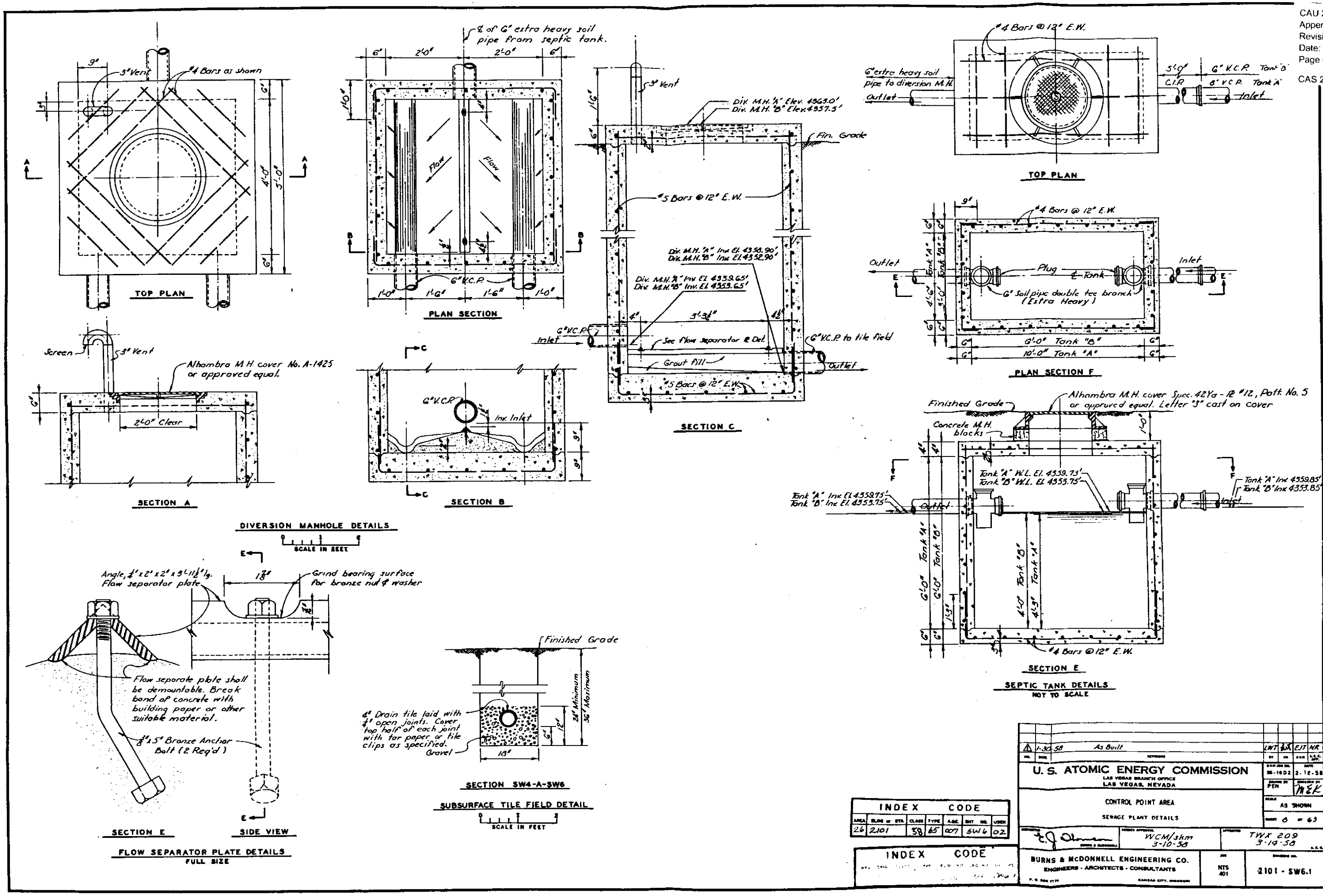

Angle 1/4"x2"x2"x3'-11 1/2"
Flow Separator Plate
Grind Bearing Surface For Bronze Nut & Washer
Flow Separator Plate Shall be Removable. Break Bond at Concrete Surface with Building Paper or other Suitable Material.
3/4" x 5" Bronze Anchor Bolt (2 Req.)
SECTION E
SIDE VIEW
FLOW SEPARATOR PLATE DETAIL
SCALE IN FEET
Finished Grade
Drain tile laid with 1/4" open joint. Cover top half of each joint with tar paper or tile clips as Specified.
Gravel As Specified
18"
SECTION D
SUBSURFACE TILE FIELD
SCALE IN FEET
M.H. No. 1
Sta. 0+00
Septic Tank
8" C.I.P.
Diversion M.H.
Typical 6"x4" "Y" Branch & 30° Long R. Curve
Plug Ends of Laterals
Min. Grade 0.25 %
Max. Grade 0.50 %
6" V.C.P. Headers
26-05-04
40'-0"
3'-0"
40'-0"
6" Headers
4" Open Joint Tile (Typical)
Closed/Sealed Joints / Headers
Plug
Note! Contractor Shall Grade over Tile field to give Cover As Shown in Section "D".
DISPOSAL FIELD LAYOUT
SCALE IN FEET
℄ of influent Sewer
5'-0"
6"
2'-0"
2'-0"
6"
4'-0"
1'-0"
Alhambra Foundry Co. Similar to No. A-1342 28"x48" Clear Opening W/ 2 - 28"x24" Hinged Covers, or Approved Equal.
TYPICAL TOP PLAN
#5 Bars @12" E.W.
℄ of 8" C.I.P. influent sewer (from Septic Tank)
Provide 1" Annular Space around pipe & pack with mastic
Slope
Shear Gates
℄ 6" V.C.P. to Disposal Field
1'-0"
1'-6"
1'-6"
1'-0"
PLAN SECTION
3" C.I. Vent
El. 4378.83'
SECTION A
#5 @12" Each Way
8" C.I.P.
Grout Fill
5-#5 @ 12" Each Way
SECTION B
DIVERSION MANHOLE DETAILS
SCALE IN FEET
2-#5 Bars
El. 4375.5'
Invert El. 4370.17
8" C.I.P.
See "Flow Separator Plate Detail"
3'-3 1/2"
Flow Separator Plate
Grout Fill
#5 @12" Each Way
Alhambra Foundry Co. No. A-3681 6" Shear Gate Valve, Or Equal.
Invert El. 4369.51
5-#5 @ 12" Each Way
SECTION C
AS BUILT
As built
Revised as per Addendum No. 1
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS, NEVADA
DISASSEMBLY BUILDING
SANITARY SEWER DETAILS #1
AS SHOWN
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS • ARCHITECTS • CONSULTANTS
2201 - SW9-A


PLAN
SCALE IN FEET
Alhambra Foundry Co. Plate No. A-1320 24" Clear Opening, 420# M.H. Frame & Solid Cover Letter "S", Or an Approved Equal.
6" C.I. pipe to ¼ bend
25'-8"
17'-6"
MH-30"C.O.
1-#5 Hoop
#4@12"o.c.
24"C.O.
#4@ 9"o.c. Typical. Pack bars between openings to maintain average spacing
½"x8" Brass anchor bolts
6" Automatic sewage siphon with 30" drawing depth. Clow National F-1670, Miller Standard or equal.
Note: Cast iron pipe from tee to diversion M.H. shall be Std Class "A"
Note: Finished Grade Should Slope Away From tank on all sides So Surface Drainage Will Not Flow Accross Tank.
WEIR PLATE
4'-2"
2'-1"
4'-6"
⅛" Steel weir plate
⅛" Neoprene backer plate (See detail)
Bolt line
SECTION B
NOT TO SCALE
10" Below bottom side
Bottom V notch of Weir
BACKER PLATE
⅛" thick Neoprene
Bolt holes to coincide with those in weir plate.
6" C.I. vent located on long. ℄
Invert Elev 4375.08
4" Short body ¼ bend
#4@12" E.W.
W.S.
2-1" Thickness Redwood baffle boards to be fabricated by cross graining material & securely nailing
2"x4" frame for baffle.
Elev 4372.07
Spacer ring to bring M.H frame to grade may be either concrete block or concrete.
Slope long
Elev 4377.49
1-#5 Hoop
Provide 1" Annular Space around pipe & pack with mastic
Plug
18" Dia. split V.C. pipe Tee with 6" Dia. spur (See Detail)
Invert elev 4375.00
6" Influent sewer
See Section A for reinforcing
Elev 4370.03
Elev 4368.24
Elev 4368.49
Elev 4371.17
18'-1"
7'-7"
SECTION ALONG LONGITUDINAL ℄
SCALE IN FEET
2'-1½"
⅜"x8" Brass Bolt
⅛"x2" Galv. Strap
SECTION C
SCALE IN FEET
#4@12"
#4@9"
2"Cl.
All reinforcing not otherwise marked to be #4@12" E.W.
2"x2" Key reg. at all constr. joints (All construction joints are optional)
6'-10"
6'-0"
7'-2"
Varies
SECTION A
SCALE IN FEET
6" Dia. Spur
18" Dia. Split Tee
INLET DETAIL
SCALE IN FEET
INDEX CODE
AS BUILT
U. S. ATOMIC ENERGY COMMISSION
LAS VEGAS, NEVADA
DISASSEMBLY BUILDING
SEPTIC TANK DETAILS
BURNS & McDONNELL ENGINEERING CO.
ENGINEERS - ARCHITECTS - CONSULTANTS
2201 - SW6

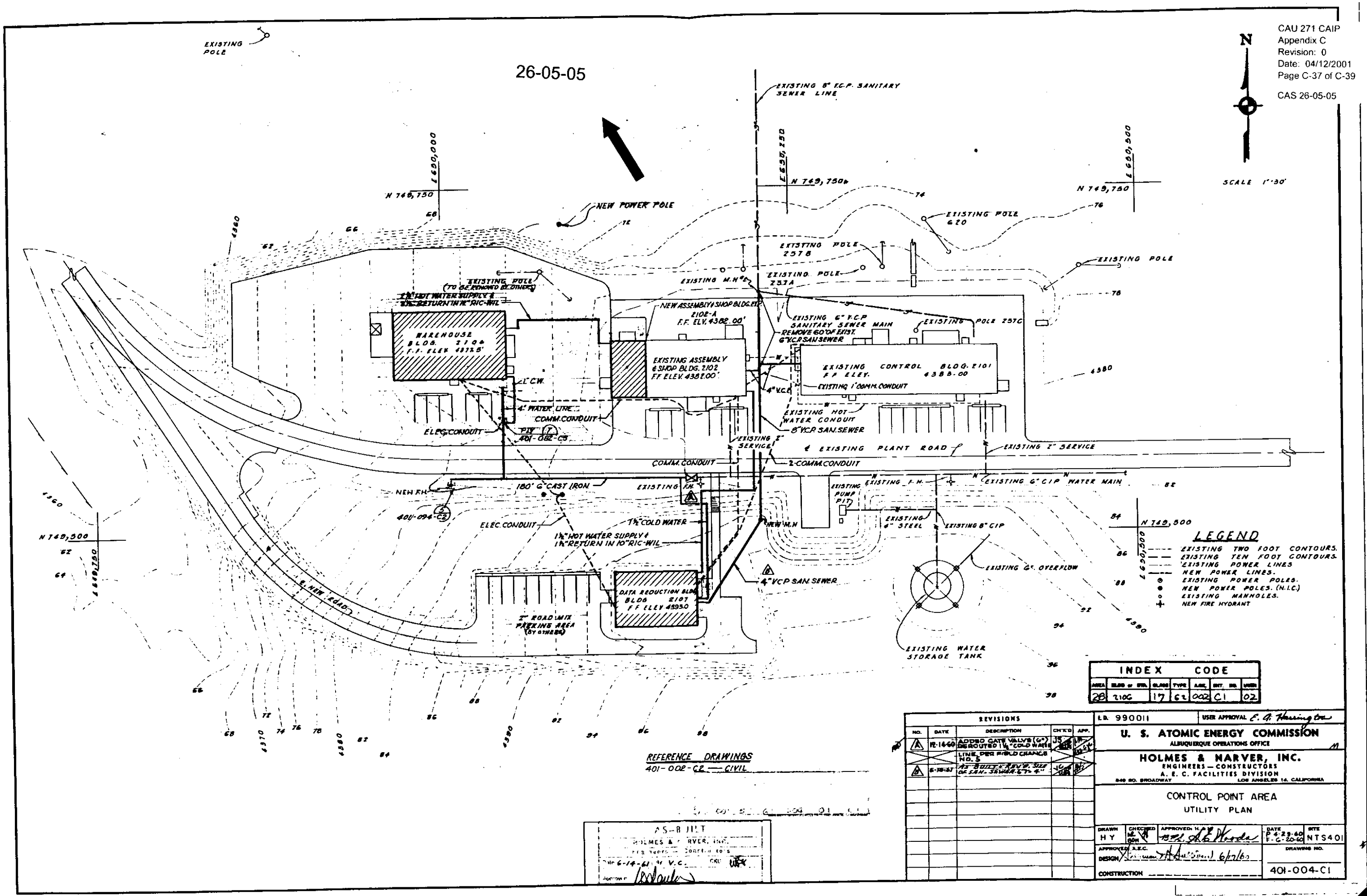


56-16 D2 NTS401 P Sewer Plans Profiles & Disposal Field Layout 2101-SW4

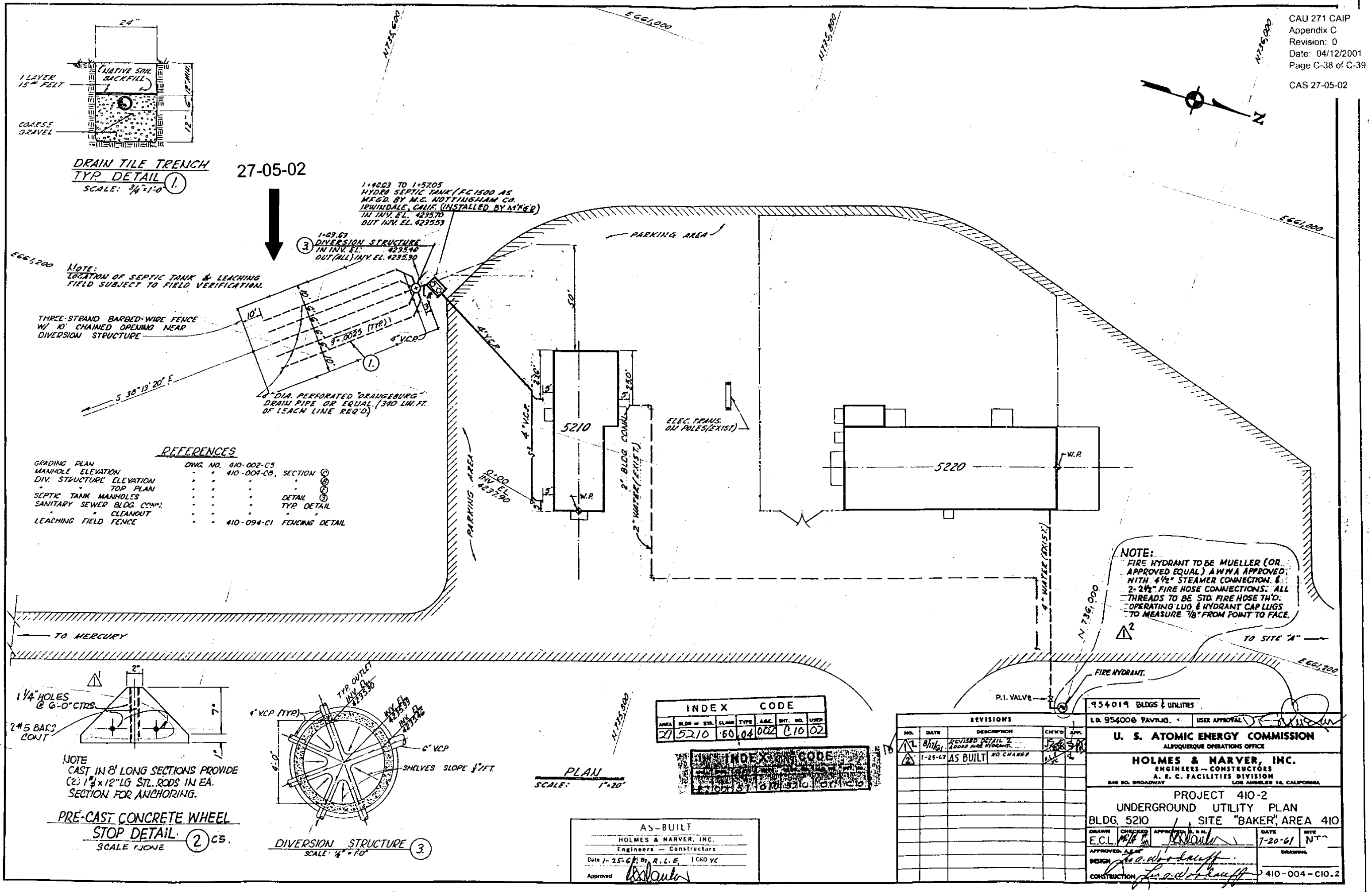
CAS 26-05-05



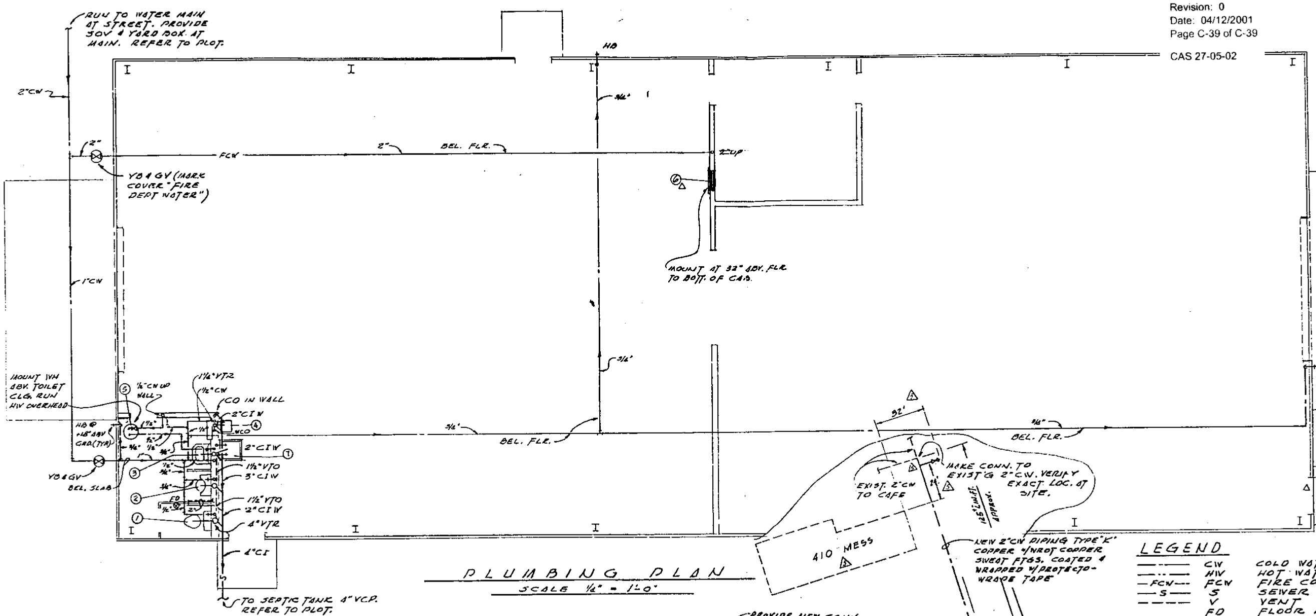
56-16D2 NTS 401 P Sewage Plant Details 2101-SW6


26-05-05
EXISTING POLE
N
SCALE 1"=30'
EXISTING 8" E.C.P. SANITARY SEWER LINE
N 749,750
E 650,000
E 650,250
E 650,500
NEW POWER POLE
EXISTING POLE 620
EXISTING POLE 2578
EXISTING POLE 257A
EXISTING POLE
EXISTING M.H.
EXISTING POLE (TO BE REMOVED BY OTHERS)
1½" HOT WATER SUPPLY & 1½" RETURN IN 10" RIC-WIL
NEW ASSEMBLY & SHOP BLDG. EXT. 2102-A F.F. ELEV. 4382.00'
EXISTING 6" V.C.P. SANITARY SEWER MAIN
REMOVE 60' OF EXIST. 6" V.C.P. SAN. SEWER
EXISTING POLE 257C
WAREHOUSE BLDG. 2104 F.F. ELEV. 4373.5'
EXISTING ASSEMBLY & SHOP BLDG. 2102 F.F. ELEV. 4382.00'
EXISTING CONTROL BLDG. 2101 F.F. ELEV. 4388.00
EXISTING 1" COMM. CONDUIT
1" C.W.
4" WATER LINE
COMM. CONDUIT
4" V.C.P.
EXISTING HOT WATER CONDUIT
8" V.C.P. SAN. SEWER
ELEC. CONDUIT
PIV
401-002-C3
EXISTING 2" SERVICE
EXISTING PLANT ROAD
COMM. CONDUIT
2-COMM. CONDUIT
NEW F.H.
180' 6" CAST IRON
EXISTING F.H.
EXISTING PUMP PIT
EXISTING F.H.
EXISTING 6" C.I.P. WATER MAIN
401-094-C2
ELEC. CONDUIT
1½" COLD WATER
1½" HOT WATER SUPPLY & 1½" RETURN IN 10" RIC-WIL
NEW M.H.
EXISTING 6" STEEL
EXISTING 8" CIP
EXISTING 6" OVERFLOW
N 749,500
4" VCP SAN. SEWER
NEW ROAD
DATA REDUCTION BLDG. BLDG. 2107 F.F. ELEV. 4393.0
2" ROAD MIX PARKING AREA (BY OTHERS)
EXISTING WATER STORAGE TANK
LEGEND
EXISTING TWO FOOT CONTOURS.
EXISTING TEN FOOT CONTOURS.
EXISTING POWER LINES.
NEW POWER LINES.
EXISTING POWER POLES.
NEW POWER POLES. (N.I.C.)
EXISTING MANHOLES.
NEW FIRE HYDRANT
INDEX CODE
2B 2106 17 62 002 C1 02
REVISIONS
ADDED GATE VALVE (6") REROUTED 1½" COLD WATER LINE PER FIELD CHANGE NO. 5
AS BUILT REV'S. SIZE OF SAN. SEWER 6" TO 4"
I.D. 990011
U. S. ATOMIC ENERGY COMMISSION
ALBUQUERQUE OPERATIONS OFFICE
HOLMES & NARVER, INC.
ENGINEERS — CONSTRUCTORS
A. E. C. FACILITIES DIVISION
LOS ANGELES 14, CALIFORNIA
CONTROL POINT AREA
UTILITY PLAN
NTS401
401-004-C1
REFERENCE DRAWINGS
401-002-C2 — CIVIL
AS-BUILT
HOLMES & NARVER, INC.
589/65-562

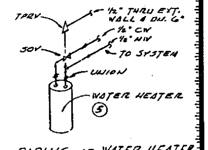
27-05-02



575/65-562



PLUMBING PLAN
SCALE ¼" = 1'-0"



PIPING AT WATER HEATER
NO SCALE

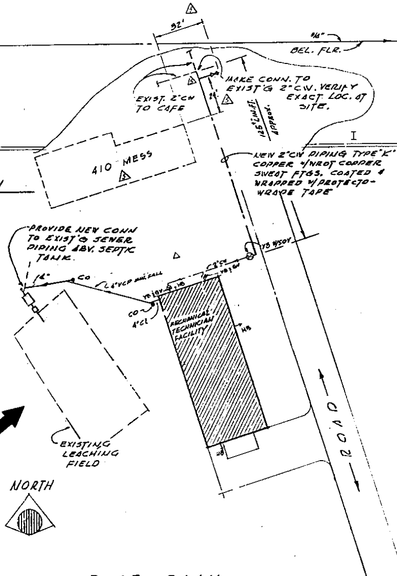
FIXTURES

1. WATER CLOSET - AMERICAN STANDARD "COMPACT" NO. F2050-11, W/ALL TRIM, WHITE SEAT & COVER.
2. URINAL - AM. STD. "STALLBROOK" NO. F6400-1, W/ ALL TRIM, NO. 185H SLOAN ROYAL FLUSH VALVE & STRAINER.
3. LAVATORY - AM. STD. "NEW LUCERNE" NO. F350-40, W/ALL TRIM, SUPPLY & STOPS, PTRAP & WALL BRACKETS.
4. DRINKING FOUNTAIN - LARCO NO. PA-9, 1/5 HP COMPR. 115-1-60. W/ALL TRIM, SUPPLY & STOP, & PTRAP.
5. WATER HEATER - RHEEM RHEEMGLASS NO. 12, 12 GAL. SIZE, ELECT. 1000 WATT 115 VOLT, W/TPRV PIPED TO DRAIN.
6. FIRE HOSE CABINET - STANDARD FIRE HOSE CO. NO. HOSE UNIT 76, STEEL CAB UNIT, SEMI-RECESSED, DOOR STYLE "A", HOSE RACK UNIT NO. 475U, 75 FT. 1½" HOSE, NOZZLE, BRASS FITTINGS & VALVE. U-L LABELED.
7. SERVICE SINK - AM. STD "ARGO" NO. P7705 W/ALL TRIM, TRAP STANDARD, LESS RIM GUARD, - 24" x 20"

NOTES

(a) WATER PIPING - BEL. GRD. COPPER TYPE "K" ABV. GRD. TYPE "L", ALL W/SWT. FTGS.
(b) VALVES - CRANE, OR EQUAL, 125 LB. BRASS SCREW. HOSE BIBBS ANTI-FREEZE
(c) CLEANOUTS - ACORN MFGR. CO.
(d) AIR HAMMER - J.R. SMITH CO. HYDRO-TROL SIZES AS RECOMMENDED BY MFGR. TO BE INSTALLED AT TOP OF ALL RISERS.
(e) ROOF FLASHING - 4 LB. LEAD SHEET, TURN INTO TOP OF PIPES W/8" RAD. BASE.
(f) ALL ABV. GRD. WATER PIPING SHALL BE ON ROOM SIDE OF BLANKET INSULATION.
(g) ALL WORK, MATERIAL & INSTALLATION TO COMPLY TO UPC-1961, & CODES, ORDINANCES & REGULATIONS HAVING JURISDICTION OVER THIS WORK.

27-05-02



PLOT PLAN
SCALE 1" = 30'-0"

LEGEND

	CW	COLD WATER
	HW	HOT WATER
	FCW	FIRE COLD WATER
	S	SEWER
	V	VENT
	FD	FLOOR DRAIN
	CO	CLEANOUT
	WCO	WALL CLEANOUT
	HB	HOSE BIBB
	VTR	VENT THRU ROOF
	VTO	VENT OVER
	CI	CAST IRON
	GV	GATE VALVE
	SOV	SHUT OFF VALVE
	TPRV	TEMP PRESS RELIEF VALVE
	YB	YARD BOX
	FLR.	FLOOR
	BEL	BELOW
	ABV	ABOVE
	DN	DOWN
	W	WASTE
	CLG.	CEILING
	BOTT	BOTTOM
		UNION

INDEX CODE

AREA	BLDG #	STR.	CLASS	TYPE	ABC	INT.	NO.	USE
27	0500		15	G3	046	P1		01

NO.	DATE	REVISIONS	BY	CK.	A.E.	A.E.C. APP.
5	9/cl/a	AS BUILT	D.L.	HEC	CCC	
4		CORRECT SERVICE SINK NOTE TO AGREE W/ SPECS - ADD. #1	G.J.			RAM
3		DELETE REFERENCE TO TRAILERS - ADD. #1	G.J.			RAM
2		SHOW PERSONNE DOOR - ADD. #1	G.J.			RAM
1		RELOCATE FIRE HOSE CAB. - ADD. #1	G.J.			RAM

U. S. ATOMIC ENERGY COMMISSION
NEVADA OPERATIONS OFFICE — LAS VEGAS, NEVADA

DESIGNED: RH
DRAWN: RH
CHECKED: REH

PLUMBING PLAN
MECHANICAL TECHNICIAN FACILITY
AREA 410

SUBMITTED: [signature] Moffitt
APPROVED: [signature] for E.A. Mgr. — A.E.C.
DATE: 10-28-63

MOFFITT & HENDRICKS
ARCHITECTS-ENGINEERS
LAS VEGAS NEVADA

DRAWING NO. NV-35-33-02
SHEET P-1 OF 1

Bdlg 5200

Appendix D

NDEP Comment Responses

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number: Draft Corrective Action Investigation Plan for Corrective Action Unit 271: Areas 25, 26, and 27 Septic Systems, Nevada Test Site, Nevada	2. Document Date: February 2001
3. Revision Number: 0	4. Originator/Organization: IT Corporation
5. Responsible DOE/NV ERP Project Mgr.: Janet Appenzeller-Wing	6. Date Comments Due: March 05, 2001
7. Review Criteria: Full	
8. Reviewer/Organization/Phone No.: Ted Zaferatos, NDEP, 486-2856	9. Reviewer's Signature:

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
1) Page 5, 1st Paragraph	M	"...Figure 1-2 shows the location of the six CASs in Area 26...". There are seven CASs in Area 26.	The first sentence text has been modified to: "…Figure 1-2 shows the location of the six CASs associated with Project Pluto in Area 26…"	Yes
2) Page 73, Section 4.2.3.3	M	"...The planned approach for the inspection of simple leachfield collection system piping is identical; the process is presented in Section 4.2.2.3...". It appears the intent of this sentence is to describe the planned approach for the inspection of simple leachfield collection system piping as being identical to that described in Section 4.2.2.3. This intent should be clarified.	Text has been modified to: "...The planned approach for the inspection of simple leachfield collection system piping is identical to the process presented in Section 4.2.2.3..." This text change clarifies that the intent of the sentence is to say that the investigative approach for simple systems is identical to that of complex systems.	Yes
3) Appendix C, Facility Drawings	S	It is difficult to ascertain which CASs the drawings are referencing. If the CAS number was placed within Title Block on the upper-right of each page, the search for the appropriate drawing would be more convenient than it is at present.	The applicable CAS number has been placed near the Title Block on the upper-right of each engineering drawing included in Appendix C.	Yes

[a] Comment Types: M = Mandatory, S = Suggested.
Return Document Review Sheets to DOE/NV Environmental Restoration Division, Attn: QAC, M/S 505.

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Michael McKinnon State of Nevada Bureau of Federal Facilities Division of Environmental Protection 555 E. Washington, Suite 4300 Las Vegas, NV 89101	1 (Controlled)*
Ted Zaferatos State of Nevada Bureau of Federal Facilities Division of Environmental Protection 555 E. Washington, Suite 4300 Las Vegas, NV 89101	1 (Uncontrolled)*
Sabrina Lawrence Environmental Restoration Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Controlled)*
Janet Appenzeller-Wing Environmental Restoration Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)*
Kevin Cabble Environmental Restoration Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)*

David Wheeler Environment, Safety and Health Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)*
Wayne Johnson Bechtel Nevada P.O. Box 98521, M/S NTS306 Las Vegas, NV 89193-8521	1 (Uncontrolled)*
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