Nevada
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Project

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National Nuclear Security Administration

Corrective Action Decision Document for Corrective Action Unit 151: Septic Systems and Discharge Area Nevada Test Site, Nevada

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Environmental Restoration
Division

U.S. Department of Energy
National Nuclear Security Administration
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CORRECTIVE ACTION DECISION DOCUMENT FOR CORRECTIVE ACTION UNIT 151: SEPTIC SYSTEMS AND DISCHARGE AREA NEVADA TEST SITE, NEVADA

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office
Las Vegas, Nevada

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CORRECTIVE ACTION DECISION DOCUMENT FOR
CORRECTIVE ACTION UNIT 151:
SEPTIC SYSTEMS AND DISCHARGE AREA
NEVADA TEST SITE, NEVADA

Approved by: APPROVED SIGNATURE Date: 4/24/2006

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Federal Project Director
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List of Acronyms and Abbreviations

ACP	Asbestos cement pipe
amsl	Above mean sea level
ASTM	American Society for Testing and Materials
bgs	Below ground surface
BMP	Best management practice
CAA	Corrective Action Alternative
CADD	Corrective Action Decision Document
CAI	Corrective Action Investigation
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
CFR	*Code of Federal Regulations*
CLP	Contract Laboratory Program
cm	Centimeter
cm^3/cm^3	Cubic centimeters per cubic centimeter
COC	Contaminant of concern
COLIWASA	Composite liquid waste sampler
COPC	Contaminant of potential concern
Cs	Cesium
CSM	Conceptual site model
day/yr	Days per year
DOE	U.S. Department of Energy
DQA	Data quality assessment
DQI	Data quality indicator
DQO	Data quality objective
DRO	Diesel-range organics

List of Acronyms and Abbreviations *(Continued)*

EML	Environmental Measurements Laboratory
EPA	U.S. Environmental Protection Agency
FADL	Field activity daily log
FAL	Final action level
FD	Field duplicate
FFACO	*Federal Facility Agreement and Consent Order*
FID	Flame-ionization detector
FSL	Field-screening level
FSR	Field-screening result
ft	Foot
g/g	Grams per gram
gal	Gallon
GPS	Global positioning system
GRO	Gasoline-range organics
HWAA	Hazardous waste accumulation area
ID	Identification
IDW	Investigation-derived waste
in.	Inch
kg/day	Kilograms per day
LCS	Laboratory control sample
MDC	Minimum detectable concentration
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mi	Mile
mrem/yr	Millirem per year
MS	Matrix spike

List of Acronyms and Abbreviations *(Continued)*

MSD	Matrix spike duplicate
N/A	Not applicable
NAC	*Nevada Administrative Code*
NAD	North American Datum
NCRP	National Council on Radiation Protection and Measurements
ND	Nondetect
NDEP	Nevada Division of Environmental Protection
NIST	National Institute for Standards and Technology
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NTS	Nevada Test Site
NV/YMP	Nevada/Yucca Mountain Project
PAI	Paragon Analytics, Inc.
PAL	Preliminary action level
PB	Preparation blank
PCB	Polychlorinated biphenyl
pCi/g	Picocuries per gram
pCi/L	Picocuries per liter
pCi/mL	Picocuries per milliliter
PID	Photoionization detector
PPE	Personal protective equipment
ppm	Parts per million
PRG	Preliminary Remediation Goal
Pu	Plutonium
QA	Quality assurance
QAPP	*Quality Assurance Project Plan*
QC	Quality control

List of Acronyms and Abbreviations *(Continued)*

RAIS	Risk Assessment Information System
RBCA	Risk-based corrective action
RBSL	Risk-based screening level
RCRA	*Resource Conservation and Recovery Act*
ROTC	Record of Technical Change
RPD	Relative percent difference
SBMS	Standards-Based Management System
SCL	Sample collection log
SDG	Sample delivery group
SNJV	Stoller-Navarro Joint Venture
SOP	Standard operating procedure
Sr	Strontium
SSTL	Site-specific target level
SVOC	Semivolatile organic compound
TCE	Trichloroethene
TCLP	Toxicity characteristic leaching procedure
Tl	Thallium
TPH	Total petroleum hydrocarbons
TSCA	*Toxic Substance Control Act*
U	Uranium
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOC	Volatile organic compound
VCP	Vitrified clay pipe
yr	Year
μg/kg	Micrograms per kilogram

Executive Summary

This Corrective Action Decision Document has been prepared for Corrective Action Unit (CAU) 151, Septic Systems and Discharge Area, at the Nevada Test Site, Nevada, according to the *Federal Facility Agreement and Consent Order* (FFACO) (1996). Corrective Action Unit 151 is comprised of eight corrective action sites (CASs):

- CAS 02-05-01, UE-2ce Pond
- CAS 12-03-01, Sewage Lagoons (6)
- CAS 12-04-01, Septic Tanks
- CAS 12-04-02, Septic Tanks
- CAS 12-04-03, Septic Tank
- CAS 12-47-01, Wastewater Pond
- CAS 18-03-01, Sewage Lagoon
- CAS 18-99-09, Sewer Line (Exposed)

The purpose of this Corrective Action Decision Document is to identify and provide the rationale for the recommendation of corrective action alternatives (CAAs) for each of the eight CASs within CAU 151. Corrective action investigation (CAI) activities were performed from September 12 through November 18, 2005, as set forth in the CAU 151 Corrective Action Investigation Plan and Record of Technical Change No. 1. Additional confirmation sampling was performed on December 9, 2005; January 10, 2006; and February 13, 2006.

Analytes detected during the CAI were evaluated against appropriate final action levels (FALs) to identify the contaminants of concern for each CAS. The results of the CAI identified contaminants of concern at two of the eight CASs in CAU 151 and required the evaluation of CAAs. Assessment of the data generated from investigation activities conducted at CAU 151 revealed the following:

- Soils at CASs 02-05-01, 12-04-01, 12-04-02, 12-04-03, 12-47-01, 18-03-01, 18-99-09, and Lagoons B through G of CAS 12-03-01 do not contain contamination at concentrations exceeding the FALs.

- Lagoon A of CAS 12-03-01 has arsenic above FALs in shallow subsurface soils.

- One of the two tanks of CAS 12-04-01, System #1, has polychlorinated biphenyls (aroclor-1254), trichloroethene, and cesium-137 above FALs in the sludge. Both CAS 12-04-01, System #1 tanks contain trichloroethene and 1,4-dichlorobenzene above *Resource Conservation and Recovery Act* toxicity characteristic limits.

Based on the evaluation of analytical data from the CAI, review of future and current operations at the eight CASs, and the detailed and comparative analysis of the potential CAAs, the following corrective actions are recommended for CAU 151.

No Further Action is the recommended corrective action for soils at CASs 02-05-01, 12-04-01, 12-04-02, 12-04-03, 18-03-01, and 18-99-09; and Lagoons C, D, F, and G of CAS 12-03-01.

No Further Action with implementation of a best management practice (BMP) is recommended for soils at CAS 12-47-01 and Lagoons B and E of CAS 12-03-01. To be protective of future workers should the present scenario used to calculate FALs change, an administrative use restriction will be recorded per the FFACO agreement as a BMP.

Close in Place with Administrative Controls is the recommended corrective action for Lagoon A of CAS 12-03-01.

Based on the evaluation of analytical data from the CAI; review of future and current operations at CASs 12-04-01, 12-04-02, and 12-04-03; and the detailed and comparative analysis of the potential CAAs, the following corrective actions are recommended for the septic tanks at these CASs.

No Further Action with implementation of BMPs is the recommended corrective action for septic tanks that do not contain potential source material from CAS 12-04-01, System #4 (four tanks); CAS 12-04-02, System #5 (six tanks); and CAS 12-04-03, System #3 (four tanks).

Clean Closure with implementation of BMPs is the recommended corrective action for the septic tanks from CAS 12-04-01, System #1 (two tanks).

The preferred CAAs were evaluated on technical merit focusing on performance, reliability, feasibility, safety, and cost. The alternatives were judged to meet all requirements for the technical components evaluated. The alternatives meet all applicable federal and state regulations for closure of the site and will reduce potential exposure pathways to the contaminated media to an acceptable level at CAU 151.

1.0 Introduction

This Corrective Action Decision Document (CADD) has been prepared for Corrective Action Unit (CAU) 151, Septic Systems and Discharge Area, Nevada Test Site (NTS), Nevada. The corrective actions proposed in this document are in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the State of Nevada, U.S. Department of Energy (DOE), and the U.S. Department of Defense (FFACO, 1996). The NTS is approximately 65 miles (mi) northwest of Las Vegas, Nevada (Figure 1-1).

Corrective Action Unit 151 is comprised of the eight corrective action sites (CASs) that are shown on Figure 1-2 and listed below:

- CAS 02-05-01, UE-2ce Pond
- CAS 12-03-01, Sewage Lagoons (6)
- CAS 12-04-01, Septic Tanks
- CAS 12-04-02, Septic Tanks
- CAS 12-04-03, Septic Tank
- CAS 12-47-01, Wastewater Pond
- CAS 18-03-01, Sewage Lagoon
- CAS 18-99-09, Sewer Line (Exposed)

A detailed discussion of the history of this CAU is presented in the *Corrective Action Investigation Plan* (CAIP) *for Corrective Action Unit 151: Septic Systems and Discharge Area* (NNSA/NSO, 2004).

1.1 Purpose

This CADD develops and evaluates potential corrective action alternatives (CAAs) and provides the rationale for the selection of recommended CAAs for the CASs in CAU 151. The CAIP provides information relating to the history, planning, and scope of the investigation; therefore, this information will not be repeated in this CADD.

Corrective Action Unit 151, Septic Systems and Discharge Area, consists of eight inactive sites:

- Corrective Action Site 02-05-01 is located in Area 2 and is a well-water collection pond used as a part of the Nash test.

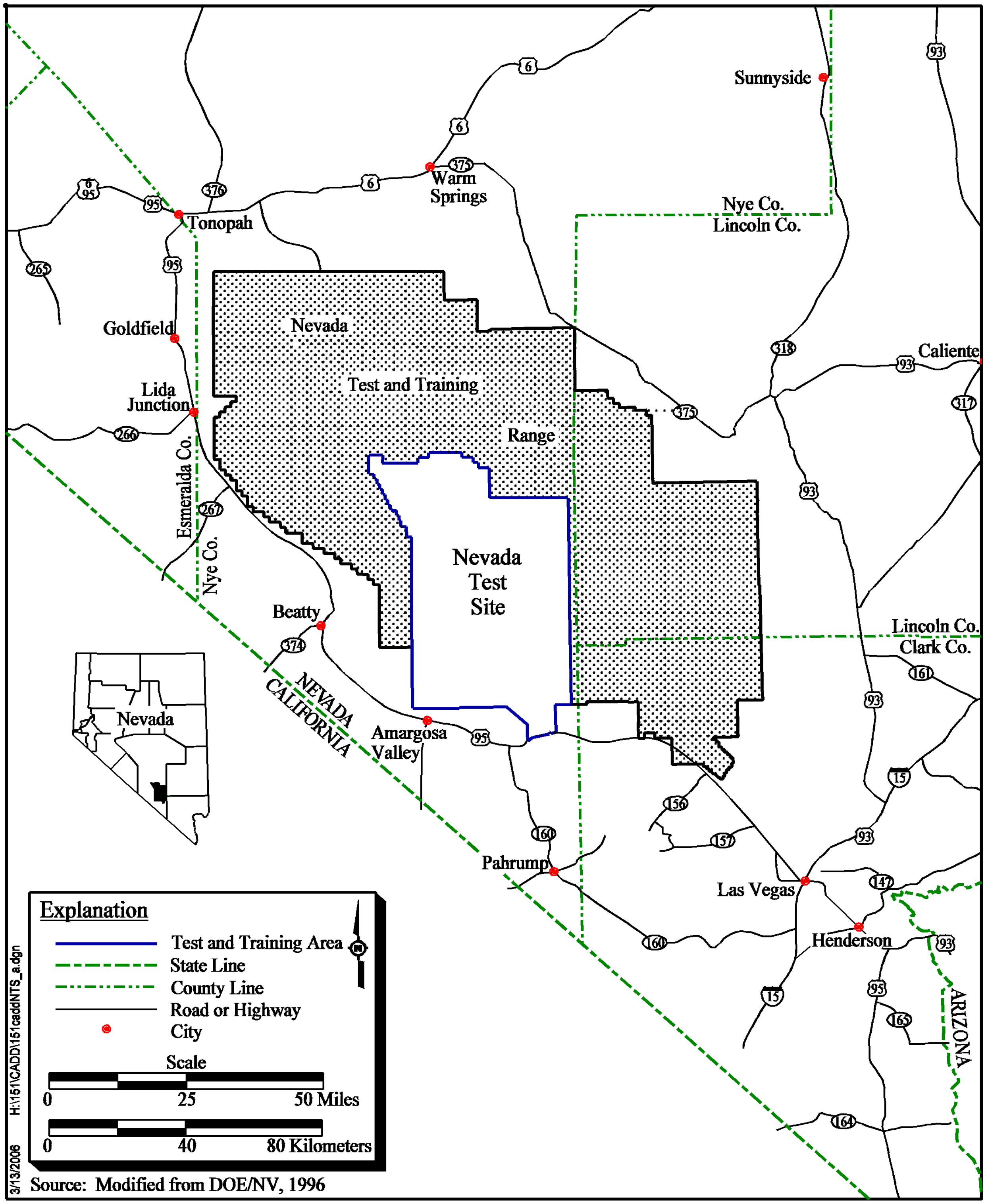

Figure 1-1
Nevada Test Site

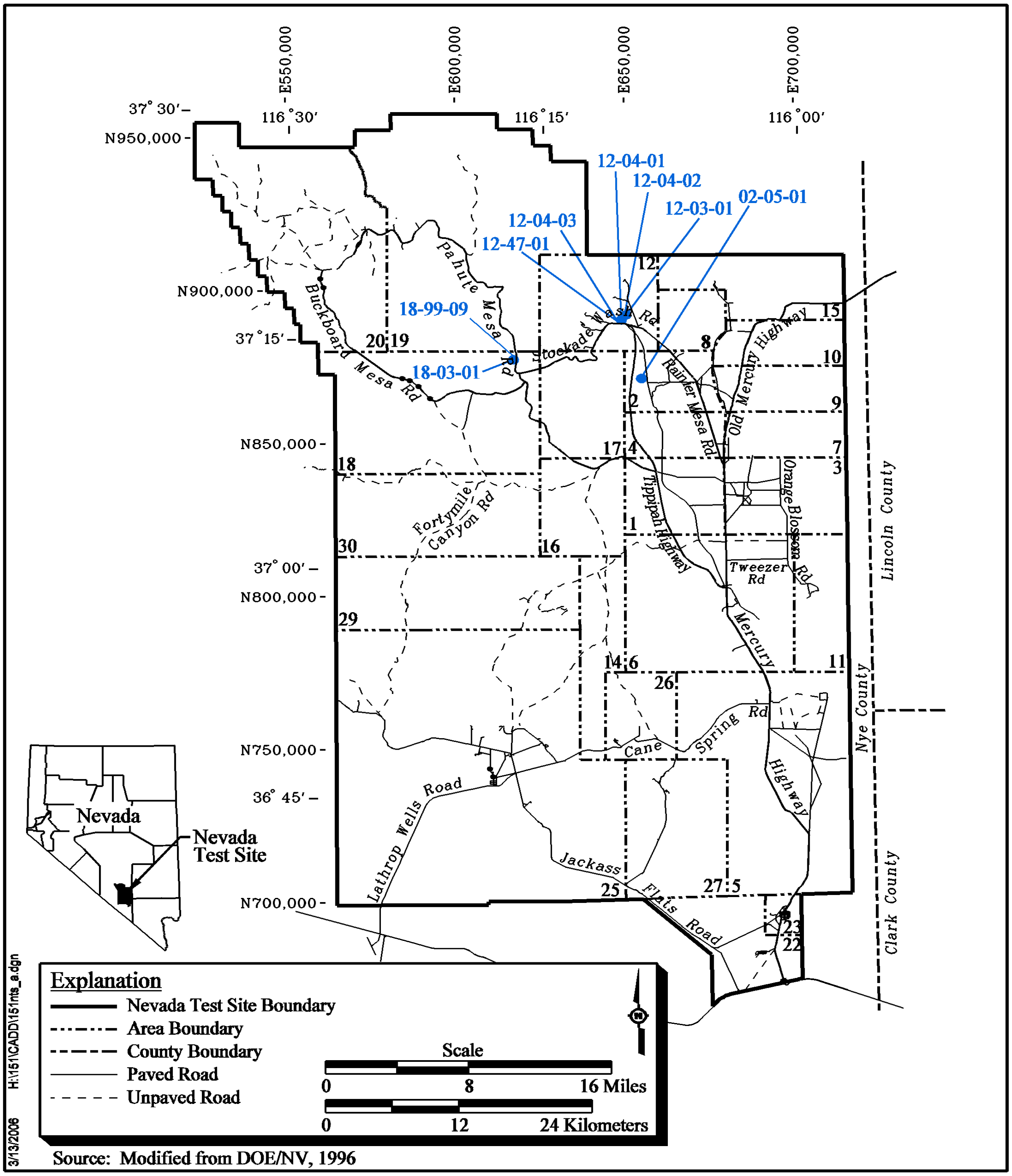

Figure 1-2
Corrective Action Unit 151, Corrective Action Sites Location Map

- Corrective Action Site 12-03-01 is located in the east-central portion of the Area 12 camp. Corrective Action Site 12-03-01 consists of seven former sanitary sewage lagoons and associated piping.

- Corrective Action Sites 12-04-01, 12-04-02, and 12-04-03 are also all located in the east-central portion of the Area 12 camp. Corrective Action Sites 12-04-01, 12-04-02, and 12-04-03 are abandoned septic tanks, with associated piping. All these features were part of the Area 12 Camp administrative, housing, and recreational facility sanitary systems.

- Corrective Action Site 12-47-01 is located in the south-central portion of the Area 12 camp and consists of two former sanitary sumps and abandoned piping. This system served the Area 12 Fleet Operations.

- Corrective Action Sites 18-03-01 and 18-99-09 are located in the Area 17 Camp in Area 18. Corrective Action Site 18-03-01 consists of two sewage lagoons and associated collection system piping. Corrective Action Site 18-99-09 consists of approximately 3 feet (ft) of exposed 6-in. vitrified clay pipe (VCP) in the vicinity of CAS 18-03-01. The origin and terminus of CAS 18-99-09 were unknown at the start of the corrective action investigation (CAI). Access and video surveying confirmed that this line does, in fact, connect to the CAS 18-03-01 system.

1.2 Scope

The scope of the activities used to identify, evaluate, and recommend preferred CAAs for CAU 151, Septic Systems and Discharge Area, included the following:

- Evaluation of current site conditions, including the concentrations and extent of contaminants of concern (COCs)

- Development of corrective action objectives based on the results of the investigation and the CAA screening criteria.

- Performance of detailed and comparative evaluations of CAAs in relation to corrective action objectives and screening criteria.

- Recommendation and justification for a preferred CAA.

1.3 Corrective Action Decision Document Contents

This CADD is divided into the following sections and appendices:

Section 1.0 - Introduction: Summarizes the purpose, scope, and contents of this CADD.

Section 2.0 - Corrective Action Investigation Summary: Summarizes the investigation field activities, the results of the investigation, and the need for corrective action.

Section 3.0 - Evaluation of Alternatives: Describes, identifies, and evaluates the steps taken to determine preferred CAAs.

Section 4.0 - Recommended Alternatives: Presents the preferred CAAs and the rationale based on the corrective action objectives and screening criteria.

Section 5.0 - References: Provides a list of all referenced documents used in the preparation of this CADD.

Appendix A - *Corrective Action Investigation Report for CAU 151*: Provides a detailed description of the project objectives, field investigation and sampling activities, investigation results, waste management, and CAS-specific information regarding field activities, sampling methods, and laboratory analytical results from the investigation.

Appendix B - *Data Assessment*: Provides a data quality assessment (DQA) that reconciles data quality objective (DQO) assumptions and requirements to the investigation results.

Appendix C - *Cost Estimates for CAU 151*: Presents cost estimates for the construction, operation, and maintenance of the CAAs evaluated for each CAS.

Appendix D - *Evaluation of Risk*: Provides documentation of the chemical and radiological risk-based corrective action (RBCA) processes as applied to CAU 151.

Appendix E - *Project Organization for CAU 151*: Identifies the DOE Project Manager and other appropriate personnel involved with the CAU 151 characterization and closure activities.

Appendix F - *Sample Location Coordinates for CAU 151*: Provides investigation sample location coordinates.

1.4 Applicable Programmatic Plans and Documents

To ensure all project objectives, health and safety requirements, and quality control (QC) procedures were adhered to, all investigation activities were performed in accordance with the following documents:

- CAIP for CAU 151, Septic Systems and Discharge Area (NNSA/NSO, 2004)
- Record of Technical Change (ROTC) No. 1 for the CAIP for CAU 151, Septic Systems and Discharge Area
- *Industrial Sites Quality Assurance Project Plan* (QAPP) (NNSA/NV, 2002)
- FFACO (1996)
- Approved procedures

2.0 Corrective Action Investigation Summary

The following sections summarize the investigation activities and investigation results, and identify the necessity for corrective action at CAU 151. Details of the investigation activities and results for individual CAU 151 CASs are presented in Appendix A of this document.

2.1 Investigation Activities

Corrective action investigation activities were performed as set forth in the CAU 151 CAIP (NNSA/NSO, 2004) from September 12 through November 18, 2005. Additional confirmation sampling was performed on December 9, 2005; January 10, 2006; and February 13, 2006. The purpose of the CAU 151 CAI was to address the decision statements in the project-specific DQOs by:

- Determining whether COCs are present in the soils associated with the CASs of CAU 151.
- Determining the lateral and vertical extent of identified COCs.
- Ensuring adequate data have been collected to close the sites under the applicable Nevada Division of Environmental Protection (NDEP), *Resource Conservations and Recovery Act* (RCRA) (CFR, 2003a), *Toxic Substance Control Act* (TSCA) (CFR, 2003b), and DOE requirements.

The scope of the CAI included the following activities:

- Video surveying of accessible lines to investigate the presence or absence of residual material and identify any line breaches.
- Field screening soil samples for volatile organic compounds (VOCs), and total alpha and beta/gamma radiation.
- Collecting environmental samples for laboratory analyses to determine the presence of COCs and to define the vertical and lateral extent of COCs, if present.
- Collecting QC samples for laboratory analyses to ensure that the data generated from the analysis of investigation samples meet the requirements of the data quality indicators (DQIs).
- Collecting liquid and solid waste samples from septic system components to identify whether the contents are potential sources of environmental contamination and to support future waste disposal activities.

A judgmental sampling scheme was implemented to select sample locations and evaluate analytical results, as outlined in the CAIP. Judgmental sampling allows the methodical selection of sample locations that target the populations of interest (defined in the DQOs) rather than non-selective random locations.

Random sample locations are used to generate average contaminant concentrations that estimate the true average ("characteristic") contaminant concentration of the site to some specified degree of confidence. Because individual sample results (rather than average concentrations) are used to compare to action levels, statistical methods to generate site characteristics (averages) are not necessary. Section 0.4.4 of the U.S. Environmental Protection Agency (EPA) *Data Quality Objectives Process for Hazardous Waste Site Investigations* (EPA QA/G-4HW) guidance states that the use of statistical methods may not be warranted by program guidelines or site-specific sampling objectives (EPA, 2000a). The need for statistical methods is dependent upon the decisions being made. Section 7.1 of the EPA QA/G-4HW guidance states that a nonprobabilistic (judgmental) sampling design is developed when there is sufficient information on the contamination sources and history to develop a valid conceptual site model (CSM) and to select specific sampling locations. This design was used to confirm the existence of contamination at specific locations and provide information (such as extent of contamination) about specific areas of the site.

Confidence in judgmental sampling results was established qualitatively by the validation of the CSM developed and concurred to by stakeholder participants (DOE, National Nuclear Security Administration Nevada Site Office [NNSA/NSO] and NDEP) during the DQO process, investigation results, and the DQA.

Waste characterization activities were conducted to gather sufficient information and data to support waste disposal decisions for the contents of septic tanks. Evaluation of the septic tank contents at CASs 12-04-01, 12-04-02, and 12-04-03 included liquid and sludge for toxicity characteristic that may exceed action levels (above toxicity characteristic leaching procedure [TCLP] waste limits). Analytical results of contents were also compared against TSCA limits.

The samples were processed in accordance with approved procedures and shipped to an off-site laboratory (Paragon Analytics, Inc.) to be analyzed by the TCLP for VOCs, semivolatile organic compounds (SVOCs), and metals, as well as the standard set of characterization sample analyses.

Total fecal coliform bacteria analysis, conducted on site for select liquid and sludge for the purpose of worker protection, were all negative. Additional information regarding waste characterization is presented in Section A.8.0 of Appendix A.

The following sections describe specific investigation activities conducted at each CAS. Additional information regarding the investigation is presented in Appendix A.

2.1.1 UE-2ce Pond (CAS 02-05-01)

This CAS consists of an approximately 68-by-50-ft excavated pond and surrounding berm, and a 60-ft surface trench running between the pond and the UE-2ce Water Well. There is also a gravel outwash mound approximately 3 ft tall by 4 ft wide by 60 ft long running down the center of the pond. In addition to the mound, there is miscellaneous debris including cables, scrap metal, and wood scattered on the bottom and around the pond. The following sections summarize the field activities conducted at CAS 02-05-01.

2.1.1.1 Site Inspection for Biasing Factors

Site inspection was conducted on the soil potentially impacted by process operations (well pumping) conducted at this CAS.

Site inspections were performed to identify biasing factors (i.e., staining, elevated radiation levels, odor) on the surface soils within the pond, trench, and surrounding area that may have been impacted by overflow of these features. No biasing factors were noted during the site inspections within this CAS; therefore, no additional bias sampling locations were proposed.

2.1.1.2 Field Screening

Soil samples were screened in the field for VOCs, and alpha and beta/gamma radioactivity. A flame-ionization detector (FID) was used for screening VOCs by the headspace method. An NE Technology Electra or E-600 meter fitted with a DP-6 dual-alpha and beta/gamma radiation scintillation probe was used to screen for alpha and beta/gamma radioactivity before soil samples were placed in sample jars. The radiological field-screening results (FSRs) were compared to field-screening levels (FSLs) to guide subsequent sampling decisions. Both the radiological and VOC FSRs were all below FSLs.

2.1.1.3 Sample Collection

A total of six environmental soil characterization samples (including one field duplicate [FD] and one matrix spike [MS]/matrix spike duplicate [MSD]) were collected from three locations during investigation activities. All samples were collected using a hand auger. Decision I surface and shallow subsurface samples were collected from the inlet trench, the outwash pile, and the low point of the collection pond.

2.1.1.4 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 151 CASs. The CSM and associated discussion for this CAS are provided in the CAIP.

The migration pathway and release mechanism information gathered during the CAI were consistent with the CSM, and all information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.2 Sewage Lagoons (6) (CAS 12-03-01)

This CAS consists of seven lagoons that were constructed in the late 1960s and early 1980s. For this CAS, the features have been identified as Lagoons A through G. Lagoons range in size from 80 by 168 ft for Lagoons A through D, and from 250 by 350 ft for Lagoons E and G. The following sections summarize the field activities conducted at CAS 12-03-01.

2.1.2.1 Site Inspection for Biasing Factors

Site inspections were conducted to identify biasing factors (i.e., staining, elevated radiation levels, odor) on the surface soils within the ponds. No biasing factors were noted during the site inspections at any of the lagoons with exposed pond bottoms within this CAS; therefore, no additional bias sampling locations were proposed. Lagoons A through D have been backfilled and graded. Site inspection at these lagoons consisted of trenching at sample locations to identify the native soil interface. During excavation activities, it was determined that piping associated with these ponds had been removed or destroyed during backfilling; therefore, no additional bias sampling locations were proposed.

2.1.2.2 Field Screening

Soil samples were screened in the field for VOCs, and alpha and beta/gamma radioactivity. An FID was used for screening VOCs by the headspace method. An NE Technology Electra or E-600 meter fitted with a DP-6 dual-alpha and beta/gamma radiation scintillation probe was used to screen for alpha and beta/gamma radioactivity before soil samples were placed in sample jars. The radiological FSRs were compared to FSLs to guide subsequent sampling decisions. Both the radiological and VOC FSRs were all below FSLs.

2.1.2.3 Sample Collection

A total of 50 environmental soil characterization samples (including three FDs and three MS/MSDs) were collected from 24 locations during initial Decision I investigation activities at CAS 12-03-01. Samples were collected using a hand auger, directly from a trench face, or from a backhoe bucket if the sampling depth was deeper than 4 ft below ground surface (bgs).

Decision I surface and subsurface samples were collected from the proximal, low or midpoint, and distal points of each lagoon. Results identified four semivolatile constituents and one RCRA metal at concentrations greater than preliminary action levels (PALs) at this CAS. Three additional Decision I samples were collected at the surface from three locations (B02A, B02B, and B03A) at 90-degree angles and 20 to 30 ft from Location B02.

Arsenic was the only RCRA metal detected above final action levels (FALs). Two additional Decision II samples were collected at Location B09 below the 3 ft bgs sample that displayed results greater than the FAL.

2.1.2.4 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 151 CASs. The CSM and associated discussion for this CAS are provided in the CAIP.

The migration pathway and release mechanism information gathered during the CAI were consistent with the CSM and all information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.3 Septic Tanks (CASs 12-04-01, 12-04-02, and 12-04-03)

These CASs consist of four separate septic systems named System #1 (CAS 12-04-01), System #3 (CAS 12-04-02), System #4 (CAS 12-04-01), and System #5 (CAS 12-04-03). These systems were associated with and discharged into CAS 12-03-01, Sewage Lagoons (6). Each system is similar, containing between two and six, 8- by-25-ft, bitumen (tar)-coated carbon-steel tanks, with an estimated 9,400-gallon (gal) capacity. Tanks in each system are adjacent to one another, approximately 18 inches (in.) apart. Each tank has as internal baffle that separates the tank into two chambers (inflow and outflow) with an access hatch to each chamber near the ends of the tanks. The following sections summarize the field activities conducted at CAS 12-04-01, 12-04-02, and 12-04-03.

2.1.3.1 Site Inspection for Biasing Factors

Site inspections were made of the septic tanks themselves and the associated system components (piping, distribution box, manholes). Site inspection was also made of the surrounding soils that may have been impacted by any possible overflow of the tanks.

Site inspections were performed to identify biasing factors (i.e., staining, elevated radiation levels, odor) inside distribution boxes, manholes, associated piping, and on the surface soil that may have been impacted by an overflow of these components. No visible signs of structural failure or other biasing factors were noted during the site inspections at any of these CASs; therefore, no additional bias sampling locations were proposed.

2.1.3.2 Video Surveys

Video surveys were conducted on the septic system piping to the extent possible to verify the presence and extent of piping identified on engineering drawings, and to identify any breaches, breaks, or residual material in the piping that might require additional biased sampling. Approximately 275 ft of piping leading to and from the septic tanks was video surveyed at CAS 12-04-01. Approximately 338 ft of piping leading to and from the septic tanks was video surveyed at CAS 12-04-02. Approximately 110 ft of piping leading to and from the septic tanks was video surveyed at CAS 12-04-03. No breaches or residual material were identified in the existing piping. Therefore, no additional biased sample locations were identified based on video-survey results. All piping that was breached during the video survey was grouted once the survey was completed. Details of the video surveys are presented in Appendix A, Section A.5.1.1.

2.1.3.3 Field Screening

Soil samples were screened in the field for VOCs, and alpha and beta/gamma radioactivity. An FID was used for screening VOCs by the headspace method. An NE Technology Electra or E-600 meter fitted with a DP-6 dual-alpha and beta/gamma radiation scintillation probe was used to screen for alpha and beta/gamma radioactivity before soil samples were placed in sample jars. The radiological FSRs were compared to FSLs to guide subsequent sampling decisions. Both the radiological and VOC FSRs were all below FSLs.

2.1.3.4 Sample Collection

<u>CAS 12-04-01</u>

A total of 23 environmental soil characterization samples (including one FD and one MS/MSD) were collected from 21 locations during investigation activities at CAS 12-04-01. Samples were collected using a hand auger, or from a backhoe bucket for sampling depths greater than 4 ft bgs.

Decision I surface and subsurface samples were collected from beneath the inlet and outlet piping of each tank, as well as between tanks at a depth equivalent to the bottom of the tanks. No Decision II sampling was necessary as all analytical results were below FALs.

Samples were also collected of each phase (liquid and sludge) present in the septic tank. Samples were collected using a composite liquid waste sampler (COLIWASA) or a sample dipper. Six septic tanks were sampled through the access hatches of each tank. A total of 14 liquid samples (including two FDs and one MS/MSD) and 16 sludge samples (including one FD and one MS/MSD) were collected.

CAS 12-04-02

A total of 19 environmental soil characterization samples (including one FD and one MS/MSD) were collected from 18 locations during investigation activities at CAS 12-04-02. Samples were collected using a hand auger, a plastic scoop directly from a trench face, or from a backhoe bucket for sampling depths greater than 4 ft bgs.

Decision I surface and subsurface samples were collected from beneath the inlet and outlet piping of each tank, as well as between tanks at a depth equivalent to the bottom of the tanks. No Decision II sampling was necessary as all analytical results were below FALs.

Samples were also collected of each phase (liquid and sludge) present in the septic tank. Samples were collected using a COLIWASA or a sample dipper. Six septic tanks were sampled, and a total of 13 liquid samples (including one FD and one MS/MSD) and 11 sludge samples (including one FD and one MS/MSD) were collected.

CAS 12-04-03

A total of 13 environmental soil characterization samples (including one FD and one MS/MSD) were collected from 12 locations during investigation activities at CAS 12-04-03. Samples were collected using a hand auger, a plastic scoop directly from a trench face, or from a backhoe bucket for sampling depths greater than 4 ft bgs.

Decision I surface and subsurface samples were collected from beneath the inlet and outlet piping of each tank, as well as between tanks at a depth equivalent to the bottom of the tanks. No Decision II sampling was necessary as all analytical results were below FALs.

Samples were also collected of each phase (liquid and sludge) present in the septic tank. Samples were collected using a COLIWASA or a sample dipper. Four septic tanks were sampled, and a total of seven liquid samples (including one FD and one MS/MSD) and seven sludge samples (including one FD and one MS/MSD) were collected.

2.1.3.5 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 151 CASs. The CSM and associated discussion for this CAS are provided in the CAIP.

The migration pathway and release mechanism information gathered during the CAI were consistent with the CSM, and all information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.4 Wastewater Pond (CAS 12-47-01)

This CAS consists of two sumps (evaporation ponds) and associated inactive piping located at the Area 12 Fleet Operations area. The initial 35- by 35-ft sump was constructed for the purpose of receiving sewage waste from Buildings 12-8 and 12-16. The newer 30- by 60-ft sump was built in 1970 to receive effluent from Buildings 12-8 and 12-16, as well as the new Building 12-910 and a women's restroom trailer. The following sections summarize the field activities conducted at CAS 12-47-01.

2.1.4.1 Site Inspection for Biasing Factors

Site inspections were conducted of the associated system components (piping and manholes). Site inspection was also made of the surrounding soils that may have been impacted by any possible overflow of the sumps.

Site inspections were performed to identify biasing factors (i.e., staining, elevated radiation levels, odor) inside manholes, associated piping, and on the surface soil that may have been impacted by an overflow of these components. No visible signs of structural failure or other biasing factors were noted during the site inspections at this CAS; therefore, no additional bias sampling locations were proposed.

2.1.4.2 Video Survey

Video surveys were conducted on the wastewater system piping to the extent possible to verify the presence and extent of piping identified on engineering drawings, and to identify any breaches, breaks, or residual material in the piping that might require additional biased sampling. Approximately 440 ft of abandoned piping leading to the old sumps was video surveyed at CAS 12-47-01. Approximately 460 ft of presently active piping was also video surveyed. Much of the active line was also used when the sumps were in operation. No breaches or residual material were identified in the abandoned piping. Therefore, no additional biased sample locations were identified based on video-survey results. One pipe breach was noted on an active line and reported to facilities management. All piping that was breached during the video survey was grouted once the survey was completed. Details of the video survey results can be found in Appendix A, Section A.6.1.1.

2.1.4.3 Field Screening

Soil samples were screened in the field for VOCs, and alpha and beta/gamma radioactivity. An FID was used for screening VOCs by the headspace method. An NE Technology Electra or E-600 meter fitted with a DP-6 dual-alpha and beta/gamma radiation scintillation probe was used to screen for alpha and beta/gamma radioactivity before soil samples were placed in sample jars. The radiological FSRs were compared to FSLs to guide subsequent sampling decisions. Both the radiological and VOC FSRs were all below FSLs.

2.1.4.4 Sample Collection

A total of 12 environmental soil characterization samples (including one FD and one MS/MSD) were collected from six locations during investigation activities at CAS 12-47-01. Samples were collected using a plastic scoop directly from a trench face, or from a backhoe bucket for sampling depths greater than 4 ft bgs.

Decision I surface and subsurface samples were collected from proximal, midpoint, and distal locations of the larger sump, and at the midpoint of the smaller sump. Analysis of these samples identified four SVOCs, total petroleum hydrocarbons (TPH)-diesel-range organics (DRO), and one polychlorinated biphenyl (PCB) at Location F03 (the old sump).

Additional Decision I samples were collected from 2 ft below the contaminated location (F03) and at four locations to either side of that location (F03B - F03E).

2.1.4.5 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 151 CASs. The CSM and associated discussion for this CAS are provided in the CAIP.

The migration pathway and release mechanism information gathered during the CAI were consistent with the CSM, and all information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.5 Sewage Lagoon (CAS 18-03-01)

This CAS includes two sewage lagoons and associated collection piping that were constructed during the early 1960s at the Area 17 Camp of Area 18. The northern lagoon measures 163 by 93 ft and is approximately 18 ft deep. The southern lagoon is 141 by 113 by 10 ft deep. The following sections summarize the field activities conducted at CAS 18-03-01.

2.1.5.1 Site Inspection for Biasing Factors

Site inspections were conducted of the associated system components (piping and manholes). Site inspection was also made of the surrounding soils that may have been impacted by any possible overflow of the lagoons or identified pipe breach.

Site inspections were performed to identify biasing factors (i.e., staining, elevated radiation levels, odor) inside manholes, associated piping, and on the surface soil that may have been impacted by an overflow of these components. One location was detected where the pipe passed beneath a driveway entrance and had been crushed. A biased Decision I sample was collected from beneath the center portion of the crushed pipe.

2.1.5.2 Video Survey

Video surveys were conducted on the wastewater collection system piping, to the extent possible, to verify the presence and extent of piping identified on engineering drawings; to identify the presence and extent of field tie-ins and laterals not identified on the engineering drawings; and to identify any breaches, breaks, or residual material in the piping that might require additional biased sampling. Approximately 3,875 ft of abandoned trunk line piping leading to the sewage lagoons was video surveyed at CAS 18-03-01. Approximately 658 ft of abandoned lateral and tie-in piping was also video surveyed. Three pipe breaches were identified during the video surveys. Three biased Decision I samples were collected from beneath the pipes at each of these locations (G16, G17, and G18).

2.1.5.3 Field Screening

Soil samples were screened in the field for VOCs, and alpha and beta/gamma radioactivity. An FID was used for screening VOCs by the headspace method. An NE Technology Electra or E-600 meter fitted with a DP-6 dual-alpha and beta/gamma radiation scintillation probe was used to screen for alpha and beta/gamma radioactivity before soil samples were placed in sample jars. The radiological FSRs were compared to FSLs to guide subsequent sampling decisions. Both the radiological and VOC FSRs were all below FSLs.

2.1.5.4 Sample Collection

A total of 36 environmental soil characterization samples (including two FDs and two MS/MSDs) were collected from 18 locations during investigation activities at CAS 18-03-01. Samples were collected using a hand auger, or from a backhoe bucket for sampling depths greater than 4 ft bgs.

2.1.5.5 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 151 CASs. The CSM and associated discussion for this CAS are provided in the CAIP.

The migration pathway and release mechanism information gathered during the CAI were consistent with the CSM, and all information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.6 Sewer Line (Exposed) (CAS 18-99-09)

This CAS consists of approximately 3 ft of exposed 6-in. VCP in the vicinity of CAS 18-03-01. However, documentation and geophysical surveys could not confirm that the pipe was attached to the system associated with the sewage lagoons. The origin and terminus of the pipe were not known and there was minimal documentation as to what structures were associated with this pipe. During the CAI, it was confirmed that this pipe served the U.S. Geological Survey (USGS) trailers (CAS 18-03-01). Activities performed at CAS 18-99-09 were sufficient to meet the DQO requirements.

2.2 Results

The summary of data from the CAI provided in Section 2.2.1 defines the areas within the CAU 151 CASs where the contaminants of potential concern (COPCs) exceeded the FALs and extent of all identified COCs. Section 2.2.2 summarizes the assessment made in Appendix B, which demonstrates that the investigation results satisfy the DQO data requirements.

2.2.1 Summary of Analytical Data

Chemical and radiological results for environmental and septic tank content samples collected at each of the CASs are summarized in Sections 2.2.1.1 through 2.2.1.7. Environmental samples are evaluated against FALs to determine the presence of COCs and the extent of COCs, if present.

In order to evaluate the potential for septic tank contents to result in the introduction of a COC to the surrounding environmental media, the following conservative assumptions were made:

- That the tank containment would fail at some point in the future and the contents would be released to the surrounding media.
- That the resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in the tank waste.
- That any contaminant in the septic tanks exceeding the RCRA toxicity characteristic concentrations can result in a COCs introduction to the surrounding media.

Based on these assumptions, septic tank sludge contaminant concentrations were compared to the PALs to evaluate the potential for the future release of COCs to the environment. Sludge containing a contaminant exceeding a FAL would be considered to be potential source material and would require evaluation of CAAs. Sludge was also compared to toxicity characteristic action levels to evaluate the potential for the future release of COCs to the environment. Sludge containing a contaminant exceeding a toxicity characteristic action level would also be considered potential source material and would require evaluation of CAAs.

For septic tank liquids, contaminant concentrations were compared to toxicity characteristic action levels to evaluate the potential for the future release of COCs to the environment. Liquid containing a contaminant exceeding a toxicity characteristic action level would be considered to be potential source material and would require evaluation of CAAs.

The PALs for the CAU 151 investigation were determined during the DQO process and are discussed in Section 3.3 of the CAIP (NNSA/NSO, 2004). The FALs used for determining the presence of COCs and for evaluating the need for corrective action are defined in Section 3.1 of this document. Details about the methods used during this investigation and a comparison of environmental sample results to PALs and FALs are presented in Appendix A.

2.2.1.1 UE-2ce Pond (CAS 02-05-01)

All concentrations of the reported constituents were compared to and were less than PALs. No Decision II sampling was required.

2.2.1.2 Sewage Lagoons (6) (CAS 12-03-01)

With the exception of four SVOCs and arsenic, all concentrations of the reported constituents were compared to and were less than PALs.

One surface sample (151B003) collected from Lagoon E at Location B02 had positive detections for benzo(a)anthracene, dibenzo(a,h)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene above their respective PALs. Final action levels were established for these contaminants based on a Tier 2 evaluation as discussed in Appendix D.

Additional Decision I samples were collected from three locations oriented at 90 degrees from the original location (B02) and from 20 ft to 30 ft from that location. All results were below PALs.

Arsenic was detected above the PAL in five samples from three locations: B09, B10, and B12. Both upper and lower shallow subsurface samples at Locations B09 and B10 had arsenic above the PAL. Only the upper shallow subsurface sample at Location B12 had an arsenic concentration above the PAL.

The surface sample (151B019) at Location B10 and the surface (151B017) and shallow subsurface (151B018) samples at Location B09 were above the FAL. Decision II sampling was performed at Location B09 to delineate the vertical extent of the contamination. Results of these samples confine the vertical extent to approximately 5.5 ft bgs. Lateral extent is defined as the lagoon perimeter.

The maximum concentration of each detected COPC at this CAS is listed in Table 2-1. Bold text in the table indicates constituents that exceed FALs.

Table 2-1
Maximum Concentration of Detected Contaminants for CAS 12-03-01, Sewage Lagoons (6)

Sample Number	Location	Depth (ft bgs)	Constituent	Maximum Result	FAL[a]	Units
151B003	B02 (Lagoon E)	0.0 - 0.5	Benzo(a)anthracene	4,000	64,300	µg/kg
			Benzo(b)fluoranthene	6,700	64,700	µg/kg
			Benzo(a)pyrene	3,700	6,470	µg/kg
			Dibenzo(a,h)anthracene	740	6,470	µg/kg
151B018	**B09 (Lagoon A)**	**2.75 - 3.0**	**Arsenic**	**58**	**45.1**	**mg/kg**

[a] FALs are established in Appendix D.

FAL = Final action level
ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
µg/kg = Micrograms per kilogram

2.2.1.3 Septic Tanks (CAS 12-04-01)

Sampling was conducted for two independent purposes at this CAS. Soil samples from beneath the inlet line and outlet line, and between the tanks at an elevation equivalent to the base of the tanks were collected for environmental purposes to determine whether the soils surrounding the tanks contained any COCs. The contents of each septic tank were sampled to determine whether this material posed a threat of the introduction of COCs if released to the environment surrounding the tanks (i.e., could serve as potential source material). The septic tank sample results will also to be used for waste handling and disposal purposes.

2.2.1.3.1 Environmental Sample Results

With the exception of TPH-DRO, all soil concentrations of the reported constituents were compared to and were less than PALs.

One shallow subsurface sample (151C006) collected from beneath the outlet pipe of CAS 12-04-01 Septic Tank #2 at a depth of 2.5 to 3 ft bgs contained TPH-DRO in excess of the PAL. The Tier 2 evaluation consisted of assessing the hazardous constituents of TPH-DRO. These evaluations are addressed in Sections A.5.2.1 and A.5.2.2. Based on the Tier 2 evaluation, the hazardous constituents of TPH-DRO did not exceed FALs; therefore, TPH-DRO is not considered a COC. The establishment of FALs and the list of hazardous constituents of TPH are presented in Appendix D and Table D.1-8. The maximum concentration of TPH-DRO at this CAS is listed in Table 2-2.

Table 2-2
Maximum Concentration of Detected Contaminants for CAS 12-04-01

Sample Number	Location	Description	Depth (ft bgs)	Constituent	Maximum Result	FAL	Units
151C006	C16	CAS 12-04-01, System #4, Tank #2, outlet end	2.5 - 3.0	TPH-DRO	110	N/A[a]	mg/kg

[a] FALs are established for the hazardous constituents of TPH-DRO in Appendix D.

DRO = Diesel-range organics
FAL = Final action level
ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
N/A = Not applicable
TPH = Total petroleum hydrocarbons

2.2.1.3.2 Septic Tank Content Sample Results

All constituents in liquid samples were less than RCRA toxicity characteristic concentrations. Therefore, no liquid potential source material was identified.

Septic tank content sampling of the sludge indicated the following organic compounds present above PALs: 1,4-dichlorobenzene, aroclor-1254, TPH-DRO, TPH-gasoline-range organics (GRO), bis(2-ethylhexyl)phthalate, and trichloroethene. Only aroclor-1254 and trichloroethene at CAS 12-04-01, System #1, exceeded Tier 2 FALs. These constituents are shown in bold type in Table 2-3.

Table 2-3
Maximum Concentration of Detected Contaminants in Septic Tank Samples for CAS 12-04-01
(Page 1 of 2)

Sample Number	Location	Tank Number/ Chamber	Matrix	Constituent	Maximum Result	FAL	Units	Volume (gallons)
System #4								
151C510	C07	Tank #4 Inlet	Sludge	TPH-DRO	1,800	N/A[a]	mg/kg	122
				Arsenic	23	45.1	mg/kg	
151C512	C05	Tank #3 Inlet		TPH-DRO	280	N/A[a]	mg/kg	919
				Arsenic	24	45.1	mg/kg	
				1,4-dichlorobenzene	12,000	3,060,000	µg/kg	
151C513	C08	Tank #4 Outlet		TPH-DRO	1,900	N/A[a]	mg/kg	339
				TPH-GRO	550	N/A[a]	mg/kg	
				1,4-dichlorobenzene	35,000	3,060,000	µg/kg	
				Aroclor-1254	1,200	27,700	µg/kg	
System #1								
151C515	C09	Tank #5 Inlet	Sludge	TPH-DRO	6,400	N/A[a]	mg/kg	610
				TPH-GRO	3,000	N/A[a]	mg/kg	
				Lead	2,300	17,079	mg/kg	
				1,4-dichlorobenzene	2,300,000	3,060,000	µg/kg	
				Aroclor-1254	6,400	27,700	µg/kg	
				Trichloroethene	**2,000,000**	**5,730**	**µg/kg**	
151C517	C10	Tank #5 Outlet		TPH-DRO	12,000	N/A[a]	mg/kg	122
				Lead	2,100	17,079	mg/kg	
				1,4-dichloroethene	16,000	3,060,000	µg/kg	
				Aroclor-1254	**37,000**	**27,700**	**µg/kg**	
				Bis(2-ethylhexyl)phthalate	130,000	4,960,000	µg/kg	
				Trichloroethene	590	5,730	µg/kg	
				Cesium-137	**13.6**	**12.2**	**pCi/g**	
151C520	C11	Tank #6 Inlet		TPH-DRO	2,700	N/A[a]	mg/kg	339
				1,4-dichlorobenzene	37,000	3,060,000	µg/kg	
				Aroclor-1254	2,200	27,700	µg/kg	

Table 2-3
Maximum Concentration of Detected Contaminants in Septic Tank Samples for CAS 12-04-01
(Page 2 of 2)

Sample Number	Location	Tank Number/ Chamber	Matrix	Constituent	Maximum Result	FAL	Units	Volume (gallons)
151C521	C11	Tank #6 Inlet	Sludge	TPH-DRO	2,600	N/A[a]	mg/kg	339
				TPH-GRO	480	N/A[a]	mg/kg	
				Lead	1,300	17,079	mg/kg	
				1,4-dichlorobenzene	530,000	3,060,000	µg/kg	
				Aroclor-1254	4,700	27,700	µg/kg	

[a] FALs are established for the hazardous constituents of TPH-DRO and TPH-GRO in Appendix D.

DRO = Diesel-range organics
FAL = Final action level
ft bgs = Feet below ground surface
GRO = Gasoline-range organics
mg/kg = Milligrams per kilogram
N/A = Not applicable
pCi/g = Picocuries per gram
TPH = Total petroleum hydrocarbons
µg/kg = Micrograms per kilogram

The RCRA metals arsenic and lead were also detected above their respective PALs. Arsenic was detected in two tank chambers, while lead was detected in three chambers. A single radionuclide (cesium [Cs]-137) was detected in one chamber at a concentration exceeding its FAL and is shown in bold type in Table 2-3. No other radionuclides were above PALs. The maximum concentration of each detected constituent at this CAS is listed in Table 2-3.

The concentrations are presented per individual tank, as the tank is regarded as the unit or scale of decision. For TPH-DRO and TPH-GRO, the Tier 2 evaluation consisted of assessing the hazardous constituents of TPH-DRO and TPH-GRO. These evaluations are addressed in Sections A.5.2.1 and A.5.2.2. Based on the Tier 2 evaluation, the hazardous constituents of TPH-DRO and TPH-GRO did not exceed FALs; therefore, TPH-DRO and TPH-GRO are not considered as potential source material. The establishment of FALs and the list of hazardous constituents of TPH are presented in Appendix D and Table D.1-8.

Analytical results for RCRA toxicity characteristics indicate the sludge in System #1, Tank #5, will likely require handling and management as a characteristic hazardous waste for 1,4-dichlorobenzene and trichloroethene if removed. Sludge in System #1, Tank #6, will also likely require handling and management as a characteristic hazardous waste for 1,4-dichlorobenzene if removed. These data also result in the contents of these two tanks as being identified as containing potential source material requiring a CAA evaluation.

2.2.1.4 Septic Tanks (CAS 12-04-02)

Sampling was conducted for two independent purposes at this CAS. Soil samples from beneath the inlet line and outlet line, and between the tanks at an elevation equivalent to the base of the tanks were collected for environmental purposes to determine whether the soils surrounding the tanks contained any COCs. The contents of each septic tank were sampled to determine whether this material posed a threat of the introduction of COCs if released to the environment surrounding the tanks (i.e., could serve as potential source material). The septic tank sample results will also be used for waste handling and disposal purposes.

2.2.1.4.1 Environmental Sample Results

With the exception of TPH-DRO, all soil concentrations of the reported constituents were compared to and were less than PALs.

One shallow subsurface sample (151D001) collected from below the outlet pipe from CAS 12-04-02 Septic Tank #1, from a depth of 2.5 to 3 ft bgs, exceeded the PAL for TPH-DRO. The Tier 2 evaluation consisted of assessing the hazardous constituents of TPH-DRO. These evaluations are addressed in Sections A.5.2.1 and A.5.2.2. Based on the Tier 2 evaluation, the hazardous constituents of TPH-DRO did not exceed FALs; therefore, TPH-DRO is not considered a COC. The establishment of FALs and the list of hazardous constituents of TPH are presented in Appendix D and Table D.1-8. The maximum concentration of each detected COPC at this CAS is listed in Table 2-4.

2.2.1.4.2 Septic Tank Content Sample Results

All constituents in liquid samples were less than RCRA toxicity characteristic concentrations. Therefore, no liquid potential source materials were identified.

Septic tank content sampling of the sludge indicated two SVOCs (1,4-dichlorobenzene and methylene chloride) present above PALs in five chambers in five different tanks. Total petroleum

Table 2-4
Maximum Concentration of Detected Contaminants for CAS 12-04-02, Septic Tanks

Sample Number	Location	Description	Depth (ft bgs)	Constituent	Maximum Result	FAL	Units
151D001	D14	CAS 12-04-02, System #3, Tank #1, outlet end	2.5 - 3.0	TPH-DRO	130	N/A[a]	mg/kg

[a] FALs are established for the hazardous constituents of TPH-DRO in Appendix D.

DRO = Diesel-range organics
FAL = Final action level
ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
N/A = Not applicable
TPH = Total petroleum hydrocarbons

hydrocarbons-DRO and TPH-GRO were also detected in the same chambers as well as in three additional chambers of two other tanks, above the PAL of 100 milligrams per kilogram (mg/kg).

Resource Conservation and Recovery Act metals, beryllium, and gamma-emitting and isotopic radionuclides were all detected to be below PALs. Additionally, no sludge samples exceeded RCRA toxicity characteristic concentrations.

The maximum concentration of each detected constituent at this CAS is listed in Table 2-5. The concentrations are presented per individual tank, as the tank is regarded as the unit or scale of decision. For TPH-DRO and TPH-GRO, the Tier 2 evaluation consisted of assessing the hazardous constituents of TPH-DRO and TPH-GRO. These evaluations are addressed in Sections A.5.2.1 and A.5.2.2. Based on the Tier 2 evaluation, the hazardous constituents of TPH-DRO and TPH-GRO did not exceed FALs; therefore, TPH-DRO and TPH-GRO are not considered as potential source materials. The establishment of FALs and the list of hazardous constituents of TPH-DRO and TPH-GRO are presented in Appendix D and Table D.1-8.

2.2.1.5 Septic Tank (CAS 12-04-03)

Sampling was conducted for two independent purposes at this CAS. Soil samples from beneath the inlet line and outlet line, and between the tanks at an elevation equivalent to the base of the tanks were collected for environmental purposes to determine whether the soils surrounding the tanks contained any COCs. The contents of each septic tank were sampled to determine whether this material posed a threat of the introduction of COCs if released to the environment surrounding the tanks (i.e., could

Table 2-5
Maximum Concentration of Detected Contaminants in Septic Tank Samples for CAS 12-04-02

Sample Number	Location	Tank Number/ Chamber	Matrix	Constituent	Maximum Result	FAL	Units	Volume (gallons)
151D507	D01	Tank #1 Inlet	Sludge	TPH-DRO	610	N/A[a]	mg/kg	339
151D508	D03	Tank #2 Inlet		TPH-DRO	1,700	N/A[a]	mg/kg	24
				1,4-dichlorobenzene	71,000	3,060,000	µg/kg	
151D509	D05	Tank #3 Inlet		TPH-DRO	390	N/A[a]	mg/kg	919
				1,4-dichlorobenzene	38,000	3,060,000	µg/kg	
151D513	D06	Tank #3 Outlet		TPH-DRO	390	N/A[a]	mg/kg	919
151D510	D07	Tank #4 Inlet		TPH-DRO	1,200	N/A[a]	mg/kg	339
				TPH-GRO	720	N/A[a]	mg/kg	
				1,4-dichlorobenzene	1,100,000	3,060,000	µg/kg	
151D521	D09	Tank #5 Inlet		TPH-DRO	2,000	N/A[a]	mg/kg	339
				TPH-GRO	150	N/A[a]	mg/kg	
				1,4-dichlorobenzene	500,000	3,060,000	µg/kg	
				Methylene Chloride	100,000	1,390,000	µg/kg	
151D522	D10	Tank #5 Outlet		TPH-DRO	230	N/A[a]	mg/kg	339
151D520	D11	Tank #6 Inlet		TPH-DRO	1,500	N/A[a]	mg/kg	610
				TPH-GRO	160	N/A[a]	mg/kg	
				1,4-dichlorobenzene	140,000	3,060,000	µg/kg	

[a] FALs are established for the hazardous constituents of TPH-DRO and TPH-GRO in Appendix D.

DRO = Diesel-range organics
FAL = Final action level
ft bgs = Feet below ground surface
GRO = Gasoline-range organics
mg/kg = Milligrams per kilogram
N/A = Not applicable
TPH = Total petroleum hydrocarbons
µg/kg = Micrograms per kilogram

serve as potential source material). The septic tank sample results will also to be used for waste handling and disposal purposes.

2.2.1.5.1 Environmental Sample Results

All concentrations of the reported constituents were compared to and were less than PALs. No Decision II sampling was required.

2.2.1.5.2 Septic Tank Content Sample Results

All constituents in liquid samples were less than RCRA toxicity characteristic concentrations. Therefore, no liquid potential source materials were identified.

Septic tank content sampling of the sludge indicated several organic compounds present above PALs in three tanks and one chamber. Maximum concentrations of 1,4-dichlorobenzene, aroclor-1260, aroclor-1268, TPH-DRO, TPH-GRO, and benzo(a)pyrene, were all in excess of their respective PALs.

Resource Conservation and Recovery Act metals, beryllium, and gamma-emitting and isotopic radionuclides were all detected to be below PALs. Additionally, no sludge exceeded RCRA toxicity characteristic concentrations.

The maximum concentration of each detected constituent at this CAS is listed in Table 2-6. For TPH-DRO and TPH-GRO, the Tier 2 evaluation consisted of assessing the hazardous constituents of TPH-DRO and TPH-GRO. These evaluations are addressed in Sections A.5.2.1 and A.5.2.2. Based on the Tier 2 evaluation, the hazardous constituents of TPH-DRO and TPH-GRO did not exceed FALs; therefore, TPH-DRO and TPH-GRO are not considered as potential source materials. The establishment of FALs and the list of hazardous constituents of TPH-DRO and TPH-GRO are presented in Appendix D and Table D.1-8.

2.2.1.6 Wastewater Pond (CAS 12-47-01)

Concentrations of VOCs, RCRA metals, beryllium, and gamma-emitting and isotopic radionuclides were compared to and were less than PALs.

Six constituents (TPH-DRO, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoroanthene, indeno(1,2,3-cd) pyrene, and aroclor-1254) were detected above their respective PALs and are associated with the shallow subsurface (5 to 5.75 ft bgs) sample and its duplicate sample from Location F03. Sample 151F005 had a concentration of benzo(a)pyrene greater than the PAL. The duplicate sample (151F006) had benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene at concentrations above their respective PALs.

Table 2-6
Maximum Concentration of Detected Contaminants in Septic Tank Samples for CAS 12-04-03

Sample Number	Location	Tank Number/ Chamber	Matrix	Constituent	Maximum Result	FAL	Units	Volume (gallons)
151E502	E08	Tank #1 Outlet	Sludge	TPH-DRO	970	N/A[a]	mg/kg	919
				1,4-dichlorobenzene	350,000	3,060,000	µg/kg	
151E506	E07	Tank #1 Inlet		TPH-DRO	2,800	N/A[a]	mg/kg	1,255
				TPH-GRO	180	N/A[a]	mg/kg	
				1,4-dichlorobenzene	300,000	3,060,000	µg/kg	
151E508	E03	Tank #3 Outlet		TPH-DRO	3,100	N/A[a]	mg/kg	122
				Aroclor-1260	5,300	28,800	µg/kg	
				Benzo(a)pyrene	250	6,470	µg/kg	
151E510	E04	Tank #3 Inlet		TPH-DRO	1,600	N/A[a]	mg/kg	122
				1,4-dichlorobenzene	27,000	3,060,000	µg/kg	
				Aroclor-1260	930	28,800	µg/kg	
				Benzo(a)pyrene	470	6,470	µg/kg	
151E512	E01	Tank #4 Inlet		TPH-DRO	2,900	N/A[a]	mg/kg	339
				Aroclor-1268	5,700	28,800	µg/kg	
151E514	E02	Tank #4 Outlet		TPH-DRO	1,900	N/A[a]	mg/kg	339
				Aroclor-1268	2,500	28,800	µg/kg	
151E515	E05	Tank #2 Inlet	Sediment	TPH-DRO	3,000	N/A[a]	mg/kg	4,700

[a] FALs are established for the hazardous constituents of TPH-DRO in Appendix D.

DRO = Diesel-range organics
FAL = Final action level
ft bgs = Feet below ground surface
GRO = Gasoline-range organics
mg/kg = Milligrams per kilogram
N/A = Not applicable
TPH = Total petroleum hydrocarbons
µg/kg = Micrograms per kilogram

Both samples had a maximum TPH-DRO concentration above the PAL of 100 mg/kg. Concentrations of the PCB aroclor-1254 in samples 151F005 and 151F006 were also above the PAL. Only benzo(a)pyrene in sample 151F006 was above the FAL. The FALs were established for these contaminants based on a Tier 2 evaluation as discussed in Appendix D.

Five additional Decision I sample locations were sampled to constrain the extent of potential contamination. Samples were collected from 2 to 3 ft bgs and 4 to 5 ft bgs at Location F03A (2 ft away from Location F03), and towards the inlet pipe at Location F03C from 2 to 3 ft bgs and from 5 to 6 ft bgs. Samples were collected from 4 to 5 ft bgs at three other locations 10 to 15 ft away from Location F03. All additional sample concentrations were below PALs.

The maximum concentration of each detected COPC at this CAS is listed in Table 2-7. Aroclor-1254 was below the Tier 2 SSTL and therefore is not considered as a COC at this CAS.

Table 2-7
Maximum Concentration of Detected Contaminants for CAS 12-47-01, Wastewater Pond

Sample Number	Location	Depth (ft bgs)	Constituent	Maximum Result	FAL	Units
151F006	F03	5.0 - 5.75	Benzo(a)anthracene	20,000	64,300	µg/kg
			Benzo(a)pyrene	11,000	6,470	µg/kg
			Benzo(b)fluoranthene	13,000	64,700	µg/kg
			Indeno(1,2,3-cd)pyrene	3,500	64,700	µg/kg
			TPH-DRO	190	N/A[a]	mg/kg
			Aroclor-1254	2,200	27,700	µg/kg

[a] FALs are established for the hazardous constituents of TPH-DRO in Appendix D.

DRO = Diesel-range organics
FAL = Final action level
ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
N/A = Not applicable
TPH = Total petroleum hydrocarbons
µg/kg = Micrograms per kilogram

The Tier 2 evaluation for TPH-DRO consisted of assessing the hazardous constituents of TPH-DRO. These evaluations are addressed in Sections A.6.2.1 and A.6.2.2. Based on the Tier 2 evaluation, the hazardous constituents of TPH-DRO did not exceed FALs; therefore, TPH-DRO is not considered a COC. The establishment of FALs and the list of hazardous constituents of TPH are presented in Appendix D and Table D.1-8.

The presence of benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoroanthene, indeno(1,2,3-cd) pyrene, is attributed to degradation products from the presence of asphalt in the sample. Because the COPCs detected are attributed to asphalt, the detection of benzo(a)pyrene does not result in the identification of a COC (see Appendix D).

2.2.1.7 Sewage Lagoon (CAS 18-03-01) and Sewer Line (Exposed) (CAS 18-99-09)

All concentrations of the reported constituents were compared to and were less than FALs. No Decision II sampling was required.

2.2.2 Data Assessment Summary

The DQA is presented in Appendix B and includes an evaluation of the DQIs to determine the degree of acceptability and usability of the reported data in the decision-making process. The DQO process ensures that the right type, quality, and quantity of data will be available to support the resolution of those decisions at an appropriate level of confidence. Using both the DQO and DQA processes helps to ensure that DQO decisions are sound and defensible.

The DQA process as presented in Appendix B is comprised of the following steps:

- Step 1: Review DQOs and Sampling Design
- Step 2: Conduct a Preliminary Data Review
- Step 3: Select the Test
- Step 4: Verify the Assumptions
- Step 5: Draw Conclusions from the Data

Evidence that selected sample locations support the presence and/or extent of contamination at each CAS is discussed in Appendix B. Based on the results of the DQA presented in Appendix B, the nature and extent of COCs at CAU 151 have been adequately identified to develop and evaluate CAAs. The DQA also determined that information generated during the investigation support the CSM assumptions, and the data collected met the DQOs and support their intended use in the decision-making process.

2.3 Need for Corrective Action

Analytes detected during the CAI were evaluated against FALs to identify COCs. The following subsections identify the COCs within the boundaries of CAU 151 CASs. A corrective action may also be required if a septic tank within a CAS contains potential source material that, if released, could result in the introduction of a COC to the environment surrounding the tank. Corrective action alternatives are identified and evaluated in Section 3.0. The impacted volume and characteristics are provided in each CAS-specific subsection below. Volume calculations for contaminated material to be removed from each area are shown in Appendix C. Corrective action alternatives are not evaluated for CASs that do not contain COCs or potential source material.

Site-specific characteristics that might constrain remediation at each of the CASs are active sanitary lines, and underground and/or overhead utilities. The CAAs are identified in Section 3.0 and evaluated for their ability to ensure protection of the public and the environment in accordance with *Nevada Administrative Code* (NAC) 445A (NAC, 2003), feasibility, and cost effectiveness.

2.3.1 UE-2ce Pond (CAS 02-05-01)

Based on observations made and analytical results for soil samples collected at this CAS, no COCs were identified. Therefore, no CAAs will be evaluated for this CAS.

2.3.2 Sewage Lagoons (6) (CAS 12-03-01)

Based on observations made and analytical results for soil samples collected at Lagoons C, D, F, and G of this CAS, no COCs were identified. Therefore, no CAAs will be evaluated for these lagoons at this CAS.

No COCs were identified in Lagoons B or E under the current use scenario used to calculate FALs. However, the FALs used to evaluate the presence of COCs for Lagoon B and Lagoon E were based on restrictive exposure scenarios (Remote Work Area, or Occasional Use Area). To ensure that a future site worker does not receive a greater exposure than was used to calculate the FALs, an administrative use restriction will be imposed on these sites as a best management practice (BMP).

Observations made and analytical results for soil samples collected at Lagoon A of this CAS indicate arsenic as a COC in the shallow subsurface soil from 1.25 to 3 ft bgs. Based on the presence of COCs in the soil, the CAAs of Close in Place with Administrative Controls and Clean Closure will be evaluated for Lagoon A of this CAS.

2.3.3 Septic Tanks (CAS 12-04-01), Septic Tanks (CAS 12-04-02), Septic Tank (CAS 12-04-03)

Based on observations made and analytical results for soil samples collected at this CAS, no COCs in the soil were identified. Therefore, no CAAs will be evaluated for the soil within these CASs.

Concentrations of potential source material requiring CAA evaluation are presented by tank, as individual tanks are regarded as the unit or scale of decision. Based on the analytical results of the septic tank contents, only the two tanks from CAS 12-04-01, System #1, contain sludge that is considered potential source material (exceeds FALs or RCRA toxicity limits). This material poses the potential for contamination of the environment surrounding the tank with a COC and must therefore be addressed under a corrective action. System #1, Tank #5, contained aroclor-1254, trichloroethene, and Cs-137 above FALs. Additionally, Tank #5 contains potential source material that exceeds the RCRA toxicity characteristic limits of 1,4-dichlorobenzene and trichloroethene. Tank #6 contained 1,4-dichlorobenzene, above the RCRA toxicity characteristic limit. Therefore, CAS 12-04-01, Septic Tanks, System #1, will be evaluated for Close in Place with Administrative Controls and Clean Closure, both to include removal of the liquid contents as a BMP.

Based on the analytical results for septic tank content samples collected from CAS 12-04-01, System #4, no potential source material was identified in any of the septic tanks. Therefore, CAS 12-04-01, Septic Tanks, System #4, will not require evaluation of CAAs. However, removal of sludge and liquids within the septic tanks and removal of the empty tanks is recommended as a BMP.

Based on the analytical results for septic tank content samples collected from CAS 12-04-02, no potential source material was identified in any of the septic tanks. Therefore, CAS 12-04-02, Septic Tanks, will not require evaluation of CAAs. However, removal of sludge and liquids within the septic tanks is recommended as a BMP.

Based on the analytical results for septic tank content samples collected from CAS 12-04-03, no potential source material was identified in any of the septic tanks. Therefore, CAS 12-04-03, Septic Tank, will not require evaluation of CAAs. However, removal of sludge and liquids within the septic tanks is recommended as a BMP.

2.3.4 Wastewater Pond (CAS 12-47-01)

Based on observations made and analytical results for soil samples collected at this CAS, the detected SVOCs (benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoroanthene, indeno(1,2,3-cd) pyrene) are known components of asphalt and are most likely related to degraded crushed asphalt from a parking area approximately 30-ft upslope from the sump. Pieces of material that resembled degraded asphalt were noted within the soil samples; therefore, these detections are likely not related to effluent contributions to the sump, but are more likely related to pieces of degraded asphalt from an adjacent parking area emplaced during backfilling operations (see Appendix D for details).

Because it is believed that asphalt is responsible for all SVOC detections at this CAS, no COCs are present at this CAS. However, the FALs used to evaluate the presence of COCs at this CAS were based on restrictive exposure scenarios (Remote Work Area, or Occasional Use Area). To ensure that a future site worker does not receive a greater exposure than was used to calculate the FALs, an administrative use restriction will be recommended at this CAS as a BMP.

2.3.5 Sewage Lagoon (CAS 18-03-01) and Sewer Line (Exposed) (CAS 18-99-09)

Based on observations made and analytical results of environmental samples collected at these CASs, no COCs were identified at these CASs. Therefore, no CAAs will be evaluated for these CASs.

3.0 Evaluation of Alternatives

The purpose of this section is to present the corrective action objectives for CAU 151, describe the general standards and decision factors used to screen the various CAAs, and develop and evaluate a set of selected CAAs that will meet the corrective action objectives.

3.1 Corrective Action Objectives

The corrective action objectives are the risk- or dose-based cleanup goals defined herein as FALs that, if met, will ensure that each release site will not pose an unacceptable risk to human health and the environment and that conditions at each site are in compliance with all applicable laws and regulations. The process to define or determine the FALs conforms with NAC Section 445A.227, which lists the requirements for sites with soil contamination. For the evaluation of corrective actions, NAC Section 445A.22705 requires the use of American Society for Testing and Materials (ASTM) Method E1739-95 to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary" (ASTM, 1995).

The ASTM procedure defines three tiers (or levels) of evaluation involving increasingly sophisticated analyses as detailed in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006).

A Tier 1 evaluation was conducted for all detected constituents to determine whether contaminant levels satisfy the criteria for a quick regulatory closure or warrant a more site-specific assessment. This was accomplished by comparing individual source area contaminant concentration results to the Tier 1 action levels (the PALs established in the CAIP).

In order to evaluate the potential for septic tank contents to result in the introduction of a COC to the surrounding environmental media, the following conservative assumptions were made:

- That the tank containment would fail at some point in the future and the contents would be released to the surrounding media.

- That the resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in the tank waste.
- That any contaminant in the septic tanks exceeding the RCRA toxicity characteristic concentrations can result in a COC's introduction to the surrounding media.

Based on these assumptions, septic tank sludge contaminant concentrations were compared to the PALs to evaluate the potential for the future release of COCs to the environment. Sludge containing a contaminant exceeding a FAL would be considered to be potential source material and would require evaluation of CAAs. Sludge containing a contaminant exceeding a toxicity characteristic action level would also be considered a potential source material and would require evaluation of CAAs.

For septic tank liquids, contaminant concentrations were compared to toxicity characteristic action levels to evaluate the potential for the future release of COCs to the environment. Liquid containing a contaminant exceeding a toxicity characteristic action level would be considered to be potential source material and would require evaluation of CAAs.

The constituents detected at the CAU 151 CASs that exceeded Tier 1 action levels (PALs) are listed in Table 3-1.

The concentrations of all constituents not listed in Table 3-1 were below Tier 1 action levels, and the corresponding FALs were established as the Tier 1 action levels. Of the constituents at CASs that exceeded Tier 1 action levels, all were passed on to a Tier 2 evaluation.

The Tier 2 evaluation of TPH-DRO and TPH-GRO at CASs 12-04-01, 12-04-02, 12-04-03, and 12-47-01 followed the ASTM E1739-95 Method (ASTM, 1995) and compared the analytical results for the hazardous constituents of TPH analytes to the Tier 2 action levels. For these CASs, the FALs for the hazardous constituents of gasoline and diesel (as applicable) were established as the corresponding Region 9 Preliminary Remediation Goal (PRG) values for industrial soils (EPA, 2002). Additional details on the Tier 2 establishment of FALs are provided in Appendix D.

Table 3-1
Definition of Final Action Levels for Constituents Detected Above Tier I Values

Constituent	CAS Number					Units
	12-03-01	12-04-01	12-04-02	12-04-03	12-47-01	
TPH-DRO[a]	--	N/A[b]	N/A[b]	N/A[b]	N/A[b]	--
TPH-GRO	--	N/A[b]	N/A[b]	N/A[b]	--	--
Aroclor-1254	--	27,700	--	--	27,700	µg/kg
Aroclor-1260	--	--	--	28,800	--	µg/kg
Aroclor-1268	--	--	--	28,800	--	µg/kg
1,4-dichlorobenzene	--	3,060,000	3,060,000	3,060,000	--	µg/kg
Benzo(a)anthracene	64,300	--	--	--	64,300	µg/kg
Benzo(b)fluoranthene	64,700	--	--	--	64,700	µg/kg
Benzo(a)pyrene	6,470	--	--	6,470	6,470	µg/kg
Bis(2-ethylhexyl)phthalate	--	4,960,000	--	--	--	µg/kg
Dibenzo(a,h)anthracene	--	--	--	6,470	--	µg/kg
Indeno(1,2,3-cd)pyrene	--	--	--	--	64,700	µg/kg
Methylene chloride	--	--	1,390,000	--	--	µg/kg
Trichloroethene	--	5,730	--	--	--	µg/kg
Arsenic	45.1	45.1	--	45.1	--	mg/kg
Lead	--	17,079	--	--	--	mg/kg
Cesium-137	--	12.2	--	--	--	pCi/g

[a] TPH-DRO was also detected above PALs in soils at CASs 12-04-01 and 12-04-02.
[b] Final action levels are established for the hazardous constituents of TPH-DRO and TPH-GRO in Appendix D.

DRO = Diesel-range organics
GRO = Gasoline-range organics
mg/kg = Milligrams per kilogram
N/A = Not applicable
-- = Not detected at this CAS
PAL = Preliminary action level
pCi/g = Picocuries per gram
TPH = Total petroleum hydrocarbons
µg/kg = Micrograms per kilogram

3.2 Screening Criteria

The screening criteria used to evaluate and select the preferred CAAs are identified in the EPA *Guidance on RCRA Corrective Action Decision Documents* (EPA, 1991) and the *Final RCRA Corrective Action Plan* (EPA, 1994).

Corrective action alternatives are evaluated based on four general corrective action standards and five remedy selection decision factors. All CAAs must meet the four general standards to be selected for evaluation using the remedy selection decision factors.

The general corrective action standards are as follows:

- Protection of human health and the environment
- Compliance with media cleanup standards
- Control the source(s) of the release
- Comply with applicable federal, state, and local standards for waste management

The remedy selection decision factors are as follows:

- Short-term reliability and effectiveness
- Reduction of toxicity, mobility, and/or volume
- Long-term reliability and effectiveness
- Feasibility
- Cost

3.2.1 Corrective Action Standards

The following text describes the corrective action standards used to evaluate the CAAs.

Protection of Human Health and the Environment

Protection of human health and the environment is a general mandate of the RCRA statute (EPA, 1994). This mandate requires that the corrective action include any necessary protective measures. These measures may or may not be directly related to media cleanup, source control, or management of wastes. The CAAs are evaluated for the ability to be protective of human health and the environment through an evaluation of risk as presented in Appendix D.

Compliance with Media Cleanup Standards

The CAAs are evaluated for the ability to meet the proposed media cleanup standards. For CAU 151, the media cleanup standards are the FALs defined in Section 3.1.

Control the Source(s) of the Release

The CAAs are evaluated for the ability to stop further environmental degradation by controlling or eliminating additional releases that may pose a threat to human health and the environment. Unless source control measures are taken, efforts to clean up releases may be ineffective or, at best, will essentially involve a perpetual cleanup. Therefore, each CAA must provide effective source control to ensure the long-term effectiveness and protectiveness of the corrective action.

Comply with Applicable Federal, State, and Local Standards for Waste Management

The CAAs are evaluated for the ability to be conducted in accordance with applicable federal and state regulations (e.g., 40 *Code of Federal Regulations* [CFR] 260-282, “Hazardous Waste Management” [CFR, 2003a]; 40 CFR 761 “Polychlorinated Biphenyls,” [CFR, 2003b]; and NAC 444.842 to 444.980, “Management of Hazardous Waste” [NAC, 2002]).

3.2.2 Remedy Selection Decision Factors

The following text describes the remedy selection decision factors used to evaluate the CAAs.

Short-Term Reliability and Effectiveness

Each CAA must be evaluated with respect to its effects on human health and the environment during implementation of the selected corrective action.

The following factors will be addressed for each alternative:

- Protection of the community from potential risks associated with implementation, such as fugitive dusts, transportation of hazardous materials, and explosion
- Protection of workers during implementation
- Environmental impacts that may result from implementation
- The amount of time until the corrective action objectives are achieved

Reduction of Toxicity, Mobility, and/or Volume

Each CAA must be evaluated for its ability to reduce the toxicity, mobility, and/or volume of the contaminated media. Reduction in toxicity, mobility, and/or volume refers to changes in one or more characteristics of the contaminated media by the use of corrective measures that decrease the inherent threats associated with that media.

Long-Term Reliability and Effectiveness

Each CAA must be evaluated in terms of risk remaining at the CAU after the CAA has been implemented. The primary focus of this evaluation is on the extent and effectiveness of the control that may be required to manage the risk posed by treatment of residuals and/or untreated wastes.

Feasibility

The feasibility criterion addresses the technical and administrative feasibility of implementing a CAA and the availability of services and materials needed during implementation. Each CAA must be evaluated for the following criteria:

- Construction and Operation. Refers to the feasibility of implementing a CAA given the existing set of waste and site-specific conditions.
- Administrative Feasibility. Refers to the administrative activities needed to implement the CAA (e.g., permits, use restrictions, public acceptance, rights-of-way, off-site approval).
- Availability of Services and Materials. Refers to the availability of adequate off-site and on-site treatment, storage capacity, disposal services, necessary technical services and materials, and prospective technologies for each CAA.

Cost

Costs for each alternative are estimated for comparison purposes only. The cost estimate for each CAA includes both capital, and operation and maintenance costs, as applicable, and are provided in Appendix C. The following is a brief description of each component:

- Capital Costs. These costs include direct costs that may consist of materials, labor, construction materials, equipment purchase and rental, excavation and backfilling, sampling and analysis, waste disposal, demobilization, and health and safety measures. Indirect costs are separate and not included in the estimates.
- Operation and Maintenance. These costs are separate and include labor, training, sampling and analysis, maintenance materials, utilities, and health and safety measures. These costs are not included in the estimates.

3.3 Development of Corrective Action Alternatives

This section identifies and briefly describes the viable corrective action technologies and the CAAs considered for CAU 151. Based on the review of existing data, future use, and current operations at the NTS, the following alternatives have been developed for consideration at CAU 151:

- Alternative 1 - No Further Action
- Alternative 2 - Closure in Place with Administrative Controls
- Alternative 3 - Clean Closure

3.3.1 Alternative 1 - No Further Action

Under the No Further Action alternative, no corrective action activities will be implemented. This alternative is a baseline case with which to compare and assess the other CAAs and their ability to meet the corrective action standards. Although no further action is required, a BMP can be implemented.

This alternative includes the closure of the septic tanks in accordance with NAC 444.818 (NAC, 1999) as a BMP. This is anticipated to include removal of all contents and removal and disposal of the tanks. However, in some cases, active utilities are within close proximity to the tanks to be removed and may prohibit removal. Any tanks left in the ground will be filled with inert materials.

The septic tank contents, and the septic tanks themselves at CASs 12-04-01, 12-04-02, and 12-04-03 are recommended for removal. A second BMP applies to soils at CASs 12-03-01 and 12-47-01 to include imposing an administrative use restriction. There will be no placement of physical barriers or signs.

3.3.2 Alternative 2 - Close in Place with Administrative Controls

For contaminated surface and subsurface soil, Alternative 2 includes the administrative activities and costs associated with application of an FFACO database Use Restriction with Administrative Controls, for CASs where contamination is present at levels that exceed the FALs (CAS 12-03-01, Lagoon A). Administrative controls will restrict inadvertent contact with contaminated media by prohibiting any activity that would cause significant exposure of site occupants to the identified COCs.

For septic tanks containing potential source material (CAS 12-04-01, System #1), this alternative includes stabilization of sludge within the tank, backfilling with inert material, and installation of a grout plug. Under this alternative, the BMP of removing the liquid contents of the septic tanks is also included. All liquid contents of the tanks will be removed and disposed of at an appropriate facility.

3.3.3 Alternative 3 - Clean Closure

For contaminated surface and subsurface soil, Alternative 3 includes excavating and disposing of all impacted soil containing COCs. Verification soil samples will also be collected and analyzed for the presence of COCs once the estimated volume of contaminated soil is removed.

This alternative includes removing the arsenic contaminated soil within Lagoon A at CAS 12-03-01. Any contaminated material that is removed will be disposed of at an appropriate disposal facility. All excavated areas will be returned to surface conditions compatible with the intended future use of the site. Overburden soil (as feasible), along with additional clean fill, will be used to backfill excavations after removal of the contaminated soil. Clean borrow soil may be removed from a nearby location for placement in the excavation, as necessary.

For septic tanks containing potential source material at CAS 12-04-01, System #1, this alternative includes removal of sludge, and excavation and disposal of the tanks. Under this alternative, the BMP of removing the liquid contents of the septic tanks is also included. All liquid contents of the tanks will be removed and disposed of at an appropriate facility. The remaining sludge will be removed for disposal. After removal of the liquid and sludge, the tanks themselves will be excavated and disposed as necessary.

3.4 Evaluation and Comparison of Alternatives

Each CAA presented in Section 3.3 will be evaluated based on the general corrective action standards described in Section 3.2. This evaluation is presented in Table 3-2. Any CAA that does not meet the general corrective action standards will be removed from consideration.

The remaining CAAs will be further evaluated based on the remedy selection decision factors described in Section 3.2. This evaluation is presented in Table 3-3. For each remedy selection decision factor the CAAs are ranked relative to each other. The CAA with the least desirable impact on the remedy selection decision factor will be given a ranking of 1. The CAAs with increasingly desirable impacts on the remedy selection decision factor receive increasing rank numbers. The CAAs that will have an equal impact on the remedy selection decision factor will receive an equal ranking number. The scoring listed in this table represents the sum of the remedy selection decision factor rankings for each CAA. The scoring does not include the BMP because the BMP will be performed regardless of the CAA selected.

As discussed in Section 2.3, CAAs will not be evaluated for soils at CASs 02-05-01; 12-03-01, Lagoons B through G; and 12-04-01, 12-04-02, 12-04-03, 12-47-01, 18-03-01, and 18-99-09, because no COCs were identified at these sites. Also as discussed in Section 2.3, septic tank contents containing potential source material at CAS 12-04-01, System #1, will require evaluation of all CAAs. Lagoon A at CAS 12-03-01, as the only soil location containing a COC, will be evaluated for all CAAs.

Table 3-2
Evaluation of General Corrective Action Standards
(Page 1 of 3)

CAS 12-03-01, Sewage Lagoons (6), Lagoon A		
CAA 1, No further action		
Standard	Comply?	Explanation
Protection of Human Health and the Environment	No	COCs are present at concentrations that exceed the FAL (Tier II SSTL), as presented in Appendix D.
Compliance with Media Cleanup Standards	No	COCs are present at concentrations that exceed the FAL (Tier II SSTL) as presented in Appendix D.
Control the Source(s) of the Release	Yes	Septage input to the lagoon has been discontinued.
Comply with Applicable Federal, State, and Local Standards for Waste Management	Yes	This alternative will not generate waste.
CAA 2, Clean closure		
Standard	Comply?	Explanation
Protection of Human Health and the Environment	Yes	Contamination exceeding the risk-based action levels will be removed.
Compliance with Media Cleanup Standards	Yes	Contamination exceeding the risk-based action levels will be removed.
Control the Source(s) of the Release	Yes	Septage input to the lagoon has been discontinued.

Table 3-2
Evaluation of General Corrective Action Standards
(Page 2 of 3)

CAS 12-03-01, Sewage Lagoons (6), Lagoon A		
Comply with Applicable Federal, State, and Local Standards for Waste Management	Yes	Excavated waste can be managed in compliance with all standards.
CAA 3, Close in place with administrative controls		
Standard	Comply?	Explanation
Protection of Human Health and the Environment	Yes	Use restrictions will be implemented to protect site workers from contamination exceeding the risk-based action levels.
Compliance with Media Cleanup Standards	Yes	Although COCs will not be removed, site workers will not be exposed to COCs.
Control the Source(s) of the Release	Yes	Septage input to the lagoon has been discontinued.
Comply with Applicable Federal, State, and Local Standards for Waste Management	Yes	This alternative will not generate waste.
CAS 12-04-01, Septic Tanks, System #1		
CAA 1, No further action		
Standard	Comply?	Explanation
Protection of Human Health and the Environment	No	Potential source material is present, sludge concentrations exceed FALs and RCRA toxicity characteristic limits (Appendix D).
Compliance with Media Cleanup Standards	No	Potential source material is present, sludge concentrations exceed FALs and RCRA toxicity characteristic limits (Appendix D).
Control the Source(s) of the Release	No	If the sludge was released from the septic tanks, it would have the potential to impact the surrounding media.
Comply with Applicable Federal, State, and Local Standards for Waste Management	Yes	This alternative will not generate waste.
CAA 2, Clean closure		
Standard	Comply?	Explanation
Protection of Human Health and the Environment	Yes	Potential source material (the sludge exceeding FALs and the RCRA toxicity characteristic limits) will be removed.
Compliance with Media Cleanup Standards	Yes	Potential source material (the sludge exceeding FALs and the RCRA toxicity characteristic limits) will be removed.
Control the Source(s) of the Release	Yes	Potential source material (the sludge exceeding FALs and the RCRA toxicity characteristic limits) will be removed.

Table 3-2
Evaluation of General Corrective Action Standards
(Page 3 of 3)

CAS 12-03-01, Sewage Lagoons (6), Lagoon A		
Comply with Applicable Federal, State, and Local Standards for Waste Management	Yes	Removed waste can be managed in compliance with all standards.
CAA 3, Close in place with administrative controls		
Standard	Comply?	Explanation
Protection of Human Health and the Environment	Yes	Solidification/stabilization of sludge and a use restriction, will be implemented to protect site workers from contamination.
Compliance with Media Cleanup Standards	Yes	Although the potential source material (sludge) will not be removed, site workers will not be exposed.
Control the Source(s) of the Release	Yes	The sludge will be stabilized.
Comply with Applicable Federal, State, and Local Standards for Waste Management	Yes	This alternative will not generate waste.

Table 3-3
Evaluation of Remedy Selection Decision Factors
(Page 1 of 3)

CAS 12-03-01, Sewage Lagoons (6), Lagoon A		
CAA 1, No further action		
Factor	Score	Explanation
Not evaluated as this CAA did not meet the General Corrective Action Standards		
CAA 2, Clean closure		
Standard	Score	Explanation
Short-Term Reliability and Effectiveness	1	This alternative is reliable and effective but involves increased short-term exposure of site workers to COCs.
Reduction of Toxicity, Mobility, and/or Volume	2	This alternative will result in a decrease of toxicity and mobility but will generate moderate waste volumes.
Long-Term Reliability and Effectiveness	2	This alternative is reliable and effective at protecting human health and the environment because removal of contaminated media will prevent future exposure of site workers to COCs.
Feasibility	1	This alternative is the most complicated of the CAAs.

Table 3-3
Evaluation of Remedy Selection Decision Factors
(Page 2 of 3)

CAS 12-03-01, Sewage Lagoons (6), Lagoon A		
Cost	1	The excavation and waste disposal costs for this alternative (estimated to be $83,607) are higher than the other CAA (see Appendix C for details).
Score	7	
CAA 3, Close in place with administrative controls		
Standard	Score	Explanation
Short-Term Reliability and Effectiveness	2	This alternative is reliable and effective in providing increased protection of human health by preventing contact with COCs.
Reduction of Toxicity, Mobility, and/or Volume	1	This alternative will not reduce toxicity or mobility of the COCs that are present but will not generate excavation waste volumes.
Long-Term Reliability and Effectiveness	1	This alternative is reliable in the long term with ongoing maintenance. It is effective in providing increased protection of human health by preventing contact with COCs.
Feasibility	2	This alternative is easily implemented but requires maintenance.
Cost	2	The installation and ongoing maintenance costs for this alternative (estimated to be $15,928) are lower than the other CAA (see Appendix C for details).
Score	8	
CAS 12-04-01, Septic Tanks System #1		
CAA 1, No further action		
Factor	Score	Explanation
Not evaluated as this CAA did not meet the General Corrective Action Standards		
CAA 2, Clean closure		
Standard	Score	Explanation
Short-Term Reliability and Effectiveness	1	This alternative is reliable and effective but involves increased short-term exposure of site workers to the potential source material (sludge).
Reduction of Toxicity, Mobility, and/or Volume	2	This alternative will result in a decrease of toxicity and mobility but will generate moderate waste volumes.
Long-Term Reliability and Effectiveness	2	This alternative is reliable and effective at protecting human health and the environment because removal of contaminated media will prevent future exposure of site workers to the potential source material (sludge).
Feasibility	2	This alternative is easily implemented.
Cost	1	Sludge removal with associated steps and waste disposal costs for this alternative (estimated to be $468,776) are comparable to the other CAA (see Appendix C for details).
Score	8	

Table 3-3
Evaluation of Remedy Selection Decision Factors
(Page 3 of 3)

CAS 12-03-01, Sewage Lagoons (6), Lagoon A		
CAA 3, Close in place with administrative controls		
Standard	Score	Explanation
Short-Term Reliability and Effectiveness	1	This alternative is reliable and effective but involves increased short-term exposure of site workers to the potential source material (sludge).
Reduction of Toxicity, Mobility, and/or Volume	1	This alternative will not reduce toxicity or volume of the sludge that is present but will not generate waste volumes. However, solidification of the sludge will immobilize this potential source material.
Long-Term Reliability and Effectiveness	1	This alternative is reliable in the long term with ongoing maintenance. It is moderately effective in providing increased protection of human health by preventing contact with COCs.
Feasibility	1	This alternative is the most complicated of the CAAs.
Cost	1	Solidification/stabilization of sludge with associated steps and ongoing maintenance costs for this alternative (estimated to be $446,356) are comparable to the other CAA (see Appendix C for details).
Score	5	

4.0 Recommended Alternatives

The three CAAs evaluated for CAU 151 were judged to meet all the requirements for the general corrective action standards. The selected alternatives meet all applicable state and federal regulations for closure of the sites and will minimize potential future exposure pathways to the contaminated media at CAU 151. Corrective action alternatives were evaluated for only those CASs with known COCs or septic tanks where potential source material exists in CAU 151.

Alternative 1, No Further Action, is the preferred corrective action for soils at CAS 02-05-01, UE-2ce Pond; Lagoons C, D, F, and G of CAS 12-03-01, Sewage Lagoons (6); CASs 12-04-01, 12-04-02, and 12-04-03, Septic Tank; and CAS 18-99-09, Sewer Line (Exposed). Selection of this CAA is consistent with past practices for CASs that do not contain COCs.

While no COCs were identified in soils at Lagoons B and E at CAS 12-03-01 and CAS 12-47-01 under the current use scenarios, to protect future workers from an exposure greater than that used to calculate the FALs, the following BMP will be recommended:

- Recording these areas as administrative use restriction areas, with no monitoring or physical barriers necessary.

No Further Action with application of BMPs is proposed for septic tank contents at CASs 12-04-01, System #4, 12-04-02, and 12-04-03. Septic tanks at these units do not contain potential source material. Best management practices to be recommended include:

- Removal and disposal of the liquid contents of the septic tanks.
- Removal and disposal of the remaining sludge in accordance with NAC 444.818 (NAC, 1999).
- Removal and disposal of the tank if utilities allow for tank removal (Section 3.3.1).
- Backfilling of all excavations with clean material.
- Grouting of all remaining open lines from tank connections.

No Further Action with application of a BMP is proposed at CAS 18-03-01, Sewage Lagoon. The BMP to be recommended is:

- Removal of the 6-in. asbestos cement pipe (ACP) from beneath the inlet walkway.

Alternative 2, Close in Place with Administrative Controls, is selected as the preferred corrective action for Lagoon A at CAS 12-03-01. Selection of this CAA is consistent with past practices for CASs that contain COCs where the removal of contaminated media is not feasible, the alternative is cost-effective, the selected alternative can be safely completed, and where limited future activity is expected. The specific activities recommended to meet the requirements of Close in Place with Administrative Controls are listed below.

To prevent any future contact with contaminants detected in the soils below Lagoon A at CAS 12-03-01, the following will be performed:

- Signs indicating a use restriction for any excavation within the area of Lagoon A will be placed to meet FFACO requirements.
- Annual inspection to ensure visibility and condition of the signs.
- Addition of this area to the FFACO Administrative Use Restriction database.

Alternative 3, Clean Closure, is the preferred CAA for CAS 12-04-01, System #1, septic tanks that contain potential source material (constituents at concentrations greater than FALs or RCRA toxicity characteristic limits). The specific activities recommended to meet the requirements of Clean Closure are listed below.

To prevent any future release of contaminants from the contents of the two septic tanks at System #1 of CAS 12-04-01, the following actions will be performed:

- Removal and disposal of the liquids from the two septic tanks as a BMP.
- Removal of the contaminated sludge from the septic tanks.
- Proper management and disposal of sludge based on hazardous constituent levels and disposal facility acceptance criteria.
- Excavation and removal of the septic tanks, and disposal in an appropriate facility.
- Backfilling of all excavations with clean material.
- Grouting of all remaining open lines from tank connections.

The preferred CAAs were evaluated on their technical merits focusing on performance, reliability, feasibility, and safety. The alternatives were judged to meet all requirements for the technical components evaluated. The alternatives meet all applicable state and federal regulations for closure of the sites and will minimize potential future exposure pathways to the contaminated media as an occasional use area at CAU 151. Implementation of corrective actions may potentially present risks to site workers. Therefore, appropriate health and safety procedures will be developed and implemented.

5.0 References

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Appendix A

Corrective Action Investigation Results for CAU 151

A.1.0 Introduction

This appendix presents CAI activities and analytical results for CAU 151. Corrective Action Unit 151 has sites located in Areas 2, 12, and 18 of the NTS (Figure 1-1) and is comprised of the eight CASs listed below:

- 02-05-01, UE-2ce Pond
- 12-03-01, Sewage Lagoons (6)
- 12-04-01, Septic Tanks
- 12-04-02, Septic Tanks
- 12-04-03, Septic Tank
- 12-47-01, Wastewater Pond
- 18-03-01, Sewage Lagoon
- 18-99-09, Sewer Line (Exposed)

The CASs within CAU 151 are primarily sanitary sewage collection and discharge systems. Corrective Action Site 02-05-01 is located in Area 2 and is a well-water collection pond used as a part of the Nash test.

Corrective Action Sites 12-03-01, 12-04-01, 12-04-02, and 12-04-03 are all located in the east-central portion of the Area 12 camp. Corrective Action Site 12-47-01 is located in the south-central portion of the Area 12 camp. Corrective Action Site 12-03-01 consists of seven former sanitary sewage lagoons and associated piping. Corrective Action Sites 12-04-01, 12-04-02, and 12-04-03 are abandoned septic tanks and associated piping, while CAS 12-47-01 is two former sanitary sumps and abandoned piping. All these features were part of the Area 12 Camp housing sanitary systems.

Corrective Action Sites 18-03-01 and 18-99-09 are located in the Area 17 Camp in Area 18. Corrective Action Site 18-03-01 consists of two sewage lagoons and associated collection system piping. The origin and terminus of CAS 18-99-09 were unknown at the start of the CAI; however, access and video surveying during this CAI confirmed that this line does, in fact, connect to the CAS 18-03-01 system.

This CAU was investigated because insufficient information exists to determine whether the associated CASs have been used to dispose of material considered to be hazardous or radioactive waste by current standards. The CAI was conducted in accordance with the CAIP for CAU 151: Septic Systems and Discharge Area (NNSA/NSO, 2004a) as developed under the FFACO (1996).

Additional information regarding the history of each site, planning, and the scope of the investigation is presented in the CAU 151 CAIP (NNSA/NSO, 2004a).

A.1.1 Project Objectives

The primary objective of the investigation was to provide sufficient information and data to develop appropriate corrective action alternatives for each CAS in CAU 151. This objective was achieved by identifying the presence or absence of COCs, the nature of the COCs, and the vertical and lateral extent of the COCs, if present.

The selection of soil and/or waste characterization sample locations was based on site conditions, and the strategy developed during the DQO process as presented in Appendix A of the CAU 151 CAIP (NNSA/NSO, 2004a). The sampling strategy involved biased (nonprobabilistic) sample locations at all CASs.

A.1.2 Contents

This appendix contains information and data in sufficient detail to support the selection of preferred corrective action alternatives in the CADD. This appendix includes the following sections:

- Section A.1.0 describes the investigation background, objectives, and content.
- Section A.2.0 provides an investigation overview.
- Sections A.3.0 through A.7.0 provide CAS-specific information regarding field activities, sampling methods, and laboratory analytical results from investigation sampling.
- Section A.8.0 summarizes waste management activities.
- Section A.9.0 discusses the quality assurance (QA) and quality control (QC) procedures followed, and results of the QA/QC activities.
- Section A.10.0 is a summary of the investigation results.
- Section A.11.0 lists the cited references.

The complete field documentation and laboratory data including field activity daily logs (FADLs), sample collection logs (SCLs), analysis request/chain-of-custody forms, soil sample descriptions, laboratory certificates of analyses, analytical results, and surveillance results are retained in project files as hard copy files or electronic media.

A.2.0 Investigation Overview

Initial field investigation and sampling activities for the CAU 151 CAI were conducted from September 12 to November 18, 2005. Additional Decision I sampling was conducted on December 9, 2005, to collect sludge samples from the septic tanks at CASs 12-04-01, 12-04-02, and 12-04-03 for TCLP analyses; and on January 10, 2006, at CAS 12-47-01 to constrain SVOC contamination detected at one location. Decision II sampling was performed on February 13, 2006, at CAS 12-03-01 to constrain the vertical extent of arsenic contamination in Lagoon A. Table A.2-1 lists the CAI activities that were conducted at each of the CASs.

The investigation and sampling program was managed in accordance with the requirements set forth in the CAU 151 CAIP (NNSA/NSO, 2004a), the Industrial Sites Field Work Permit for CAU 151 (SNJV, 2005), the approved *Industrial Sites Project Health and Safety Plan* (SNJV, 2004), and the DOE Integrated Safety Management System. Samples were collected and documented following approved protocols and procedures indicated in the CAU 151 CAIP. Quality control samples (e.g., field blanks, equipment rinsate blanks, trip blanks, and duplicate samples) were collected as required by the Industrial Sites QAPP (NNSA/NV, 2002) and the CAU 151 CAIP (NNSA/NSO, 2004a). During field activities, waste minimization practices were followed according to approved procedures, including segregation of waste by waste stream.

Weather conditions at the sites varied to include sunshine with cool (mid-50s) to warm (upper 90s) temperatures, rain, cloudiness, and calm to strong (>15 mph) winds. Delays were caused by rain resulting in wet soils, which prevented accurate radiological scanning of samples.

The CASs were investigated by conducting visual surveys of surface sites, sewer lines, and components exposed during excavation; and by sampling of septic tank contents, surface soils at lagoons, and subsurface soils. Surface soil samples were collected using a hand auger. Subsurface soil samples were collected either by hand augering, hand sampling directly from a trench face, or hand sampling from a backhoe bucket when sample depths were greater than 4 ft bgs. Investigation intervals and soil samples were field screened to guide in the selection of samples shipped to an off-site laboratory. The field-screening readings were also used to guide health and safety controls.

Table A.2-1
Corrective Action Investigation Activities Conducted at Each Corrective Action Site To Meet Corrective Action Investigation Plan Requirements for CAU 151

Corrective Action Investigation Activities	Corrective Action Site				
	02-05-01	12-03-01	12-04-01, 12-04-02, 12-04-03	12-47-01	18-03-01
Inspected and verified the CAS components identified in the Corrective Action Investigation Plan.	X	X	X	X	X
Performed site walkovers to identify biased sampling locations.	X	X	X	X	X
Conducted video surveys using a video-mole survey instrument on the septic system features and the associated piping to identify any residual material, breaches, or unknown tie-ins.	N/A	N/A	X	X	X
Collected biased soil samples.	X	X	X	X	X
Collected liquid and sludge samples from septic system features for waste characterization to support disposal recommendations and determine whether the waste could be a potential source of contamination to the environment (i.e., soil).	N/A	N/A	X	N/A	N/A
Field screened samples for total alpha and beta/gamma radiation using a handheld survey instrument.	X	X	X	X	X
Screened septic system samples for gamma radiation for shipping purposes using a high-purity germanium gamma spectrometer (Building 23-153, Mercury, NV).	N/A	N/A	X	N/A	N/A
Field screened soil samples for volatile organic compounds using the headspace method and a flame-ionization detector or photoionization detector.	X	X	X	X	X
Performed swipe sampling for removable radioactivity using a handheld survey instrument and/or a gamma scintillator (Building 23-153, Mercury, NV).	X	X	X	X	X
Conducted analysis for total fecal coliform bacteria for the protection of workers and off-site laboratory personnel.	N/A	N/A	X	N/A	N/A
Submitted select samples for off-site laboratory analysis.	X	X	X	X	X
Collected GPS coordinates for sample locations and points of interest.	X	X	X	X	X

N/A = Not applicable

Except as noted in the following CAS-specific sections, CAU 151 sampling locations were accessible, and sampling activities at planned locations were not restricted. Decision II step-out sample locations were accessible and remained within anticipated spatial boundaries.

Sections A.2.1 through A.2.4 summarize the investigation methodology, laboratory analytical information, and physical site characteristics. Additional activity-specific details for the individual CASs are presented in Sections A.3.0 through A.7.0.

A.2.1 Sample Locations

Investigation locations selected for sampling were selected based on interpretation of existing engineering drawings, interviews with former and current site employees, and site-specific biasing factors as provided in the CAU 151 CAIP. The planned sample locations are discussed in text and represented on figures in the CAIP. Actual sample locations are shown on the figures included in Sections A.3.0 through A.7.0. Some locations were modified slightly from planned positions due to field conditions and observations. In some cases, FSRs and/or laboratory analytical results determined the need to collect samples at additional sampling locations. Sample locations were staked, labeled appropriately, and surveyed with a Trimble Pathfinder ProXRS global positioning system (GPS) instrument. Sample locations and additional points of interest associated with each CAS have been plotted based on the coordinates collected by the GPS instrument and are provided in Appendix E.

A.2.2 Investigation Activities

The investigation activities performed at CAU 151 are listed in Table A.2-1. The investigation strategy allowed the nature and extent of contamination associated with each CAS to be established. The following sections summarize specific investigation activities that took place at CAU 151.

A.2.2.1 Radiological Surveys

Radiological surveys (i.e., scanning, static, and swipe collection) were performed at all the CASs during the CAI. Radiological surveys were performed to identify the presence and extent of radiological activities statistically greater than background. To conduct radiological static surveys to detect total alpha and beta/gamma radiation, a handheld instrument was held within an inch over the sample for one minute. To support unrestricted release determinations per the *Nevada/Yucca Mountain Project (NV/YMP) Radiological Control Manual* (NNSA/NV, 2004b), radiological surveys were performed at each CAS using a NE Technology Electra or E-600 meter fitted with a DP-6 dual-alpha and beta/gamma radiation scintillation probe. Swipe samples were also collected for identification of removable contamination. Screening of personnel, personal protective equipment (PPE), and equipment at all CASs revealed no removable radiological contamination. Swipes taken from the surfaces of sample containers and equipment likewise revealed no removable radiological contamination.

A.2.2.2 Site Walkovers

Site walkovers were performed at all CASs within CAU 151. This was accomplished by walking accessible areas in and near all CASs, as well as the areas identified in engineering drawings that connected some of the CASs. Observations were made to visually inspect and identify biased sampling locations (e.g., stained soil, depositional low points, unidentified or out-of-place objects). Results are discussed in the CAS-specific locations.

A.2.2.3 Field Screening

Field-screening activities for VOCs, and total alpha and beta/gamma radiation, were performed as specified in the CAU 151 CAIP. The FSL for VOC headspace was established at 20 parts per million (ppm) or 2.5 times background, whichever was greater. Site-specific FSLs for alpha and beta/gamma radiation were defined as the mean background activity level plus two times the standard deviation of the mean background activity from material collected at 10 randomly selected undisturbed locations near each CAS. The radiation FSLs are instrument-specific and were established daily for each instrument and CAS before sampling.

Field screening for VOCs was conducted using an FID during activities at each CAS. A photoionization detector (PID) was used for three days due to the unavailability of an FID. Total alpha and beta/gamma radiation were performed on all samples as specified in the CAU 151 CAIP (NNSA/NSO, 2004a). Alpha and beta/gamma radiation screening of soil samples was performed at each CAS using an NE Technologies Electra or E-600 meter fitted with a DP6 dual alpha-beta/ gamma radiation scintillation probe before material was placed in sample jars. Liquid and sludge samples were screened using a Canberra gamma spectrometry counter at the end of a collection day and before sample shipment.

Total fecal coliform bacteria analysis was conducted on samples of liquid and sludge collected from the tanks and sumps for the protection of workers and off-site laboratory personnel.

The CAS-specific sections of this document identify the CASs where field screening was conducted and how the FSLs were used to aid in the selection of sample locations. Field-screening results are recorded on SCLs that are retained in project files.

A.2.2.4 Pipe, Tank, and System Component Inspection

The pipe, tank, and system component inspection of surface features (manholes, access hatches, and tie-ins) and subsurface features (manhole and septic tank inlet and outlet pipes, possible breach areas in piping) for those CASs with septic tanks and/or piping systems was conducted using a video surveyor, or by exposing the component and performing a visual inspection (e.g., excavation). Notes in the FADL and field maps provide documentation of the integrity of the individual components. The following subsections provide details of investigation techniques that were used to verify the integrity of the pipe, tank, and system components.

A.2.2.4.1 Video Survey

Video surveys were conducted using a camera and cable video-mole survey instrument for the visual inspection of a system’s component integrity and to identify residual material, breaches, or unknown tie-ins. The video mole was introduced into the pipe system through easily accessible points (e.g., cleanouts, surface drains) or a field opening made after exposure of the line through excavation. Soil samples were collected beneath breached piping identified during the video-mole survey to verify the absence of contamination potentially released through the breach. Residual material identified in the piping by the video-mole surveys were sampled if adequate volume was present. Sections of piping that were breached to gain access for the video mole and/or to collect samples were grouted. Distances between access points were measured and recorded on field maps and in the FADLs. Some lines were filled with soil, and the blockages were recorded on the respective field maps. The video system was decontaminated using standard techniques and equipment between different lines and between CASs.

Video-mole surveys were conducted at all CASs with the exception of 02-05-01 and 12-03-01. These two CASs did not contain any piping. Additional detail is presented in Sections 5.0 through 7.0.

A.2.2.4.2 Manhole, Cleanout, and Distribution Box Survey/Inspection

Access points (manholes, cleanouts) were inspected and used for video mole access before excavating. Removing the covers to see the interior walls, using the video survey, or following excavation of the feature allowed for visual inspection of the inlets, outlets, sidewalls, and bottoms of these features. All but one manhole were verified visually as being intact. Samples were collected from below the bottom of one manhole at CAS 18-03-01 after it had been excavated and exposed. This was done because the manhole had been backfilled and the interior could not be visually inspected. Visual inspection of the exposed portions showed that the manhole appeared in good condition.

Before excavation, if the potential for overflow was observed at the feature, the CAIP required that surface samples be collected if biasing features were noted. None of these features showed evidence of having overflowed at any of the CASs within this CAU.

A.2.2.4.3 Septic Tank Inspection

Each of the CASs 12-04-01, 12-04-02, and 12-04-03 has at least three septic tanks. The tank configurations are similar for each site; tanks were placed adjacent to one another approximately 18 in. apart. Previous geophysical and utility investigations were inconclusive as to whether or not there were three or four tanks present at CAS 12-04-03. Intrusive activities were necessary to expose the access hatches to each of the tanks. During this activity, a fourth tank was located.

If the septic tanks had fluid levels that approached the inlet or outlet piping for the tank, only hand excavation was allowed and no pipe intrusion was performed. Two steps were used to inspect and sample septic tanks:

1. A visual inspection of the interior of the tank above the fluid level was performed to note items such as chambers present, and to provide access for measurement of the phases, estimation of the amount of contents, condition of the interior of the tank, and condition of the contents.

2. Integrity of the tanks was evaluated by excavating to the base of each tank and verifying that there had not been a release from the tanks. Visual observations were recorded in the FADL and on the SCLs.

A.2.2.4.4 Lagoons/Sumps/Ponds Inspection

Corrective Action Sites 02-05-01, 12-03-01, 12-47-01, and 18-03-01 each have a lagoon or lagoon-like (i.e., sump) component. Decision I activities at these CASs consisted of locating the inflow and outflow pipes or discharge area within each lagoon for sample collection.

A.2.2.5 Soil Sample Collection

Samples were collected as outlined in the CAU 151 CAIP (NNSA/NSO, 2004a) and submitted to an off-site laboratory for laboratory analysis. The analytical parameters are specific to CAU 151 and were defined in the DQOs established in the CAIP.

Intrusive investigation activities (i.e., surface and shallow subsurface soil sampling) were conducted at all CASs within CAU 151 to support Decision I and Decision II investigation activities. Soil samples were collected using hand auger sampling (surface and shallow subsurface samples) or a backhoe bucket for sample depths greater than 4 ft bgs.

Labeled sample containers were filled according to the following sequence (depending on the analysis required). Total VOCs and TPH-GRO sample containers were filled directly at the sample location, followed by the collection of soil for VOC field screening using headspace analysis. Additional soil was transferred into a new aluminum foil pan, homogenized, and field screened for alpha and beta/gamma radiation. All remaining sample containers (total SVOCs, total pesticides, PCBs, TPH-DRO, total RCRA metals, beryllium, strontium (Sr)-90, tritium, isotopic uranium, isotopic plutonium, and gamma spectrometry) were then filled. Excess soil was returned to the sampling location. Backhoe excavations were backfilled and rough graded to match the surrounding ground contours. Augered holes were backfilled so that no void spaces remained.

Sampling depths were recorded in ft bgs using the ground surface as the datum. A brief geologic description of the sample and any biasing or distinguishable (e.g., compaction, foreign material, debris) features were also recorded. Justification for any deviation from the prescribed sampling interval was thoroughly documented in the FADL. A detailed discussion for how the sampling met DQOs is provided in Appendix B.

Surface soil samples were collected from 0.0 to 0.75 ft bgs at field-determined locations based on biasing factors (e.g., stained soil, settling areas collecting runoff) and field conditions (site geography). Shallow subsurface soil samples were collected as a continuation at surface soil sample locations. Shallow subsurface soil samples were generally collected from a depth of 2.5 ft below the surface soil sample, or at the depth of refusal. Subsurface samples (greater than 4 ft bgs) below the septic tanks and lagoon bottoms were collected by hand from a backhoe bucket.

Decision I samples of lagoon sediments and soil at the historical native soil interface at the proximal, midpoint, and distal ends of each lagoon, or open trench area in the case of CAS 02-03-01. Subsequent samples, based on FSLs and FSRs, were not necessary at any of the Decision I locations of the CASs in CAU 151, as all field readings were less than FSLs.

For sites within CASs 12-03-01 and 12-47-01, some of the lagoons/sumps have been filled in; therefore, sample locations were first excavated to the native soil interface and collected. By trenching at prospective sampling locations within the lagoons the varying soil interfaces (e.g., fill, clay, and native soil) were often apparent.

Environmental soil samples at CASs 12-04-01, 12-04-02, and 12-04-03 were collected from below the inlet and outlet of each septic tank. Due to the close spacing of the tanks, a set of samples collected at a depth equivalent to the base of each tank and positioned between the tanks at their ends, served as the integrity samples for a cluster of given tanks (normally pairs).

Septic tank samples were collected of the individual phases of contents. Liquid samples were collected first to avoid mixing, followed by sludge sampling. All septic tank samples were field screened for fecal coliform. Results of the fecal coliform screenings were all negative and are maintained in the project records.

A.2.2.6 Waste Characterization Sampling

Characterization of CAS-specific components, objects, materials, and investigation derived waste (IDW) generated during the CAI was characterized to support recommendations for disposal of these items during anticipated closure activities and to determine whether the waste in question at these CASs could be acting as a source of potential soil contamination. Investigation methods included direct sampling of septic tank contents and decontamination rinsate. Waste characterization activities were performed to gather adequate information and data to support decisions regarding the disposal options and disposal pathways for septic tank contents and generated IDW.

A.2.3 Laboratory Analytical Information

Paragon Analytics, Inc., of Fort Collins, Colorado, performed the chemical and radiological analyses. The analytical suites and laboratory analytical methods used to analyze investigation samples are listed in Table A.2-2. Organic, inorganic, and radionuclide analytical results are reported in this appendix if they are detected at or above minimum detectable concentrations (MDCs). The complete laboratory data packages are available in the project files.

Validated analytical data for CAU 151 investigation samples have been compiled and evaluated to confirm the presence or absence of contaminants, if present. The analytical results for each CAS or group of CASs are presented in Sections A.3.0 through A.7.0. The analytical results have been compared to MDCs, as appropriate, and only those above MDCs are included in the CAS-specific tables.

A.2.4 Comparison to Action Levels

A COC is defined as any contaminant exceeding a FAL. A COC may also be defined as a contaminant that, in combination with other like contaminants, is determined to jointly pose an unacceptable risk based on a multiple constituent analysis (DOE, 2006). Multiple constituent analyses are presented in Appendix D.

If COCs are present, corrective action must be considered for the CAS. The FALs for the CAU 151 investigation are defined for each CAS in Section 3.1. Results that are equal to or greater than FALs are identified by bold text in the CAS-specific results tables (Sections A.3.0 through A.7.0).

The evaluation of the need for corrective action will include the potential for wastes that are present at a site to cause the future contamination of site environmental media if the wastes were to be released.

Table A.2-2
Laboratory Analytical Parameters and Methods, CAU 151 Investigation Samples[a]

Analytical Parameter	Analytical Method
Organic and Inorganic	
Total volatile organic compounds	Water and Soil - SW-846 8260B[b]
Total semivolatile organic compounds	Water and Soil - SW-846 8270C[b]
Total petroleum hydrocarbons (gasoline-range organics)	Water and Soil - SW-846 8015B (modified)[b]
Total petroleum hydrocarbons (diesel-range organics)	
Polychlorinated biphenyls	Water and Soil - SW-846 8082[b]
Total pesticides	Water and Soil - SW-846 8081A
Total RCRA metals[c] plus beryllium	Water - SW-846 6010B[b] Soil - SW-846 6010B[b]
Mercury	Water - SW-846 7470A[b] Soil - SW-846 7471A[b]
Waste Management	
TCLP volatile organic compounds	SW-846 1311[b] and 8260B[b]
TCLP semivolatile organic compounds	SW-846 1311[b] and 8270C[b]
TCLP RCRA metals[c]	SW-846 1311[b], 6010B[b], and 7470A[b]
Radionuclides	
Gamma spectroscopy	Water and Soil - PAI 713R8[d] and 739R8[d]
Isotopic uranium	Water and Soil - PAI 714R8[e], 721R10[e], 773R8[e], 778R8[e], and 776R8[e]
Isotopic plutonium	Water and Soil - PAI 714R8[f], 721R10[f], 773R8[f], 778R8[f], and 776R8[f]
Strontium-90	Water and Solid - PAI 724R8[g] and 707R7[g]
Tritium	Water - PAI 704R[h] and 700R[h]

[a]Investigation samples include both environmental and waste characterization samples and associated quality control samples.
[b]*Test Methods for Evaluating Solid Waste*, *Physical/Chemical Methods*, 3rd Edition, Parts 1-4, SW-846 CD ROM (EPA, 1996).
[c]Arsenic, barium, cadmium, chromium, lead, selenium, and silver.
[d]PAI SOPs (PAI, 1999-2003) are a variant of and incorporate all the intentions of EPA Procedure 901.1 and DOE/EML Procedure 4.5.2.3.
[e]PAI SOPs (PAI, 1999-2003) are principally similar to the DOE/EML Procedure U-02.
[f]PAI SOPs (PAI, 1999-2003) are principally similar to the DOE/EML Procedures Pu-02 for soil and Pu-10 for water.
[g]PAI SOPs (PAI, 1999-2003) are principally similar to the DOE/EML Procedure Sr-02 for soil and similar to EPA Procedure 905.0 for water.
[h]PAI SOPs (PAI, 1999-2003) are similar to EPA Procedure 906.0.

EML = Environmental Measurements Laboratory
EPA = U.S. Environmental Protection Agency
PAI = Paragon Analytics, Inc.
Pu = Plutonium
RCRA = *Resource Conservation and Recovery Act*
SOP = Standard operating procedure
Sr = Strontium
TCLP = Toxicity Characteristic Leaching Procedure
U = Uranium

To evaluate the potential for septic tank contents to result in the introduction of a COC to the surrounding environmental media, the following conservative assumptions were made:

- That the tank containment would fail at some point and the contents would be released to the surrounding media.
- That the resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in the tank waste.
- That any liquid contaminant in the septic tanks exceeding the RCRA toxicity characteristic concentration can result in introduction of a COC to the surrounding media.

Sludge containing a contaminant exceeding an equivalent FAL concentration would be considered to be potential source material and would require a corrective action. Septic tank liquids with contaminant concentrations exceeding an equivalent toxicity characteristic action level would be considered to be potential source material and would require a corrective action.

A.3.0 Corrective Action Site 02-05-01, UE-2ce Pond

Corrective Action Site 02-05-01, UE-2ce Pond, is located in Area 2, south of the Nash test crater. This CAS consists of an excavated pond, surrounding bermed area, and a surface trench running between the pond and the UE-2ce Water Well. There is also a gravel outwash mound running down the center of the pond. In addition to the mound, there is miscellaneous debris including cables, scrap metal, and wood scattered on the bottom and around the pond.

The conceptual site model (CSM) as developed in the CAU 151 CAIP (NNSA/NSO, 2004a) demonstrates the most probable scenario for current conditions, pathways, and features at this CAS. Conceptual site model pathways include discharges to the surface trench, bermed pond area, and potentially arroyos and washouts if the pond overflowed. The release mechanism for this CAS was discharge of well water potentially containing COCs into the pond. The designed releases are the primary concern for the CAS.

A.3.1 Corrective Action Investigation

A total of six environmental soil characterization samples (including one field duplicate [FD] and one matrix spike/matrix spike duplicate [MS/MSD]) were collected during investigation activities. The sample locations are shown on Figure A.3-1. The sample identification numbers, locations, depth, types, and analyses are listed in Table A.3-1. The specific CAI activities conducted to satisfy the CAIP requirements are described in the following sections.

A.3.1.1 Field Screening

Decision I soil samples (151A001 through 151A006) were field screened for VOCs and alpha and beta/gamma radiation as specified in the CAU 151 CAIP. The FSRs were compared to FSLs to guide subsequent sampling decisions where appropriate.

Alpha and beta/gamma radiation FSLs were not exceeded during sampling activities. Volatile organic compound headspace FSLs were also not exceeded.

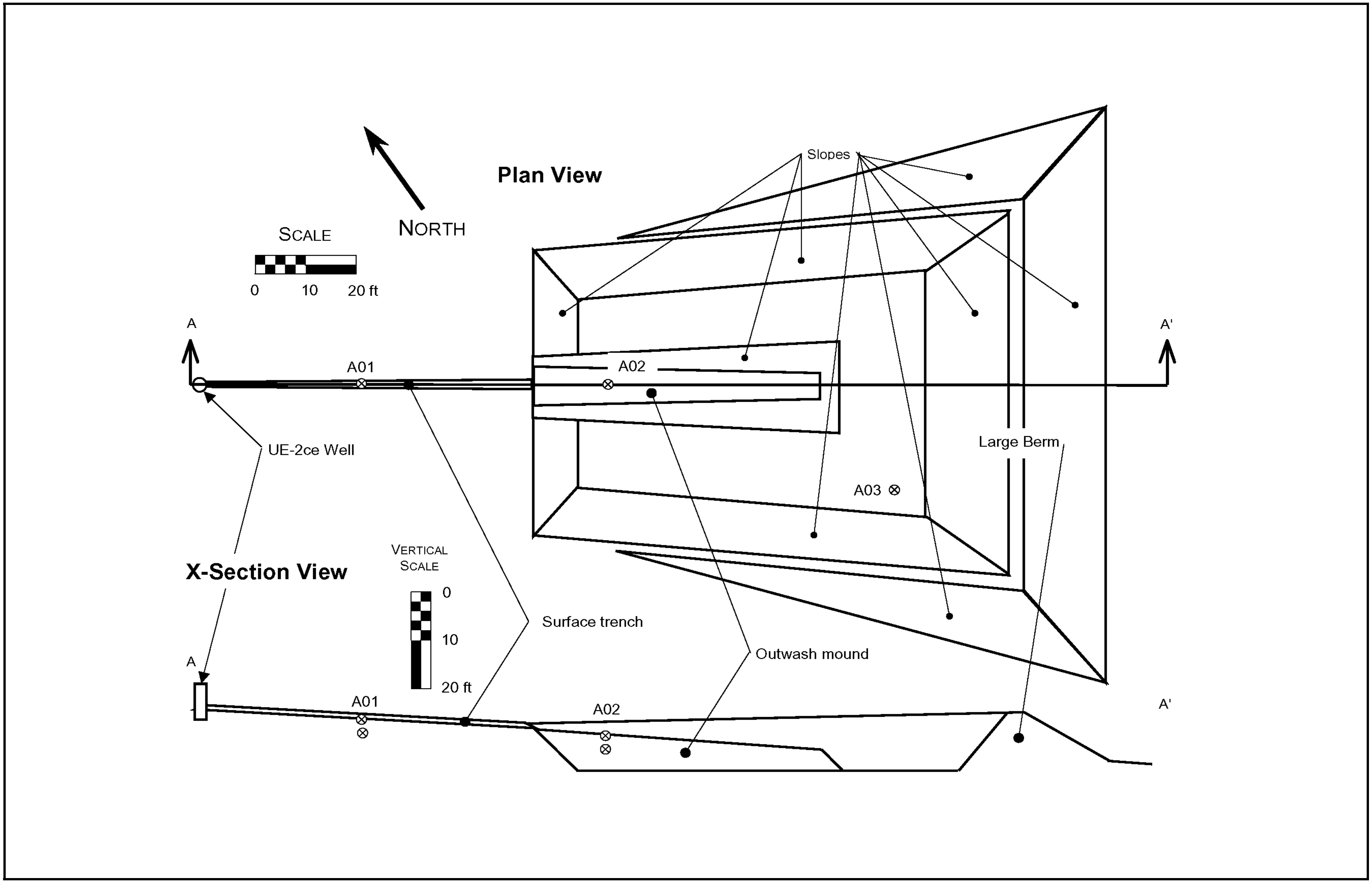

Figure A.3-1
Soil Sampling Locations at CAS 02-05-01

Table A.3-1
Soil Samples Collected at CAS 02-05-01, UE-2ce Pond

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
A01	151A001	0.0 – 0.5	Soil	Environmental, MS/MSD	Set 1
	151A002	2.0 – 2.25	Soil	Environmental	Set 1
A02	151A003	0.0 – 0.75	Soil	Environmental	Set 1
	151A004	2.25 – 2.5	Soil	Environmental	Set 1
A03	151A005	0.0 – 0.5	Soil	Environmental	Set 1
	151A006	0.0 – 0.5	Soil	Field Duplicate of #151A005	Set 1
N/A	151A301	N/A	Water	Trip Blank	Total VOCs
N/A	151A302	N/A	Water	Field Blank	Set 1

Set 1 = Total VOCs, Total SVOCs, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90, Tritium

ft bgs = Feet below ground surface
MS/MSD = Matrix spike/matrix spike duplicate
N/A = Not applicable

A.3.1.2 Sample Collection

Intrusive investigation activities (i.e., surface and shallow subsurface soil sampling) were conducted to support investigation activities. Soil samples were collected using hand auger sampling equipment.

Table A.3-1 lists the samples and sample-specific analytical suite. The analytical parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2.

Decision I sampling activities included the collection of environmental soil samples from three locations: A01 through A03 (Figure A.3-1). These locations represented areas of known water release. Samples were collected as outlined in the CAU 151 CAIP (NNSA/NSO, 2004a) and submitted to an off-site laboratory for laboratory analysis.

A.3.1.3 Deviations

There were no deviations to the CAIP requirements at this CAS.

A.3.2 Investigation Results

The following sections provide analytical results from the samples collected to complete investigation activities as outlined in the CAIP. Investigation samples were analyzed for the CAIP-specified COPCs, which included VOCs, SVOCs, PCBs, RCRA metals and beryllium, gamma-emitting radionuclides, tritium, isotopic uranium, isotopic plutonium, and Sr-90. An unedited set of all analytical data is retained in electronic format in the project files.

Analytical results from the soil samples with concentrations exceeding MDCs are summarized in the following sections. An evaluation was conducted on all contaminants detected above MDCs by comparing individual concentration or activity results against the FALs. Establishment of the FALs is presented in Appendix D. The FALs were established as the corresponding PAL concentrations or activities if the contaminant concentrations were below their respective PALs.

A.3.2.1 Volatile Organic Compounds

Analytical results for VOCs were all below MDCs; therefore, results are not presented in this appendix.

A.3.2.2 Semivolatile Organic Compounds

Analytical results for SVOCs detected above MDCs are presented in Table A.3-2. No SVOCs were detected at concentrations exceeding the respective PALs at this CAS.

A.3.2.3 Polychlorinated Biphenyls

Analytical results for PCBs detected above MDCs are presented in Table A.3-3. No PCBs were detected at concentrations exceeding the respective PALs at this CAS.

A.3.2.4 RCRA Metals and Beryllium

Analytical results for RCRA metal and beryllium detected above MDCs are presented in Table A.3-4. No metals were detected at concentrations exceeding the respective PALs at this CAS.

Table A.3-2
Sample Results for SVOCs Detected Above
Minimum Detectable Concentrations at CAS 02-05-01, UE-2ce Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)	
			Bis(2-Ethylhexyl)Phthalate	Di-N-Butyl Phthalate
Final Action Levels[a]			120,000	62,000,000
A01	151A001	0.0 - 0.5	32 (J)	28 (J)
	151A002	2.0 - 2.25	--	24 (J)
A03	151A005	0.0 - 0.5	--	25 (J)
	151A006	0.0 - 0.5	--	27 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

Table A.3-3
Sample Results for PCBs Detected Above
Minimum Detectable Concentrations at CAS 02-05-01, UE-2ce Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)
			Aroclor 1254
Final Action Levels[a]			740
A01	151A001	0.0 - 0.5	38

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram

A.3.2.5 Gamma-Emitting Radionuclides

Gamma-emitting radionuclide analytical results for soil samples detected above MDCs are presented in Table A.3-5. No radionuclides were detected at concentrations exceeding the respective PALs at this CAS.

Table A.3-4
Sample Results for Metals Detected Above
Minimum Detectable Concentrations at CAS 02-05-01, UE-2ce Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)					
			Arsenic	Barium	Beryllium	Chromium	Lead	Mercury
Final Action Levels			23[a]	67,000[b]	1,900[b]	450[b]	750[b]	310[b]
A01	151A001	0.0 - 0.5	8	170	0.76	16	260	0.18 (J)
	151A002	2.0 - 2.25	6.9	140	0.58	20	65	0.041 (J)
A02	151A003	0.0 - 0.75	2.5	27	--	1.4	79	--
	151A004	2.25 - 2.5	3.9	63	--	3.8	37	--
A03	151A005	0.0 - 0.5	3.2	130	0.59	51	130	--
	151A006	0.0 - 0.5	4.2	120	0.59	7.3	150	--

[a] Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b] Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum detectable concentrations.
J = Estimated value.

A.3.2.6 Isotopic Radionuclides

Isotopic radionuclide (plutonium [Pu]-238, Pu-239, Sr-90, uranium [U]-234, U-235, and U-238) analytical results for soil samples detected above MDCs are presented in Table A.3-6. No radionuclides were detected at concentrations exceeding the respective PALs at this CAS.

A.3.2.7 Tritium

Analytical results of tritium for soil samples detected above MDCs are presented in Table A.3-7. No tritium was detected at concentrations exceeding the PAL at this CAS.

A.3.3 Nature and Extent of Contamination

Based on the analytical results, it was determined that results from all locations were below FALs; therefore, no COCs were identified at this CAS.

Table A.3-5
Sample Results for Gamma-Emitting Radionuclides Detected
Above Minimum Detectable Concentrations at CAS 02-05-01, UE-2ce Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)									
			Actinium-228		Bismuth-214		Lead-212		Lead-214		Thallium-208	
Final Action Levels[a]			5	15	5	15	5	15	5	15	5	15
Depth bgs (cm)			<15	>15	<15	>15	<15	>15	<15	>15	<15	>15
A01	151A001	0.0 - 0.5	0.93 (G, TI)	N/A	1.2 (G, J)	N/A	1.1 (J)	N/A	1.39 (G, J)	N/A	0.37 (G)	N/A
	151A002	2.0 - 2.25	N/A	0.88 (G)	N/A	0.76 (G, J)	N/A	1.16 (J)	N/A	1.2 (G, J)	N/A	0.279 (G)
A02	151A003	0.0 - 0.75	--	N/A	0.4 (J)	N/A	0.25	N/A	0.38 (J)	N/A	--	N/A
	151A004	2.25 - 2.5	N/A	0.83 (G, TI)	N/A	0.88 (G, J)	N/A	0.55 (J)	N/A	0.81 (G, J)	N/A	0.222 (G)
A03	151A005	0.0 - 0.5	1.14 (G)	N/A	1.08 (G, J)	N/A	1.8 (J)	N/A	1.3 (G, J)	N/A	0.54 (G)	N/A
	151A006	0.0 - 0.5	1.39 (G)	N/A	1.3 (G, J)	N/A	1.69 (J)	N/A	1.43 (G, J)	N/A	0.51 (G)	N/A

[a] Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, as found in Chapter IV of DOE Order 5400.5, Change 2, “Radiation Protection of the Public and Environment” (DOE, 1993). The FALs for these isotopes are specified as 5 pCi/g averaged over the first 15 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 in.); therefore, 5 pCi/g represents the FALs for these radionuclides in the surface soil (0 to 0.5 ft bgs).

cm = Centimeter
ft bgs = Feet below ground surface
N/A = Not applicable
pCi/g = Picocuries per gram
-- = Not detected above minimum detectable concentrations.
> = Greater than
< = Less than
G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.
TI = Nuclide identification is tentative.

A.3.4 Revised Conceptual Site Model

The results of the CAI at CAS 02-05-01 did not contradict the CSM. No revision of the CSM was necessary.

Table A.3-6
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 02-05-01, UE-2ce Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)	
			Uranium-234	Uranium-238
Final Action Levels[a]			143	105
A01	151A001	0.0 - 0.5	0.86 (M3)	0.75
	151A002	2.0 - 2.25	0.88	0.87
A02	151A003	0.0 - 0.75	0.286	0.42
	151A004	2.25 - 2.5	0.78	0.71
A03	151A005	0.0 - 0.5	0.85	0.83
	151A006	0.0 - 0.5	0.9	0.84

[a]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
M3 = The requested minimum detectable concentration was not met, but the reported activity is greater than the reported minimum detectable concentration.

Table A.3-7
Sample Results for Tritium Detected Above Minimum Detectable Concentrations at CAS 02-05-01, UE-2ce Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/mL)
			Tritium
Final Action Levels[a]			400,000
A01	151A001	0.0 - 0.5	2.35
	151A002	2.0 - 2.25	10.1
A02	151A003	0.0 - 0.75	8.6 (M3)
	151A004	2.25 - 2.5	59.2
A03	151A005	0.0 - 0.5	55.6
	151A006	0.0 - 0.5	59.1

[a] Based on the UGTA Project limit of 400,000 pCi/L for discharge of water containing tritium to an infiltration basin/area (NNSA/NV, 2002b).

ft bgs = Feet below ground surface
pCi/mL = Picocuries per milliliter
M3 = The requested minimum detectable concentration was not met, but the reported activity is greater than the reported minimum detectable concentration.

A.4.0 Corrective Action Site 12-03-01, Sewage Lagoons (6)

Corrective Action Site 12-03-01, Sewage Lagoons (6), is located in the northeast of the Area 12 camp. This CAS consists of seven lagoons that were constructed in the late 1960s and early 1980s. For this CAS, the features have been identified as Lagoons A through G. These lagoons are associated with the septic systems from the Area 12 Camp (CASs 12-04-01, 12-04-02, and 12-04-03). Lagoons A through D and F received effluent from the septic systems and buildings in the Area 12 Camp up until the closing of the septic tanks in the early 1980s. After that time, the septic tanks were bypassed, and all effluent went to Lagoon E and overflowed to Lagoon G. In the early 1990s, these ponds were abandoned and two new sewage lagoons to the east of Area 12 went into use.

The CSM as developed in the CAU 151 CAIP (NNSA/NSO, 2004a) demonstrates the most probable scenario for current conditions, pathways, and features at this CAS. Conceptual site model pathways include discharges to the unlined pond areas and potentially arroyos and washouts if the ponds overflowed. Release mechanisms for this CAS were sanitary effluent and possible industrial discharge into a sanitary collection system (e.g., lagoon, sump, or pond).

A.4.1 Corrective Action Investigation

A total of 50 environmental soil characterization samples (including three FDs and three MS/MSDs) were collected during investigation activities at CAS 12-03-01. Three additional samples not required by the CAIP were collected during Decision I activities from Lagoon E at the discretion of the Task Manager. Two additional Decision II samples were collected at Location B09 in Lagoon A. The sample locations are shown on Figure A.4-1. The sample identification numbers, locations, depth, types, and analyses are listed in Table A.4-1. The specific CAI activities conducted to satisfy the CAIP requirements are described in the following sections.

A.4.1.1 Visual Inspections

Engineering drawings indicated three features associated with the effluent distribution system were present at CAS 12-03-01. These features consisted of two valve boxes and a manhole. Excavation revealed that the valve boxes had been broken up when Lagoons A through D were backfilled. The manhole was accessed and inspected. The bottom of the manhole clearly showed where the line to

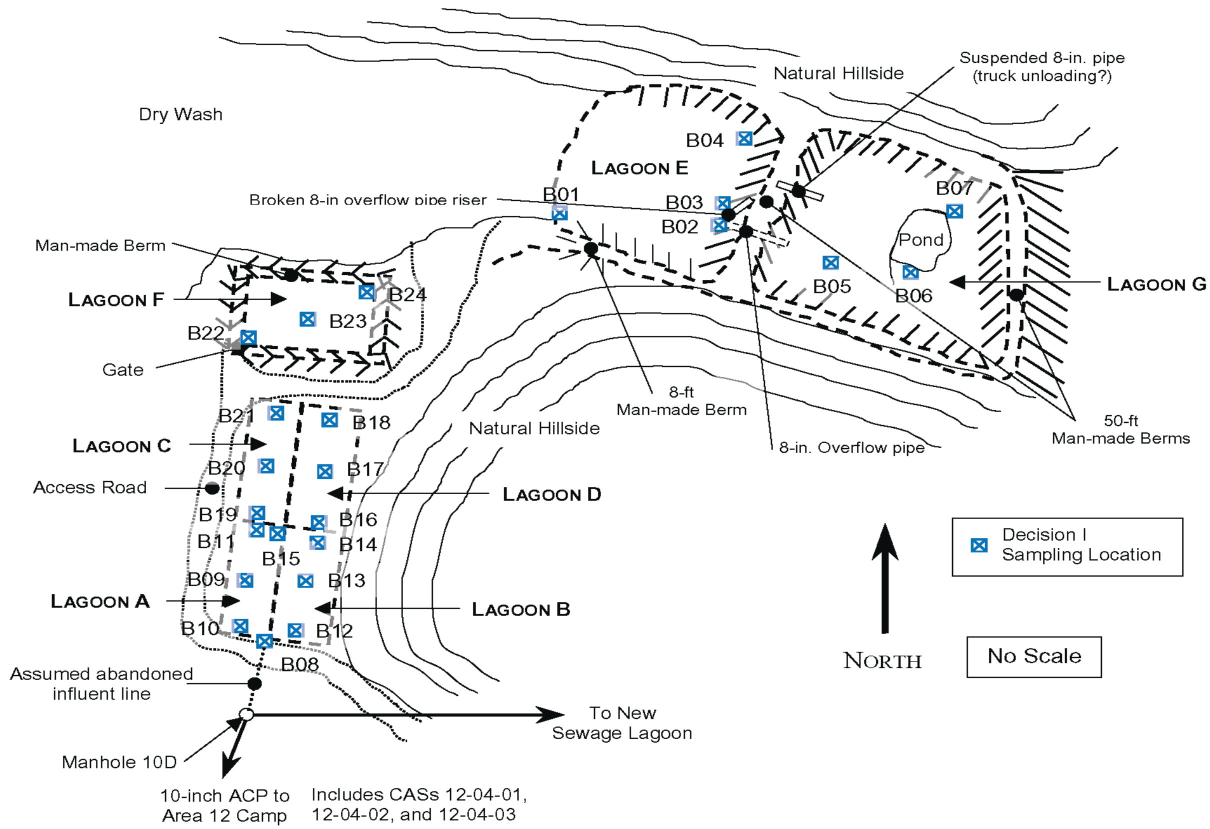

Figure A.4-1
Soil Sampling Locations at CAS 12-03-01

Table A.4-1
Soil Samples Collected at CAS 12-03-01, Sewage Lagoons (6)
(Page 1 of 2)

Lagoon	Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
Lagoon E	B01	151B001	0.0 – 0.5	Soil	Environmental	Set 1
		151B002	2.0 – 2.5	Soil	Environmental	Set 1
	B02	151B003	0.0 – 0.5	Soil	Environmental	Set 1
		151B004	2.0 – 2.5	Soil	Environmental	Set 1
	B03	151B005	0.0 – 0.5	Soil	Environmental	Set 1
		151B006	2.0 – 2.5	Soil	Environmental	Set 1
	B02A	151B051	0.0 – 1.0	Soil	Environmental	Set 2
	B02B	151B052	0.0 – 1.0	Soil	Environmental	Set 2
	B02C	151B053	0.0 – 1.0	Soil	Environmental	Set 2
	B04	151B007	0.0 – 0.5	Soil	Environmental	Set 1
		151B008	2.0 – 2.5	Soil	Environmental	Set 1
Lagoon G	B05	151B009	0.0 – 0.5	Soil	Environmental	Set 1
		151B010	1.0 – 1.5	Soil	Environmental	Set 1
	B06	151B011	0.0 – 0.5	Soil	Environmental, MS/MSD	Set 1
		151B012	2.0 – 2.5	Soil	Environmental	Set 1
		151B013	2.0 – 2.5	Soil	Field Duplicate of #151B012	Set 1
	B07	151B014	0.0 – 0.5	Soil	Environmental	Set 1
		151B015	1.5 – 2.0	Soil	Environmental	Set 1
Distribution Box	B08	151B016	5.5 – 6.0	Soil	Environmental	Set 1
Lagoon A	B09	151B017	1.25 – 1.5	Soil	Environmental	Set 1
		151B018	2.75 – 3.0	Soil	Environmental	Set 1
		151B054	5.5 – 6.0	Soil	Environmental	Set 3
		151B055	8.5 – 9.0	Soil	Environmental	Set 3
	B10	151B019	0.75 – 1.0	Soil	Environmental	Set 1
		151B020	2.0 – 2.5	Soil	Environmental	Set 1
	B11	151B028	2.0 – 2.25	Soil	Environmental	Set 1
		151B029	3.5 – 4.0	Soil	Environmental	Set 1
Lagoon B	B12	151B021	1.0 – 1.5	Soil	Environmental	Set 1
		151B022	4.0 – 4.5	Soil	Environmental	Set 1
	B13	151B023	1.0 –1.5	Soil	Environmental	Set 1
		151B024	3.0 – 3.5	Soil	Environmental	Set 1
	B14	151B025	1.0 – 1.5	Soil	Environmental	Set 1
		151B026	3.0 – 3.5	Soil	Environmental	Set 1
		151B027	3.0 – 3.5	Soil	Field Duplicate of #151B026	Set 1
Distribution Box	B15	151B030	1.5 – 1.75	Soil	Environmental	Set 1
		151B031	3.25 – 3.5	Soil	Environmental	Set 1

Table A.4-1
Soil Samples Collected at CAS 12-03-01, Sewage Lagoons (6)
(Page 2 of 2)

Lagoon	Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
Lagoon C	B16	151B032	1.75 – 2.0	Soil	Environmental	Set 1
		151B033	3.5 – 4.0	Soil	Environmental	Set 1
	B17	151B034	1.25 – 1.5	Soil	Environmental, MS/MSD	Set 1
		151B035	3.5 – 4.0	Soil	Environmental	Set 1
	B18	151B036	0.75 – 1.0	Soil	Environmental	Set 1
		151B037	3.5 – 4.0	Soil	Environmental	Set 1
Lagoon D	B19	151B042	1.25 – 1.5	Soil	Environmental	Set 1
		151B043	3.75 – 4.0	Soil	Environmental	Set 1
	B20	151B040	1.0 – 1.25	Soil	Environmental	Set 1
		151B041	2.75 – 3.0	Soil	Environmental	Set 1
	B21	151B038	0.75 – 1.0	Soil	Environmental	Set 1
		151B039	3.5 – 3.75	Soil	Environmental	Set 1
Lagoon F	B22	151B048	0.75 – 1.0	Soil	Environmental	Set 1
		151B049	0.75 – 1.0	Soil	Field Duplicate of #151B048	Set 1
		151B050	3.75 – 4.0	Soil	Environmental	Set 1
	B23	151B046	1.0 – 1.5	Soil	Environmental	Set 1
		151B047	5.5 – 6.0	Soil	Environmental	Set 1
	B24	151B044	1.0 – 1.25	Soil	Environmental	Set 1
		151B045	3.75 – 4.0	Soil	Environmental, MS/MSD	Set 1
N/A	N/A	151B301	N/A	Water	Trip Blank	Total VOCs
N/A	N/A	151B302	N/A	Water	Trip Blank	Total VOCs
N/A	N/A	151B303	N/A	Water	Trip Blank	Total VOCs
N/A	N/A	151B304	N/A	Water	Equipment Rinsate Blank	Set 1 (except Pesticides)
N/A	N/A	151B305	N/A	Water	Trip Blank	Total VOCs
N/A	N/A	151B306	N/A	Water	Trip Blank	Total VOCs
N/A	N/A	151B307	N/A	Water	Trip Blank	Total VOCs
N/A	N/A	151B308	N/A	Water	Trip Blank	Total VOCs
N/A	N/A	151B309	N/A	Water	Field Blank	Set 1
N/A	N/A	151B310	N/A	Water	Trip Blank	Total VOCs
N/A	N/A	151B311	N/A	Water	Equipment Rinsate Blank	Set 1

Set 1 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90
Set 2 = Total SVOCs
Set 3 = Arsenic and Beryllium

ft bgs = Feet below ground surface
MS/MSD = Matrix spike/matrix spike duplicate
N/A = Not applicable

the lagoons had been grouted over and flow diverted to the new lagoons. Initial inspection indicated that the integrity of the manhole was intact.

A.4.1.2 Field Screening

Soil samples (151B001 through 151B055) were field screened for VOCs and alpha and beta/gamma radiation as specified in the CAU 151 CAIP. The FSRs were compared to FSLs to guide subsequent sampling decisions where appropriate.

Alpha and beta/gamma radiation FSLs were not exceeded during sampling activities. Volatile organic compound headspace FSLs were also not exceeded.

A.4.1.3 Sample Collection

Surface and shallow subsurface soil samples were collected using hand auger sampling equipment, with a plastic scoop directly from a trench face, or from a backhoe bucket for sampling depths greater than 4 ft bgs.

Decision I sampling activities included the collection of environmental soil samples from 24 locations: B01 through B24. These locations represented the assumed (for backfilled lagoons) or actual proximal, low or midpoint, and distal points of each lagoon.

Additional Decision I samples were collected on December 9, 2005, from three locations at 90-degree angles from Location B02 in Lagoon E. Samples 151B051 through 151B053 were collected from 0 to 1 ft bgs at each location, to define the lateral extent of SVOCs that exceeded PALs. Decision II sampling to investigate the subsurface at Location B09 in Lagoon A was performed on February 13, 2006. Two samples (151B054 and 151B055) were collected from Location B09 at depths of 5.5 to 6 and 8.5 to 9 ft bgs, respectively. These intervals are below the deepest sample showing arsenic contamination above FALs and constrain the vertical extent of arsenic contamination.

A.4.1.4 Deviations

There was one minor deviation to the CAIP requirements at this CAS. This deviation occurred as a result of the presence of water in the lowest part of Lagoon G. Therefore, the absolute low point was not sampled. This deviation is not believed to affect sample results or DOQs as the CSM assumes uniform distribution of contaminants within the lagoons.

A.4.2 Investigation Results

The following sections provide analytical results for the samples collected to complete investigation activities as outlined in the CAIP. Investigation samples were analyzed for the CAIP-specified COPCs, which included VOCs, SVOCs, pesticides, PCBs, TPH-GRO, TPH-DRO, RCRA metals and beryllium, gamma-emitting radionuclides, isotopic uranium, isotopic plutonium, and Sr-90. An unedited set of all analytical data is retained in electronic format in the project files.

Analytical results from the soil samples with concentrations exceeding MDCs are summarized in the following sections. An evaluation was conducted on all contaminants detected above MDCs by comparing individual concentration or activity results against the FALs. Establishment of the FALs is presented in Appendix D. The FALs were established as the corresponding PAL concentrations or activities if the contaminant concentrations were below their respective PALs.

A.4.2.1 Volatile Organic Compounds

Analytical results for VOCs detected above MDCs are presented in Table A.4-2. No VOCs were detected at concentrations exceeding the respective PALs at this CAS.

Table A.4-2
Sample Results for VOCs Detected Above
Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)	
			1,2,4-Trimethylbenzene	Acetone
Final Action Levels[a]			170,000	54,000,000
B02	151B003	0.0 - 0.5	1.5 (J)	--
B06	151B011	0.0 - 0.5	--	18 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

A.4.2.2 Semivolatile Organic Compounds

Analytical results for SVOCs detected above MDCs are presented in Table A.4-3. Sample 151B003 had four SVOCs above their respective PALs: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene. This sample was collected from the upper 6 in. at the location immediately beneath the overflow pipe between Lagoons E and G. Additional Decision I sample analysis from this location showed all contaminants were below PALs.

No SVOC COCs were identified at this CAS.

A.4.2.3 Pesticides

Analytical results for pesticides detected above MDCs are presented in Table A.4-4. No pesticides were detected at concentrations exceeding the respective PALs at this CAS.

A.4.2.4 Total Petroleum Hydrocarbons

Total petroleum hydrocarbons-DRO and TPH-GRO analytical results detected above MDCs are presented in Table A.4-5. No TPH-DRO or TPH-GRO were detected at concentrations exceeding the PAL of 100 mg/kg at this CAS.

A.4.2.5 Polychlorinated Biphenyls

Analytical results for PCBs exceeding the MDCs are presented in Table A.4-6. Concentrations of PCBS were not detected in soil samples above associated PALs.

A.4.2.6 RCRA Metals and Beryllium

Analytical results for RCRA metals and beryllium detected above MDCs are presented in Table A.4-7. Arsenic was the only RCRA metal measured above FALs. Samples 151B017 and 151B018 were collected at Location B09 at the midpoint of the backfilled Lagoon A. Sample 151B017 was collected from a depth of 1.25 to 1.5 ft bgs at the apparent natural soil interface at the bottom of the pond. Sample 151B018 was collected from a depth of 2.75 to 3 ft bgs, approximately 2.5 ft below sample 151B017. These samples had results for arsenic of 51 mg/kg and 58 mg/kg, respectively, above the FAL of 45.1 mg/kg, and therefore identify arsenic as a COC.

Table A.4-3
Sample Results for SVOCs Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)																	
			Acenaphthene	Anthracene	Benzo(a)Anthracene	Benzo(a)Pyrene	Benzo(b)Fluoranthene	Benzo(g,h,i)Perylene	Benzo(k)Fluoranthene	Bis(2-Ethylhexyl)Phthalate	Carbazole	Chrysene	Dibenzo(a,h)Anthracene	Dibenzofuran	Fluoranthene	Fluorene	Indeno(1,2,3-cd)Pyrene	Naphthalene	Phenanthrene	Pyrene
Final Action Levels			29,000,000[a]	100,000,000[a]	64,300[b]	6,470[b]	64,700[b]	29,000,000[a]	21,000[a]	120,000[a]	86,000[a]	210,000[a]	6,470[b]	1,600,000[a]	22,000,000[a]	26,000,000[a]	2,100[a]	190,000[a]	100,000,000[a]	29,000,000[a]
B02	151B003	0.0 - 0.5	130 (J)	140 (J)	4,000	3,700 (J)	6,700 (J)	2,500 (J)	2,600 (J)	42 (J)	230 (J)	5,700	740 (J)	27 (J)	3,800	82 (J)	1,800 (J)	750 (J)	1,300	4,500
	151B004	2.0 - 2.5	--	--	27 (J)	22 (J)	32 (J)	--	62 (J)	--	--	--	--	--	--	--	--	--	--	--
B02B	151B052	0.0 - 1.0	--	--	--	42 (J)	--	--	--	190 (J)	--	--	--	--	--	--	--	--	--	--
B03	151B005	0.0 - 0.5	--	--	--	--	--	--	70 (J)	--	--	--	--	--	--	--	--	--	--	--
	151B006	2.0 - 2.5	--	--	--	--	--	--	59 (J)	--	--	--	--	--	--	--	--	--	--	--
B04	151B007	0.0 - 0.5	--	--	--	--	--	--	58 (J)	--	--	--	--	--	--	--	--	--	--	--
	151B008	2.0 - 2.5	--	--	--	--	--	--	--	450 (J)	--	--	--	--	--	--	--	--	--	--
B07	151B015	1.5 - 2.0	--	--	--	--	--	--	--	110 (J)	--	--	--	--	--	--	--	--	--	--
B11	151B028	2.0 - 2.25	--	--	--	--	--	--	--	34 (J)	--	--	--	--	--	--	--	--	--	--
B12	151B022	4.0 - 4.5	--	--	--	--	--	--	--	140 (J)	--	--	--	--	--	--	--	--	--	--
B15	151B030	1.5 - 1.75	--	--	--	--	--	--	--	630 (B)	--	--	--	--	--	--	--	--	--	46 (J)
B16	151B032	1.75 - 2.0	--	--	--	--	--	--	--	36 (J)	--	--	--	--	--	--	--	--	--	--
B17	151B034	1.25 - 1.5	--	--	--	--	--	--	--	39 (J)	--	--	--	--	--	--	--	--	--	--

Table A.4-3
Sample Results for SVOCs Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)																	
			Acenaphthene	Anthracene	Benzo(a)Anthracene	Benzo(a)Pyrene	Benzo(b)Fluoranthene	Benzo(g,h,i)Perylene	Benzo(k)Fluoranthene	Bis(2-Ethylhexyl)Phthalate	Carbazole	Chrysene	Dibenzo(a,h)Anthracene	Dibenzofuran	Fluoranthene	Fluorene	Indeno(1,2,3-cd)Pyrene	Naphthalene	Phenanthrene	Pyrene
Final Action Levels			29,000,000[a]	100,000,000[a]	64,300[b]	6,470[b]	64,700[b]	29,000,000[a]	21,000[a]	120,000[a]	86,000[a]	210,000[a]	6,470[b]	1,600,000[a]	22,000,000[a]	26,000,000[a]	2,100[a]	190,000[a]	100,000,000[a]	29,000,000[a]
B19	151B042	1.25 - 1.5	--	--	--	--	--	--	--	67 (J)	--	--	--	--	--	--	--	--	--	--
B22	151B050	3.75 - 4.0	--	--	--	--	--	--	--	140 (J)	--	--	--	--	--	--	--	--	--	--
B24	151B044	1.0 - 1.25	--	--	--	--	--	--	--	76 (J)	--	--	--	--	--	--	--	--	--	--
	151B045	3.75 - 4.0	--	--	--	--	--	--	--	83 (J)	--	--	--	--	--	--	--	--	--	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).
[b]Based on Oak Ridge National Laboratory Risk Assessment Information System (ORNL, 2005).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
B = Value less than the contract required detection limit, but greater than the instrument detection limit.
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

Table A.4-4
Sample Results for Pesticides Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)							
			4,4'-DDD	4,4'-DDE	4,4'-DDT	Alpha-BHC	Beta-BHC	Chlordane	Delta-BHC	Endrin Aldehyde
Final Action Levels[a]			**10,000**	**7,000**	**7,000**	**360**	**1,300**	**6,500**	**360**	**180,000**
B01	151B001	0.0 - 0.5	--	32 (J)	33 (J)	--	--	610	--	--
	151B002	2.0 - 2.5	72 (J)	300 (J)	100 (J)	--	--	4,700 (J)	--	--
B02	151B003	0.0 - 0.5	--	--	--	--	--	5,000 (J)	--	--
	151B004	2.0 - 2.5	12 (J)	9.7 (J)	--	--	--	--	--	--
B03	151B005	0.0 - 0.5	240 (J)	81 (J)	--	--	--	2,000 (J)	--	--
	151B006	2.0 - 2.5	34 (J)	30 (J)	--	--	--	780	--	--
B04	151B007	0.0 - 0.5	--	51 (J)	--	--	--	1,100 (J)	--	--
	151B008	2.0 - 2.5	380 (J)	110 (J)	--	--	--	3,400 (J)	--	--
B05	151B009	0.0 - 0.5	17 (J)	31 (J)	24 (J)	--	--	1,100 (J)	--	--
	151B010	1.0 - 1.5	29 (J)	68 (J)	--	--	--	2,200 (J)	--	--
B12	151B021	1.0 - 1.5	--	0.46 (J)	--	--	--	--	2.9 (J)	--
	151B022	4.0 - 4.5	--	0.52 (J)	1.8 (J)	--	--	--	1.5 (J)	--
B13	151B023	1.0 - 1.5	--	0.49 (J)	--	--	--	--	1.4 (J)	--
B11	151B028	2.0 - 2.25	--	--	--	--	--	--	--	--
B15	151B030	1.5 - 1.75	--	5.2 (J)	26 (J)	11 (J)	--	--	--	--
B16	151B033	3.5 - 4.0	--	0.31 (J)	--	--	--	--	--	--
B17	151B035	3.5 - 4.0	--	--	--	--	--	--	--	1.6 (J)
B18	151B036	0.75 - 1.0	--	0.24 (J)	--	--	--	--	--	--
	151B037	3.5 - 4.0	0.93 (J)	15 (J)	7.8 (J)	--	--	86	--	--
B21	151B038	0.75 - 1.0	--	0.57 (J)	1.3 (J)	--	2.2 (J)	--	--	--
	151B039	3.5 - 3.75	--	--	1.2 (J)	--	--	--	--	--

[a] Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

Table A.4-5
Sample Results for TPH-DRO and TPH-GRO Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Diesel-Range Organics	Gasoline-Range Organics
Preliminary Action Levels[a]			100	100
B01	151B001	0.0 - 0.5	--	0.26 (J)
B02	151B003	0.0 - 0.5	22 (H)	--
B07	151B014	0.0 - 0.5	8.9	--
B10	151B019	0.75 - 1.0	2 (J)	--
	151B020	2.0 - 2.5	2 (J)	--
B11	151B028	2.0 - 2.25	6.3 (H, Z)	--
B13	151B023	1.0 - 1.5	4.2 (J)	--
	151B024	3.0 - 3.5	2.1 (J)	--
B15	151B030	1.5 - 1.75	93 (H)	--
B17	151B035	3.5 - 4.0	3.4 (J)	--

[a]Based on *Nevada Administrative Code*; Contamination of soil: Establishment of action levels (NAC, 2002).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
Z = Result did not resemble any common TPH products.
-- = Not detected above minimum detectable concentrations.

Table A.4-6
Sample Results for PCBs Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)
			Aroclor 1254
Final Action Levels[a]			740
B11	151B028	2.0 - 2.25	28
B15	151B030	1.5 - 1.75	270 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value.

Table A.4-7
Sample Results for Metals Detected Above
Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			**45.1**[a]	**67,000**[b]	**1,900**[b]	**450**[b]	**450**[b]	**750**[b]	**310**[b]	**5,100**[b]	**5,100**[b]
B01	151B001	0.0 - 0.5	5.3	130	1.5	--	5.1	15	0.042	--	--
	151B002	2.0 - 2.5	3.2	130	1.3	--	4.4	21	--	--	--
B02	151B003	0.0 - 0.5	7.7	130	1.7	--	7.8	19	0.21	--	--
	151B004	2.0 - 2.5	4	140	1	--	3.2	18	--	--	--
B03	151B005	0.0 - 0.5	7	160	2.4	--	11	25	0.69	--	0.23 (B)
	151B006	2.0 - 2.5	11	150	2.8	--	12	25	0.3	--	0.16 (B)
B04	151B007	0.0 - 0.5	7.4	170	2.6	--	12	28	0.56	--	0.22 (B)
	151B008	2.0 - 2.5	9	180	2.1	--	9.9	24	0.35	--	0.19 (B)
B05	151B009	0.0 - 0.5	12	140	1.4	--	8	20	0.064	--	0.25 (B)
	151B010	1.0 - 1.5	10	130	1.4	--	7	17	0.056	--	--
B06	151B011	0.0 - 0.5	5.8	130	1.4	--	8.3	19	--	--	--
	151B012	2.0 - 2.5	5.4	180	1.8	--	4.1	16	0.077	--	--
	151B013	2.0 - 2.5	4.7	180	1.8	--	5.2	16	0.077	--	--
B07	151B014	0.0 - 0.5	6.1	160	1.7	--	6.4	23	0.042	--	--
	151B015	1.5 - 2.0	5.7	150	1.4	--	3.5	19	0.064	--	--
B08	151B016	5.5 - 6.0	3.4	100	1.6	--	3.2	15	0.025 (J-)	--	--
B09	151B017	1.25 - 1.5	**51**	50	0.95	--	9.3	9.2	0.32	--	--
	151B018	2.75 - 3.0	**58**	53	0.93	--	7.3	9.4	0.32	0.82	--
	151B054	5.5 - 6.0	14	--	1.2	--	--	--	--	--	--
	151B055	8.5 - 9.0	5.5	--	1.2	--	--	--	--	--	--
B10	151B019	0.75 - 1.0	**47**	68	0.97	--	7	18	0.22	0.37 (B)	--
	151B020	2.0 - 2.5	42	94	1.2	--	8.9	13	0.2	0.57	--
B11	151B028	2.0 - 2.25	17	91	1.5	--	6.1	15	0.22	--	--
	151B029	3.5 - 4.0	3.4	110	1.1	--	3.4	16	--	--	--
B12	151B021	1.0 - 1.5	22	120	1.3	--	10	15	0.08	--	--
	151B022	4.0 - 4.5	29	96	1.1	--	7.8	13	0.082	--	--
B13	151B023	1.0 -1.5	3.9	93	1.4	0.069 (J-)	3.6	11	--	--	--
	151B024	3.0 - 3.5	3.9	94	1.4	--	4.9	16	--	--	--

Table A.4-7
Sample Results for Metals Detected Above
Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			45.1[a]	67,000[b]	1,900[b]	450[b]	450[b]	750[b]	310[b]	5,100[b]	5,100[b]
B14	151B025	1.0 - 1.5	3	92	1.4	--	3.3	12	--	--	--
	151B026	3.0 - 3.5	3.6	89	1.6	0.037 (J-)	4	14	--	--	--
	151B027	3.0 - 3.5	3.7	88	1.6	--	3.9	21	--	--	--
B15	151B030	1.5 - 1.75	2.9	160	1.4	0.25 (J-)	3.7	29	0.052	--	--
	151B031	3.25 - 3.5	3.4	92	1.5	--	3.9	16	--	--	--
B16	151B032	1.75 - 2.0	7.9	100	1.5	--	4.3	12	0.044	--	--
	151B033	3.5 - 4.0	5.2	95	1.4	--	4.2	12	--	--	--
B17	151B034	1.25 - 1.5	2.2	91	1.3	--	2.5	14	--	--	--
	151B035	3.5 - 4.0	2.9	94	1.5	0.055 (J-)	4	11	--	--	--
B18	151B036	0.75 - 1.0	3.7	110	1.5	0.03 (B)	3.7	16	--	--	--
	151B037	3.5 - 4.0	3.1	120	1.2	--	3.5	14	--	--	--
B19	151B042	1.25 - 15	5.9	85	1.4	--	3.3	15	--	--	--
	151B043	3.75 - 4.0	4.1	87	1.5	--	3.5	10	--	--	--
B20	151B040	1.0 - 1.25	3.3	110	1.5	--	3.4	16	--	--	--
	151B041	2.75 - 3.0	3.3	94	1.5	--	3.2	17	--	--	--
B21	151B038	0.75 - 1.0	3.3	100	1.5	--	4	14	--	--	--
	151B039	3.5 - 3.75	3	110	1.6	--	4	13	--	--	--
B22	151B048	0.75 - 1.0	2.8	84	1.4	--	2.4	9.8	--	--	--
	151B049	0.75 - 1.0	3.4	84	1.4	--	2.4	14	--	--	--
	151B050	3.75 - 4.0	3	89	1.5	--	3	11	--	--	--
B23	151B046	1.0 - 1.5	5.1	110	1.5	--	2.4	23	--	--	--
	151B047	5.5 - 6.0	3.1	88	1.5	--	3.1	14	--	--	--
B24	151B044	1.0 - 1.25	5	210	1.2	--	4.9	12	0.28	--	--
	151B045	3.75 - 4.0	3.4	110	1.5	--	3	14	--	--	--

[a]Based on Oak Ridge National Laboratory Risk Assessment Information System (ORNL, 2005).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum detectable concentrations.
B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
J- = The result is an estimated quantity, but the result may be biased low.

Samples 151B019 and 151B020 are from Location B10 at the proximal end at the estimated inlet of the backfilled Lagoon A. Sample 151B019 was collected from a depth of 0.75 to 1 ft bgs at the apparent natural soil interface at the bottom of the pond. Sample 151B020 was collected from a depth of 2 to 2.5 ft bgs, approximately 1 ft below sample 151B019. Only sample 151B019 is also greater than the FAL of 45.1 mg/kg, and therefore identifies arsenic as a COC.

Sample 151B022 is from the subsurface at Location B12, at a depth of 4 to 4.5 ft bgs. This sample is from the proximal end of the backfilled Lagoon B at the estimated inlet location. The sample is approximately 3 ft below the natural soil contact. Arsenic is not identified as a COC as the concentration in this sample was less than the FAL of 45.1 mg/kg.

Decision II sampling was done to vertically bound the arsenic contamination at Location B09. Samples 151B054 and 151B055 were collected at Location B09 from 5.5 to 6 ft bgs and from 8.5 to 9 ft bgs, respectively. Concentrations of arsenic from these two depths was below PALs, thus bounding the arsenic to between approximately 3 and 6 ft bgs. Arsenic at Location B10 is bounded by sample 151B020, which does not exceed the FAL, and therefore serves to vertically constrain the COC at this location.

A.4.2.7 Gamma-Emitting Radionuclides

Gamma-emitting radionuclide analytical results detected above MDCs are presented in Table A.4-8. No radionuclides were identified above associated PALs at this CAS

A.4.2.8 Isotopic Radionuclides

Isotopic radionuclide analytical results detected above MDCs are presented in Table A.4-9. No radionuclides were identified above associated PALs at this CAS.

A.4.3 Nature and Extent of Contamination

Arsenic was identified as a COC at Locations B09 and B10 in Lagoon A. Decision II samples (151B054 and 151B055) collected below the Location B09 samples bound the vertical extent of arsenic contamination at this location. Arsenic at Location B10 was present only in the upper sample, thus vertical extent is bounded by the absense of a COC in the deeper sample. Because the CSM

Table A.4-8
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
(Page 1 of 4)

Sample Location	Sample Number	Depth (ft bgs)	Actinium-228[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]	
			Contaminants of Potential Concern (pCi/g)										
Final Action Levels			5	15	5	15	12.2	5	15	5	15	5	15
Depth bgs (cm)			<15	>15	<15	>15		<15	>15	<15	>15	<15	>15
B01	151B001	0.0 - 0.5	--	N/A	--	N/A	--	2.14 (J)	N/A	1.12 (G, J)	N/A	0.67 (G)	N/A
	151B002	2.0 - 2.5	N/A	--	N/A	--	0.71 (G)	N/A	1.81 (J)	N/A	--	N/A	0.82 (G)
B02	151B003	0.0 - 0.5	--	N/A	--	N/A	1.28 (G)	1.39 (J)	N/A	--	N/A	--	N/A
	151B004	2.0 - 2.5	N/A	2.36 (G)	N/A	1.61 (G, J)	--	N/A	1.59 (J)	N/A	0.98 (G, J)	N/A	0.72 (G)
B03	151B005	0.0 - 0.5	--	N/A	--	N/A	--	1.73 (J)	N/A	1.23 (G, J)	N/A	0.65 (G)	N/A
	151B006	2.0 - 2.5	N/A	2.36 (G, TI)	N/A	1.22 (G, J)	--	N/A	1.99 (J)	N/A	1.22 (G, J)	N/A	0.67 (G)
B04	151B007	0.0 - 0.5	--	N/A	--	N/A	--	1.93 (J)	N/A	--	N/A	--	N/A
	151B008	2.0 - 2.5	N/A	--	N/A	--	--	N/A	1.99 (J)	N/A	--	N/A	0.87 (G)
B05	151B009	0.0 - 0.5	1.89 (G)	N/A	1.08 (G, J)	N/A	--	1.18 (J)	N/A	1.22 (G, J)	N/A	0.62 (G)	N/A
	151B010	1.0 - 1.5	N/A	2.46 (G)	N/A	--	--	N/A	1.55 (J)	N/A	1.1 (G, J)	N/A	--
B06	151B011	0.0 - 0.5	--	N/A	--	N/A	--	1.53 (J)	N/A	1.62 (G, J)	N/A	--	N/A
	151B012	2.0 - 2.5	N/A	--	N/A	--	--	N/A	1.78 (J)	N/A	1.08 (G, J)	N/A	--
	151B013	2.0 - 2.5	N/A	--	N/A	--	--	N/A	2.17 (J)	N/A	1.52 (G, J)	N/A	0.85 (G)
B07	151B014	0.0 - 0.5	--	N/A	--	N/A	--	2.08 (J)	N/A	1.17 (G, J)	N/A	0.65 (G)	N/A
	151B015	1.5 - 2.0	N/A	2.62 (G)	N/A	--	--	N/A	2.17 (J)	N/A	1.22 (G, J)	N/A	0.66 (G)
B08	151B016	5.5 - 6.0	N/A	2.07 (G)	N/A	1.19 (G, J)	--	N/A	2.55 (J)	N/A	1.16 (G, J)	N/A	0.65 (G)

Table A.4-8
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
(Page 2 of 4)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)											
			Actinium-228[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]	
Final Action Levels			5	15	5	15	12.2	5	15	5	15	5	15
Depth bgs (cm)			<15	>15	<15	>15		<15	>15	<15	>15	<15	>15
B09	151B017	1.25 - 1.5	N/A	1.03 (G)	N/A	1.39 (G, J)	--	N/A	1.56 (J)	N/A	1.67 (G, J)	N/A	0.39 (G)
	151B018	2.75 - 3.0	N/A	0.98 (G)	N/A	1.2 (G, J)	--	N/A	1.27 (J)	N/A	1.21 (G, J)	N/A	0.31 (G)
B10	151B019	0.75 - 1.0	N/A	--	N/A	--	--	N/A	0.97 (J)	N/A	1.09 (G, J)	N/A	--
	151B020	2.0 - 2.5	N/A	--	N/A	--	--	N/A	1.07 (J)	N/A	0.94 (G, J)	N/A	--
B11	151B028	2.0 - 2.25	N/A	2.5 (G)	N/A	--	--	N/A	1.78 (J)	N/A	0.91 (G, J)	N/A	--
	151B029	3.5 - 4.0	N/A	--	N/A	1.12 (G, J)	--	N/A	2.05 (J)	N/A	0.96 (G, J)	N/A	0.55 (G)
B12	151B021	1.0 - 1.5	N/A	--	N/A	1.52 (G, J)	0.47 (G, LT)	N/A	1.5 (J)	N/A	1.27 (G, J)	N/A	0.55 (G)
	151B022	4.0 - 4.5	N/A	1.5 (G)	N/A	1.15 (G, J)	0.49 (G, LT)	N/A	1.63 (J)	N/A	1.18 (G, J)	N/A	--
B13	151B023	1.0 - 1.5	N/A	1.89 (G)	N/A	--	--	N/A	1.87 (J)	N/A	0.87 (G, J)	N/A	0.61 (G)
	151B024	3.0 - 3.5	N/A	--	N/A	1.43 (G, J)	--	N/A	1.89 (J)	N/A	0.99 (G, J)	N/A	0.57 (G)
B14	151B025	1.0 - 1.5	N/A	--	N/A	--	--	N/A	1.79 (J)	N/A	1.17 (G, J)	N/A	0.45 (G)
	151B026	3.0 - 3.5	N/A	--	N/A	1.1 (G, J)	--	N/A	2.39 (J)	N/A	1 (G, J)	N/A	0.75 (G)
	151B027	3.0 - 3.5	N/A	1.8 (G)	N/A	1.03 (G, J)	--	N/A	2.23 (J)	N/A	--	N/A	--
B15	151B030	1.5 - 1.75	N/A	--	N/A	--	--	N/A	1.69 (J)	N/A	1.01 (G, J)	N/A	0.77 (G)
	151B031	3.25 - 3.5	N/A	2.5 (G, TI)	N/A	1.13 (G, J)	--	N/A	1.42 (J)	N/A	0.97 (G, J)	N/A	0.84 (G)
B16	151B032	1.75 - 2.0	N/A	1.77 (G)	N/A	--	--	N/A	1.77 (J)	N/A	0.95 (G, J)	N/A	0.47 (G)
	151B033	3.5 - 4.0	N/A	--	N/A	--	--	N/A	2.01 (J)	N/A	1.23 (G, J)	N/A	0.64 (G)

Table A.4-8
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
(Page 3 of 4)

Sample Location	Sample Number	Depth (ft bgs)	Actinium-228[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]	
Final Action Levels			5	15	5	15	12.2	5	15	5	15	5	15
Depth bgs (cm)			<15	>15	<15	>15		<15	>15	<15	>15	<15	>15
B17	151B034	1.25 - 1.5	N/A	2.82 (G)	N/A	0.79 (G, J)	--	N/A	1.8 (J)	N/A	0.9 (G, J)	N/A	0.55 (G)
B17	151B035	3.5 - 4.0	N/A	1.44 (G)	N/A	1 (G, J)	0.58 (G)	N/A	1.9 (J)	N/A	1.08 (G, J)	N/A	0.52 (G)
B18	151B036	0.75 - 1.0	N/A	--	N/A	1.06 (G, J)	--	N/A	1.86 (J)	N/A	0.98 (G, J)	N/A	--
B18	151B037	3.5 - 4.0	N/A	1.82 (G)	N/A	1.12 (G, J)	1.12 (G)	N/A	1.76 (J)	N/A	1.11 (G, J)	N/A	0.71 (G)
B19	151B042	1.25 - 1.5	N/A	--	N/A	1.25 (G, J)	--	N/A	1.89 (J)	N/A	--	N/A	0.73 (G)
B19	151B043	3.75 - 4.0	N/A	2.55 (G)	N/A	--	--	N/A	1.64 (J)	N/A	1.17 (G, J)	N/A	0.71 (G)
B20	151B040	1.0 - 1.25	N/A	2.2 (G)	N/A	--	--	N/A	1.98 (J)	N/A	--	N/A	0.59 (G)
B20	151B041	2.75 - 3.0	N/A	--	N/A	--	--	N/A	1.62 (J)	N/A	0.88 (G, J)	N/A	--
B21	151B038	0.75 - 1.0	N/A	2.03 (G)	N/A	--	--	N/A	1.76 (J)	N/A	1.11 (G, J)	N/A	--
B21	151B039	3.5 - 3.75	N/A	1.66 (G)	N/A	1.14 (G, J)	--	N/A	2.1 (J)	N/A	1.21 (G, J)	N/A	0.51 (G)
B22	151B048	0.75 - 1.0	N/A	1.79 (G)	N/A	--	--	N/A	1.9 (J)	N/A	0.85 (G, J)	N/A	0.55 (G)
B22	151B049	0.75 - 1.0	N/A	1.59 (G)	N/A	--	--	N/A	2.1 (J)	N/A	0.77 (G, J)	N/A	0.48 (G)
B22	151B050	3.75 - 4.0	N/A	2.02 (G)	N/A	--	--	N/A	1.94 (J)	N/A	0.74 (G, J)	N/A	0.61 (G)
B23	151B046	1.0 - 1.5	N/A	--	N/A	--	--	N/A	1.79 (J)	N/A	0.83 (G, J)	N/A	0.63 (G)
B23	151B047	5.5 - 6.0	N/A	1.95 (G)	N/A	--	--	N/A	1.55 (J)	N/A	1.04 (G, J)	N/A	0.64 (G)
B24	151B044	1.0 - 1.25	N/A	--	N/A	--	--	N/A	1.22 (J)	N/A	0.81 (G, J)	N/A	--
B24	151B045	3.75 - 4.0	N/A	1.82 (G)	N/A	--	--	N/A	1.78 (J)	N/A	0.81 (G, J)	N/A	0.55 (G)

Contaminants of Potential Concern (pCi/g)

Table A.4-8
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
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Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)										
			Actinium-228[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]	
Final Action Levels			5	15	5	15	12.2	5	15	5	15	5	15
Depth bgs (cm)			<15	>15	<15	>15		<15	>15	<15	>15	<15	>15

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, as found in Chapter IV of DOE Order 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The FALs for these isotopes are specified as 5 pCi/g averaged over the first 15 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 in.); therefore, 5 pCi/g represents the FALs for these radionuclides in the surface soil (0 to 0.5 ft bgs).
[b]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

cm = Centimeter
ft bgs = Feet below ground surface
N/A = Not applicable
pCi/g = Picocuries per gram
-- = Not detected above minimum detectable concentrations.
< = Less than
> = Greater than
G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.
LT = Result is less than requested minimum detectable concentration, but greater than sample specific minimum detectable concentration.
TI = Nuclide identification is tentative.

Table A.4-9
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			13	12.7	838	143	17.5	105
B01	151B001	0.0 - 0.5	0.23 (J)	0.67	--	1.45	0.088	1.16 (J)
	151B002	2.0 - 2.5	0.046 (J)	0.132	--	1.16	0.048 (LT)	1.02 (J)
B02	151B003	0.0 - 0.5	0.273 (J)	0.84	--	1.33	0.068	1.29 (J)
	151B004	2.0 - 2.5	--	--	--	1.02	0.06	1.14 (J)
B03	151B005	0.0 - 0.5	--	0.261	--	1.45	0.067	1.31 (J)
	151B006	2.0 - 2.5	--	0.116	--	1.47	0.069	1.26 (J)
B04	151B007	0.0 - 0.5	0.065 (J)	0.241	--	1.31	0.075	1.18 (J)
	151B008	2.0 - 2.5	--	0.093	--	1.36	0.065	1.29 (J)
B05	151B009	0.0 - 0.5	0.157 (J)	0.69	--	1.18	--	1.16 (J)
	151B010	1.0 - 1.5	0.062 (J)	0.7	--	1.19	0.054	1.13 (J)
B06	151B011	0.0 - 0.5	0.155 (J)	0.46	--	0.99	0.097	1 (J)
	151B012	2.0 - 2.5	--	--	--	1.41	0.097	1.2 (J)
	151B013	2.0 - 2.5	--	--	--	1.34	--	1.1 (J)
B07	151B014	0.0 - 0.5	--	--	--	1.32	0.075	1.12 (J)
	151B015	1.5 - 2.0	--	--	--	1.46	0.083	1.3 (J)
B08	151B016	5.5 - 6.0	--	--	--	1.04	0.075	1.02
B09	151B017	1.25 - 1.5	0.165	0.401 (J)	--	1.44	--	1.33
	151B018	2.75 - 3.0	0.068	0.214 (J)	--	1.49	0.099	1.39
B10	151B019	0.75 - 1.0	--	--	--	0.96	--	0.88
	151B020	2.0 - 2.5	--	0.08	--	0.96	--	1.1
B11	151B028	2.0 - 2.25	0.071	0.296	--	0.97	0.077	1.04
	151B029	3.5 - 4.0	--	--	--	1.21 (M3)	--	1.2 (M3)
B12	151B021	1.0 - 1.5	0.252	0.77	--	0.93	0.061	0.94
	151B022	4.0 - 4.5	0.302	0.73	0.7	0.92	0.061	0.86
B13	151B023	1.0 - 1.5	--	--	--	1.13	0.078	1.11
	151B024	3.0 - 3.5	0.145	0.354	--	0.93	--	1.02
B14	151B025	1.0 - 1.5	--	--	--	1.11	--	1.17
	151B026	3.0 - 3.5	--	0.073	--	0.82	--	0.94
	151B027	3.0 - 3.5	--	--	--	0.86	--	0.97

Table A.4-9
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-03-01, Sewage Lagoons (6)
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			13	12.7	838	143	17.5	105
B15	151B030	1.5 - 1.75	--	--	--	1	--	0.98
	151B031	3.25 - 3.5	0.177	0.61	--	0.86	--	0.96
B16	151B032	1.75 - 2.0	--	--	--	0.91 (M3)	--	0.92
	151B033	3.5 - 4.0	--	0.047 (LT)	--	0.93	0.07	0.98
B17	151B034	1.25 - 1.5	--	--	--	1.06	0.072	1.09
	151B035	3.5 - 4.0	0.087	0.42	--	1.4	--	1.1
B18	151B036	0.75 - 1.0	--	--	--	1.08	0.091	1.03
	151B037	3.5 - 4.0	1.14	2.93	--	1.04	0.069	1.03
B19	151B042	1.25 - 1.5	--	--	--	0.83	--	0.9
	151B043	3.75 - 4.0	--	0.081	--	1	--	1.1
B20	151B040	1.0 - 1.25	--	--	--	1.11	0.052	0.99
	151B041	2.75 - 3.0	--	--	--	1.07	0.069	0.93
B21	151B038	0.75 - 1.0	0.147	0.81	--	1.06	0.075	1.08
	151B039	3.5 - 3.75	--	--	--	1.59	0.095	1.23
B22	151B048	0.75 - 1.0	--	--	--	1	--	0.97
	151B049	0.75 - 1.0	--	--	--	1	--	1.06
	151B050	3.75 - 4.0	--	--	--	1.05	--	1.05
B23	151B046	1.0 - 1.5	--	--	--	0.81	--	0.96
	151B047	5.5 - 6.0	0.376	1.1	--	0.96	--	0.93
B24	151B044	1.0 - 1.25	--	0.092	--	0.9	0.065	0.97
	151B045	3.75 - 4.0	--	--	--	1.09	--	1.01

[a]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
J = Estimated value.
LT = Result is less than requested minimum detectable concentration, but greater than sample specific minimum detectable concentration.
M3 = The requested minimum detectable concentration was not met, but the reported activity is greater than the reported minimum detectable concentration.
-- = Not detected above minimum detectable concentrations.

assumes uniform distribution of contaminants within a lagoon, the lateral extent is assumed to be bounded by the sides of the pond.

A.4.4 Revised Conceptual Site Model

The results of the CAI at CAS 12-03-01 did not contradict the CSM. No revision of the CSM was necessary.

A.5.0 Corrective Action Sites 12-04-01, Septic Tanks; 12-04-02, Septic Tanks; and 12-04-03, Septic Tank

Corrective Action Sites 12-04-01, 12-04-02, and 12-04-03 are located in the east-central and northeast portions of Area 12. These CASs consists of four separate septic systems and are referred to as Systems #1, #3, #4, and #5 in historical documents. These systems are associated with and discharge into CAS 12-03-01, Sewage Lagoons (6). Historical documentation indicates that these CASs were used to collect sanitary effluent from the Area 12 Camp administrative, recreational, and housing buildings from 1961 to the early 1980s (REECo, 1992a and 1995).

Corrective Action Site 12-04-01 addresses Systems #1 and #4. System #1 consists of two septic tanks, two manholes, four access covers, and the associated 6-in. vitrified clay pipe (VCP). System #4 is comprised of four tanks, eight access covers, and the associated 6-in. VCP. All of the tanks in Systems #1 and #4 are documented as 8 by 25 ft with a 7,500-gal capacity (Bingham, 1992; REECo, 1967a, 1992a and b, and 1995).

Corrective Action Site 12-04-02 addresses System #5. This system was constructed between 1961 and 1962 and consists of six septic tanks, two manholes, eight visible access covers, and associated VCP. The same 6-in. VCP and tank size apply to this system as for Systems #1 and #4.

Corrective Action Site 12-04-03 addresses System #3. System #3 consists of four tanks, two manholes, one visible access cover, and associated VCP. The same 6-in. VCP and tank size apply to this system as for Systems #1, #4 and #5.

The CSM as developed in the CAU 151 CAIP (NNSA/NSO, 2004a) demonstrates the most probable scenario for current conditions, pathways, and features at this CAS. Conceptual site model pathways include potential discharges to arroyos and washouts if the tanks overflowed, and possible subsurface releases from any breached pipe or leaking tank. Release mechanisms are sanitary effluent and possible industrial discharge into sanitary systems.

A.5.1 Corrective Action Investigation

A total of 23 environmental soil characterization samples (including one FD and one MS/MSD) were collected during investigation activities at CAS 12-04-01, Systems #1 and #4. The sample locations are shown on Figures A.5-1 and A.5-2. The sample identification numbers, locations, depth, matrices, purpose, and analyses are listed in Table A.5-1.

A total of 19 environmental soil characterization samples (including one FD and one MS/MSD) were collected during investigation activities at CAS 12-04-02, System #5. The sample locations are shown on Figure A.5-3. The sample identification numbers, locations, depth, matrices, purpose, and analyses are listed in Table A.5-2.

A total of 13 environmental soil characterization samples (including one FD and one MS/MSD) were collected during investigation activities at CAS 12-04-03, System #3. The sample locations are shown on Figure A.5-4. The sample identification numbers, locations, depth, matrices, purpose, and analyses are listed in Table A.5-3. The specific CAI activities conducted to satisfy the CAIP requirements are described in the following sections.

Field conditions of the tank hatches and surrounding area did not suggest that any of the tanks had overflowed. Tank 2 of CAS 12-04-03 (Location E05 on Figure A.5-4) had become exposed in a runoff channel. The upstream tank cover had apparently been removed by high-velocity flow in the channel. At the time of sampling, this tank was completely filled with sediment.

A.5.1.1 Video Surveying

Video surveys were conducted on the septic system associated piping to the extent possible to identify any breaches or residual material in the piping, and to verify the presence and extent of piping. No breaches or residual material were identified in the existing piping. Figures A.5-5 and A.5-6 show the lines that were video surveyed during CAI activities at CAS 12-04-01. Video surveying of System #4 was performed starting at the inlet of Tank 1. This line extended from the tank approximately 23 ft, then took a 45-degree bend; extended another 10 ft to an second 45-degree turn, where it continued for approximately 5 ft; and ended at the northwest corner of the distribution box. The inlet line from Tank 2 ran towards the distribution box for 24 ft before becoming blocked

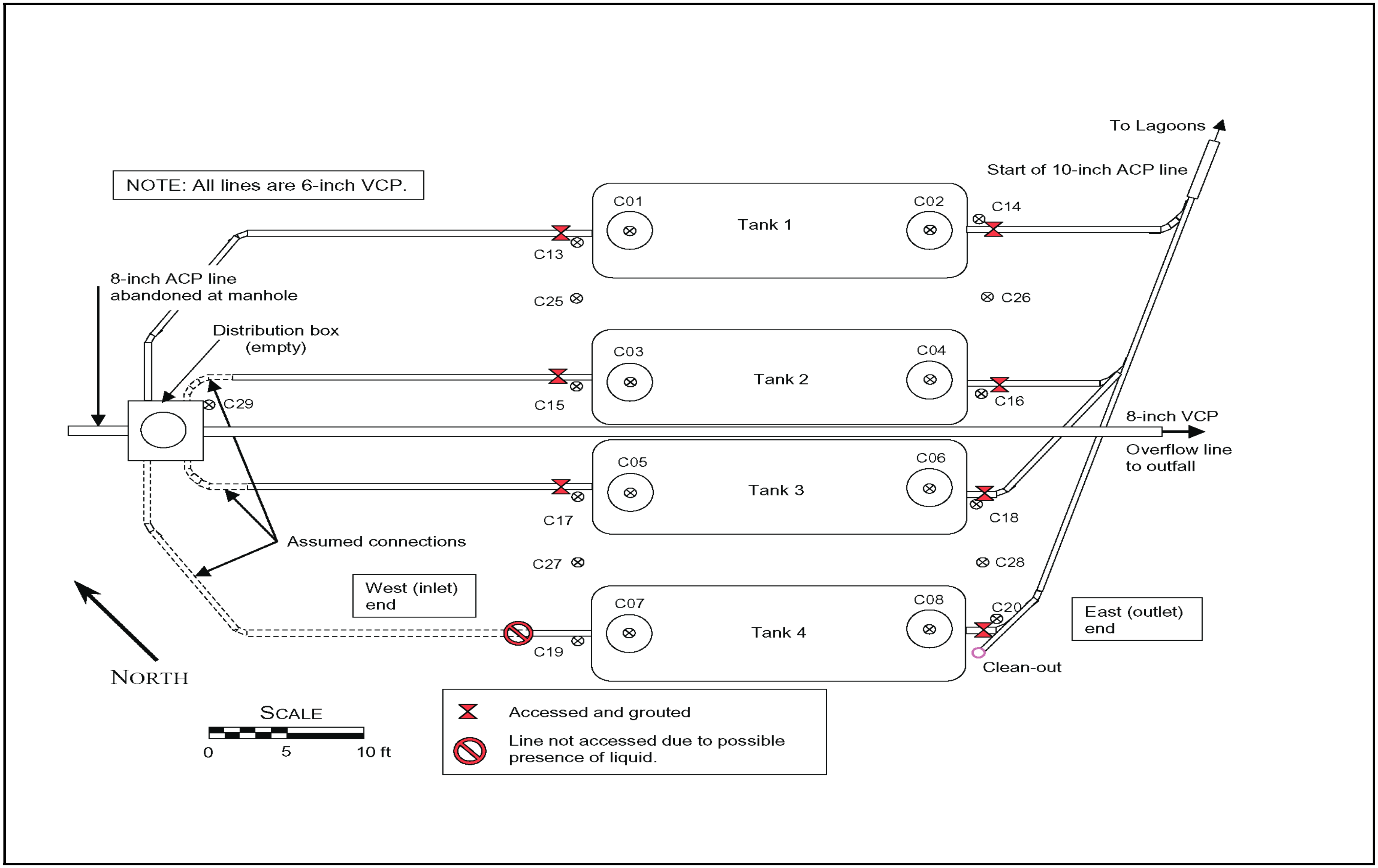

Figure A.5-1
Tank and Soil Sample Locations for System #4, CAS 12-04-01

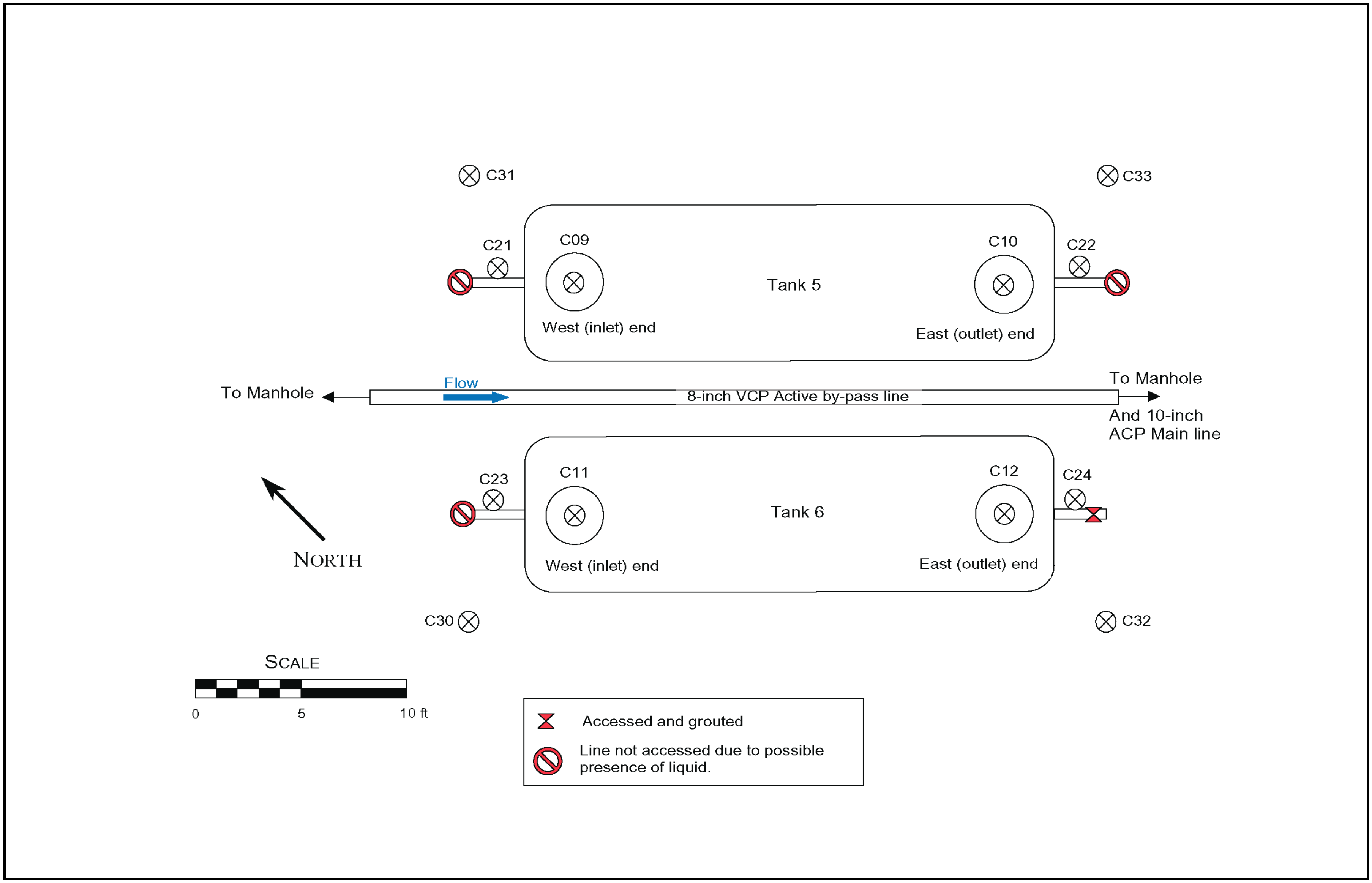

Figure A.5-2
Tank and Soil Sample Locations for System #1, CAS 12-04-01

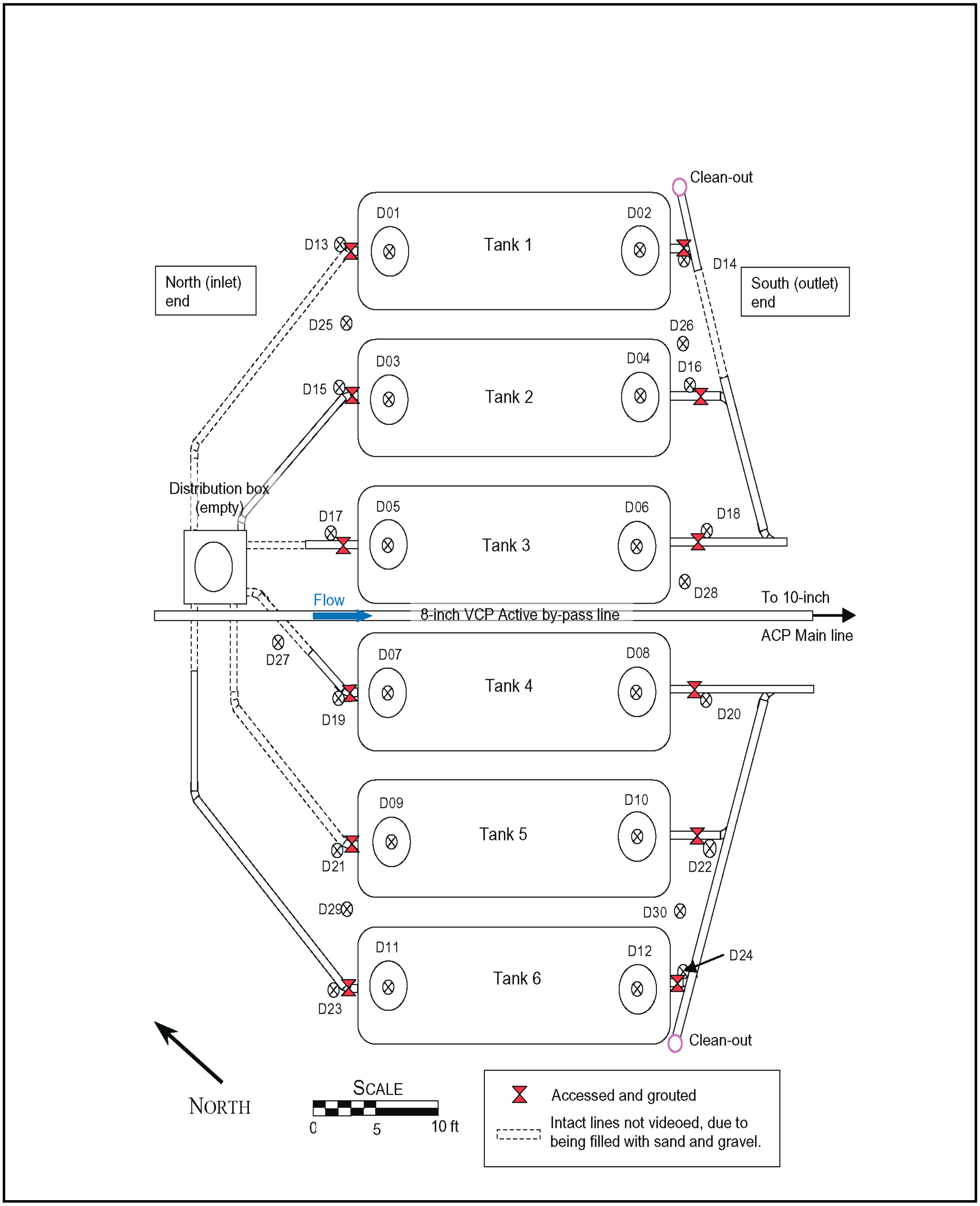

Figure A.5-3
Tank and Soil Sample Locations for System #5, CAS 12-04-02

Table A.5-1
Characterization Samples Collected at CAS 12-04-01, Septic Tanks
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
C13	151C023	0.0 -1.0	Soil	Environmental	Set 5
	151C013	3.0 – 3.5	Soil	Environmental	Set 1
C14	151C005	3.0 – 3.5	Soil	Environmental	Set 1
C15	151C001	2.5 – 3.0	Soil	Environmental	Set 1
C16	151C006	2.5 – 3.0	Soil	Environmental	Set 1
C17	151C003	2.5 – 3.0	Soil	Environmental	Set 1
C18	151C007	2.5 – 3.0	Soil	Environmental	Set 1
C19	151C004	4.0 – 4.5	Soil	Environmental	Set 1
C20	151C008	3.5 – 4.0	Soil	Environmental	Set 1
	151C009	3.5 – 4.0	Soil	Field Duplicate of #151C008	Set 1
C21	151C010	2.0 – 2.5	Soil	Environmental	Set 1
C22	151C011	2.0 – 2.5	Soil	Environmental	Set 1
C23	151C012	2.0 – 2.5	Soil	Environmental	Set 1
C24	151C013	2.0 – 2.5	Soil	Environmental	Set 1
C25	151C016	8.0 – 8.5	Soil	Environmental	Set 1
C26	151C015	8.0 – 8.5	Soil	Environmental, MS/MSD	Set 1
C27	151C017	8.0 – 8.5	Soil	Environmental	Set 1
C28	151C014	8.0 – 8.5	Soil	Environmental	Set 1
C29	151C018	4.0 – 4.5	Soil	Environmental	Set 1
C30	151C019	7.5 – 8.0	Soil	Environmental	Set 1
C31	151C021	8.0 – 8.5	Soil	Environmental	Set 1
C32	151C020	8.0 – 8.5	Soil	Environmental	Set 1
C33	151C022	8.0 – 8.5	Soil	Environmental	Set 1
N/A	151C301	N/A	Water	Trip Blank	Total VOCs
N/A	151C301A	N/A	Water	Trip Blank	Total VOCs
N/A	151C302	N/A	Water	Trip Blank	Total VOCs
N/A	151C303	N/A	Water	Field Blank	Set 2
N/A	151C304	N/A	Water	Trip Blank	Total VOCs
N/A	151C305	N/A	Water	Trip Blank	Total VOCs
N/A	151C306	N/A	Water	Source Blank	Set 2
N/A	151C307	N/A	Water	Trip Blank	Total VOCs
N/A	151C308	N/A	Water	Trip Blank	Total VOCs
N/A	151C309	N/A	Water	Trip Blank	Total VOCs
N/A	1512310	N/A	Water	Equipment Rinsate Blank	Set 1
C01	151C501	N/A	Liquid	Waste Management	Set 2
	151C502	N/A	Liquid	Field Duplicate of #151C501	Set 2

Table A.5-1
Characterization Samples Collected at CAS 12-04-01, Septic Tanks
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
C02	151C503	N/A	Liquid	Waste Management	Set 2
C03	151C504	N/A	Liquid	Waste Management	Set 2
C04	151C505	N/A	Liquid	Waste Management	Set 2
C05	151C506	N/A	Liquid	Waste Management	Set 2
	151C512	N/A	Sludge	Waste Management	Set 2
	151C512A	N/A	Sludge	Waste Management	Set 3
C06	151C507	N/A	Liquid	Waste Management	Set 2
	151C511	N/A	Sludge	Waste Management	Set 2
	151C511A	N/A	Sludge	Waste Management	Set 3
C07	151C508	N/A	Liquid	Waste Management	Set 2
	151C510	N/A	Sludge	Waste Management	Set 2
	151C510A	N/A	Sludge	Waste Management	Set 3
C08	151C509	N/A	Liquid	Waste Management	Set 2
	151C513	N/A	Sludge	Waste Management	Set 2
	151C513A	N/A	Sludge	Waste Management	Set 3
C09	151C514	N/A	Liquid	Waste Management	Set 2
	151C515	N/A	Sludge	Waste Management	Set 4
C10	151C516	N/A	Liquid	Waste Management	Set 2
	151C517	N/A	Sludge	Waste Management	Set 4
C11	151C518	N/A	Liquid	Waste Management, MS/MSD	Set 2
	151C519	N/A	Liquid	Field Duplicate of #151C518	Set 2
	151C520	N/A	Sludge	Waste Management, MS/MSD	Set 4
	151C521	N/A	Sludge	Field Duplicate of #151C520	Set 4
C12	151C522	N/A	Liquid	Waste Management	Set 2

Set 1 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90.
Set 2 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90.
Set 3 = TCLP VOCs, TCLP SVOCs, TCLP RCRA Metals.
Set 4 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90, TCLP VOCs, TCLP SVOCs, TCLP RCRA Metals.
Set 5 = Total VOCs, Total SVOCs, TPH-DRO, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gamma Spectroscopy

ft bgs = Feet below ground surface
MS/MSD = Matrix spike/matrix spike duplicate
N/A = Not applicable

Table A.5-2
Characterization Samples Collected at CAS 12-04-02, Septic Tanks
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
D13	151D012	2.5 – 3.0	Soil	Environmental	Set 1
D14	151D001	2.5 – 3.0	Soil	Environmental	Set 1
D15	151D011	2.5 – 3.0	Soil	Environmental	Set 1
D16	151D002	2.5 – 3.0	Soil	Environmental	Set 1
D17	151D010	2.5 – 3.0	Soil	Environmental	Set 1
D18	151D003	2.5 – 3.0	Soil	Environmental	Set 1
D19	151D009	2.5 – 3.0	Soil	Environmental	Set 1
D20	151D004	2.5 – 3.0	Soil	Environmental	Set 1
D21	151D008	2.5 – 3.0	Soil	Environmental	Set 1
D22	151D005	2.5 – 3.0	Soil	Environmental	Set 1
D23	151D007	2.5 – 3.0	Soil	Environmental, MS/MSD	Set 1
D24	151D006	2.5 – 3.0	Soil	Environmental	Set 1
D25	151D016	8.0 – 8.5	Soil	Environmental	Set 1
D26	151D019	8.0 – 8.5	Soil	Environmental	Set 1
D27	151D014	8.0 – 8.5	Soil	Environmental	Set 1
	151D015	8.0 – 8.5	Soil	Field Duplicate of #151D014	Set 1
D28	151D018	8.0 – 8.5	Soil	Environmental	Set 1
D29	151D013	8.0 – 8.5	Soil	Environmental	Set 1
D30	151D017	8.0 – 8.5	Soil	Environmental	Set 1
D01	151D501	N/A	Liquid	Waste Management	Set 2
	151D507	N/A	Sludge	Waste Management	Sets 2 and 3
	151D507A	N/A	Sludge	Waste Management	Set 3
D02	151D519	N/A	Liquid	Waste Management	Set 2
D03	151D502	N/A	Liquid	Waste Management	Set 2
	151D508	N/A	Sludge	Waste Management	Sets 2 and 3
	151D508A	N/A	Sludge	Waste Management	Set 3
D04	151D503	N/A	Liquid	Waste Management	Set 2
	151D515	N/A	Liquid	Waste Management	Set 2
D05	151D504	N/A	Liquid	Waste Management	Set 2
	151D509	N/A	Sludge	Waste Management	Sets 2 and 3

Table A.5-2
Characterization Samples Collected at CAS 12-04-02, Septic Tanks
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
D06	151D511	N/A	Liquid	Waste Management, MS/MSD	Set 2
	151D512	N/A	Liquid	Field Duplicate of #151D511	Set 2
	151D513	N/A	Sludge	Waste Management, MS/MSD	Sets 2 and 3
	151D514	N/A	Sludge	Field Duplicate of #151D513	Sets 2 and 3
D07	151D510	N/A	Sludge	Waste Management	Sets 2 and 3
D08	151D505	N/A	Liquid	Waste Management	Set 2
D09	151D517	N/A	Liquid	Waste Management	Set 2
	151D521	N/A	Sludge	Waste Management	Sets 2 and 3
D10	151D518	N/A	Liquid	Waste Management	Set 2
	151D522	N/A	Sludge	Waste Management	Sets 2 and 3
D11	151D506	N/A	Liquid	Waste Management	Set 2
	151D520	N/A	Sludge	Waste Management	Sets 2 and 3
D12	151D516	N/A	Liquid	Waste Management	Set 2
N/A	151D301	N/A	Water	Trip Blank	Total VOCs
N/A	151D302	N/A	Water	Trip Blank	Total VOCs
N/A	151D303	N/A	Water	Trip Blank	Total VOCs
N/A	151D304	N/A	Water	Trip Blank	Total VOCs
N/A	151D305	N/A	Water	Trip Blank	Total VOCs
N/A	151D306	N/A	Water	Field Blank	Set 2
N/A	151D307	N/A	Water	Equipment Rinsate Blank	Set 2

Set 1 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90.
Set 2 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90.
Set 3 = TCLP VOCs, TCLP SVOCs, TCLP RCRA Metals.

ft bgs = Feet below ground surface
MS/MSD = Matrix spike/matrix spike duplicate
N/A = Not applicable

Table A.5-3
Characterization Samples Collected at CAS 12-04-03, Septic Tank
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
E09	151E007	2.5 – 3.0	Soil	Environmental	Set 1
E10	151E008	2.5 – 3.0	Soil	Environmental	Set 1
	151E009	2.5 – 3.0	Soil	Field Duplicate of #151E008	Set 1
E11	151E005	2.5 – 3.0	Soil	Environmental, MS/MSD	Set 1
E12	151E006	2.5 – 3.0	Soil	Environmental	Set 1
E13	151E003	2.5 – 3.0	Soil	Environmental	Set 1
E14	151E004	2.5 – 3.0	Soil	Environmental	Set 1
E15	151E001	2.5 – 3.0	Soil	Environmental	Set 1
E16	151E002	2.5 – 3.0	Soil	Environmental	Set 1
E17	151E011	7.5 – 8.0	Soil	Environmental	Set 1
E18	151E012	8.0 – 8.5	Soil	Environmental	Set 1
E19	151E010	8.0 – 8.5	Soil	Environmental	Set 1
E20	151E013	8.0 – 8.5	Soil	Environmental	Set 1
E01	151E511	N/A	Liquid	Waste Management	Set 2
	151E512	N/A	Sludge	Waste Management	Set 3
E02	151E513	N/A	Liquid	Waste Management	Set 2
	151E514	N/A	Sludge	Waste Management	Set 3
E03	151E507	N/A	Liquid	Waste Management	Set 2
	151E508	N/A	Sludge	Waste Management	Set 3 (except pesticides)
E04	151E509	N/A	Liquid	Waste Management	Set 2
	151E510	N/A	Sludge	Waste Management	Set 3
E05	151E515	N/A	Sediment	Waste Management	Set 3
E06	151E516	N/A	Sediment	Waste Management	Set 3
E07	151E503	N/A	Liquid	Waste Management, MS/MSD	Set 2
	151E504	N/A	Liquid	Field Duplicate of #151E503	Set 2
	151E505	N/A	Sludge	Waste Management, MS/MSD	Set 3
	151E506	N/A	Sludge	Field Duplicate of #151E505	Set 3
E08	151E501	N/A	Liquid	Waste Management	Set 2
	151E502	N/A	Sludge	Waste Management	Set 3
N/A	151E301	N/A	Water	Trip Blank	Total VOCs
N/A	151E302	N/A	Water	Trip Blank	Total VOCs

Table A.5-3
Characterization Samples Collected at CAS 12-04-03, Septic Tank
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses

Set 1 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90.
Set 2 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90.
Set 3 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90, TCLP VOCs, TCLP SVOCs, TCLP RCRA Metals.

ft bgs = Feet below ground surface
MS/MSD = Matrix spike/matrix spike duplicate
N/A = Not applicable

by rust flakes and sediment. Tank inlet 3 was similarly blocked after a 23-ft run. The inlet from Tank 4 was not accessed due to the liquid level in the tank being above the inlet.

Outlet lines are also shown on Figure A.5-5. The outlet line from Tank 1 was surveyed and determined to run 18 ft to a 90-degree bend and extended an additional 5 ft. At this point, the 6-in. VCP line became a 10-in. asbestos cement pipe (ACP) main trunk line as shown on the engineering drawings. Video surveying continued down the 10-in. line to a total length of 86 ft. The Tank 2 outlet extended 12 ft to the tie-in from Tank 1. A tie-in was observed at approximately 7 ft and again at 11 ft. The Tank 3 outlet was surveyed for 16 ft, where it tied in to the line from Tank 2. The Tank 4 outlet was surveyed for 21 ft to where it joined the line from Tank 2.

Only the outlet line from CAS 12-04-01 Tank 6 (System #1) could be video surveyed (Figure A.5-6). The liquid levels were too close to the inlet and outlet lines at all the other locations to allow for breaching. The outlet line from Tank 6 traveled 38 ft before connecting to the 10-in. main line. The mole was pushed another 5 ft down the main line, where it became visible in the manhole.

The inlet and outlet lines from the six tanks of CAS 12-04-02 were video surveyed and are shown in Figure A.5-7. Both inlet and outlet lines from Tank 1 were filled with sediment and could not be surveyed. The inlet from Tank 2 was surveyed for a distance of 14 ft, where it entered the southeast corner of the distribution box. The inlet to Tank 3 could only be surveyed for 3 ft before it was blocked with sediment. Similarly, the Tank 4 and Tank 5 inlet could only be video surveyed for 5 ft and 2.5 ft, respectively. The inlet to Tank 6 was video surveyed for 24 ft before becoming blocked.

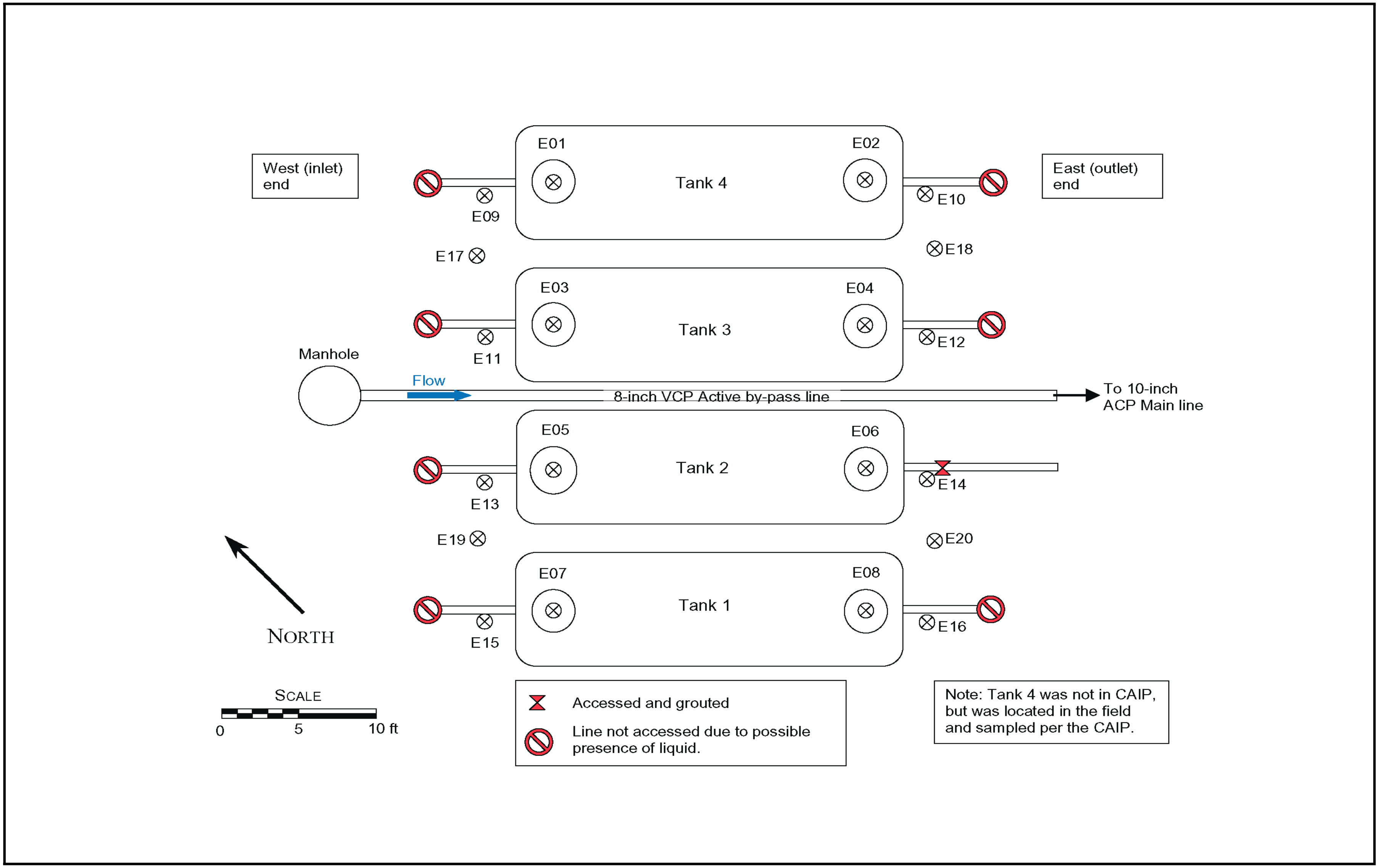

Figure A.5-4
Tank and Soil Sample Locations for System #3, CAS 12-04-03

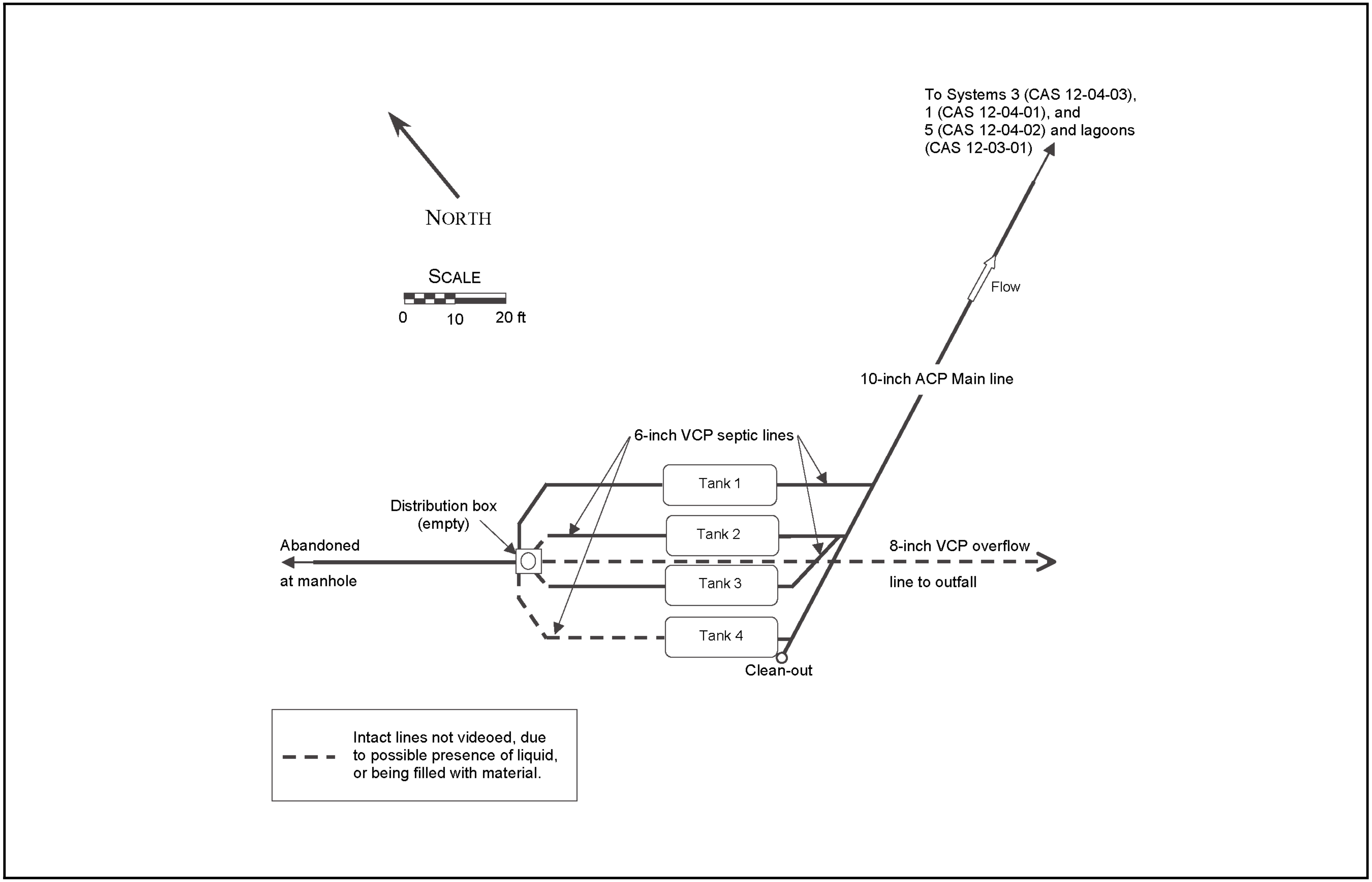

Figure A.5-5
Video-Survey Map of System #4, CAS 12-04-01

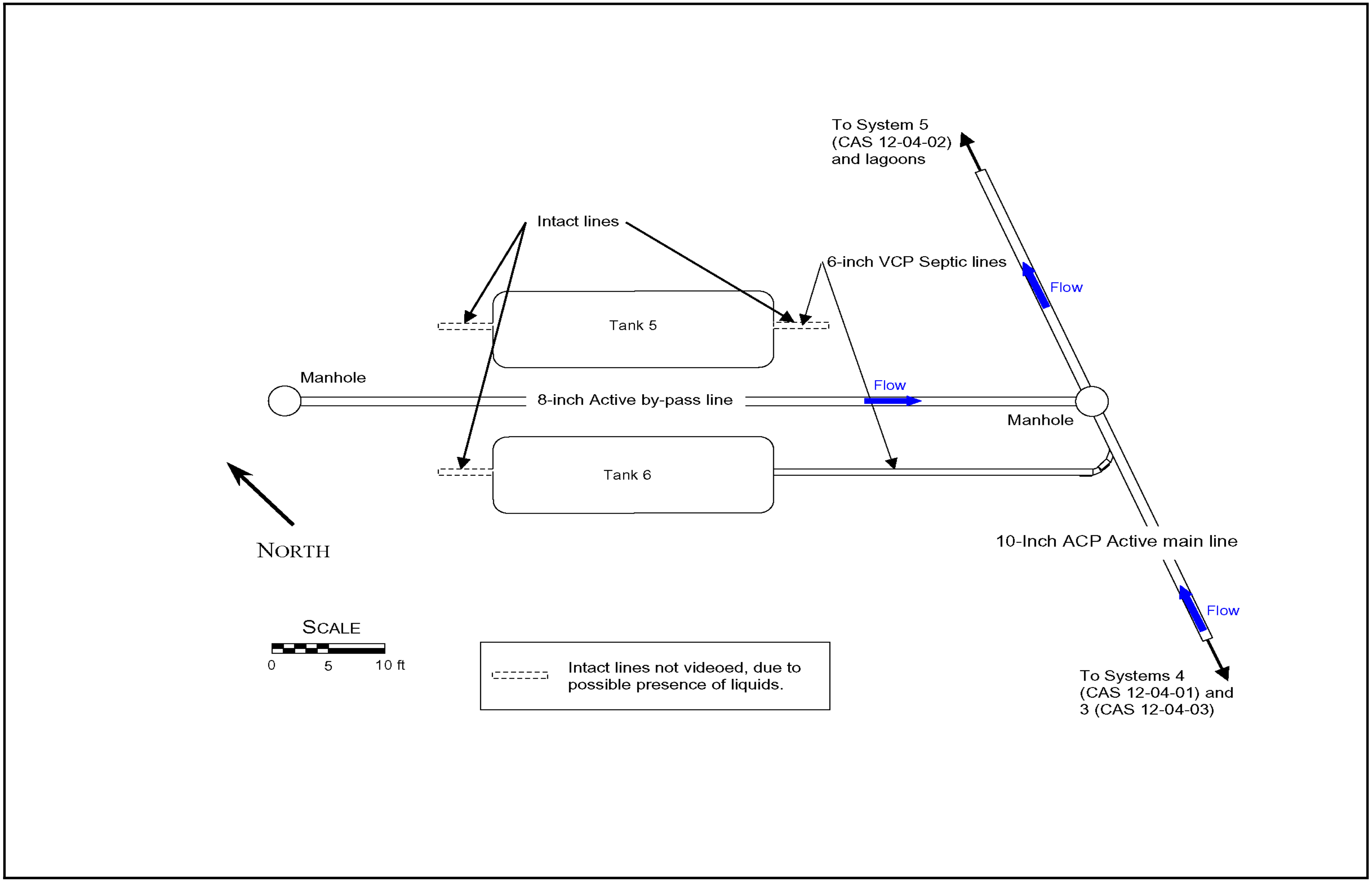

Figure A.5-6
Video-Survey Map of System #1, CAS 12-04-01

During later sampling excavation, all lines were verified to extend to the distribution box. The distribution box was opened and contained no residual material.

The outlet line from Tank 2 extended 5 ft, where it tied in to the line from Tank 1. It then continued another 12 ft south with a tie-in at approximately 11 ft. The outlet from Tank 3 line ran 4 ft to the tie-in from Tank 2 and became blocked approximately 1 ft farther. Tanks 4, 5, and 6 were similarly linked and tied in to 10-in. main line.

Due to concerns over the potential of liquids in three of the tanks at CAS 12-04-03, only one line was video surveyed. The outlet line from Tank 2 to the 10-in. ACP main and manhole was surveyed (see Figure A.5-8)

No broken or breached lines were detected during video surveying or excavation at any of the CASs.

A.5.1.2 Field Screening

Decision I soil samples from each CAS were field screened for VOCs and alpha and beta/gamma radiation as specified in the CAU 151 CAIP. The FSRs were compared to FSLs to guide subsequent sampling decisions where appropriate. Alpha and beta/gamma radiation FSLs were not exceeded during sampling activities. Volatile organic compound headspace FSLs were also not exceeded.

A.5.1.3 Sample Collection

Intrusive investigation activities (i.e., surface and shallow subsurface soil sampling) were conducted to support investigation activities. Soil samples were collected using hand auger sampling equipment or from a backhoe bucket for sampling depths greater than 4 ft bgs.

Decision I sampling activities at CAS 12-04-01 included the collection of environmental soil samples from 21 locations: C13 through C33. These locations represented areas of potential release as detailed in the CAU 151 CAIP. Locations included beneath inlet and outlet lines, and between tanks at a depth equivalent to the bottom of the tanks.

The contents of the six septic tanks were sampled through the access hatches of each tank. Samples C01 through C12 were collected to determine whether the contents constituted a potential contamination source and for waste management purposes.

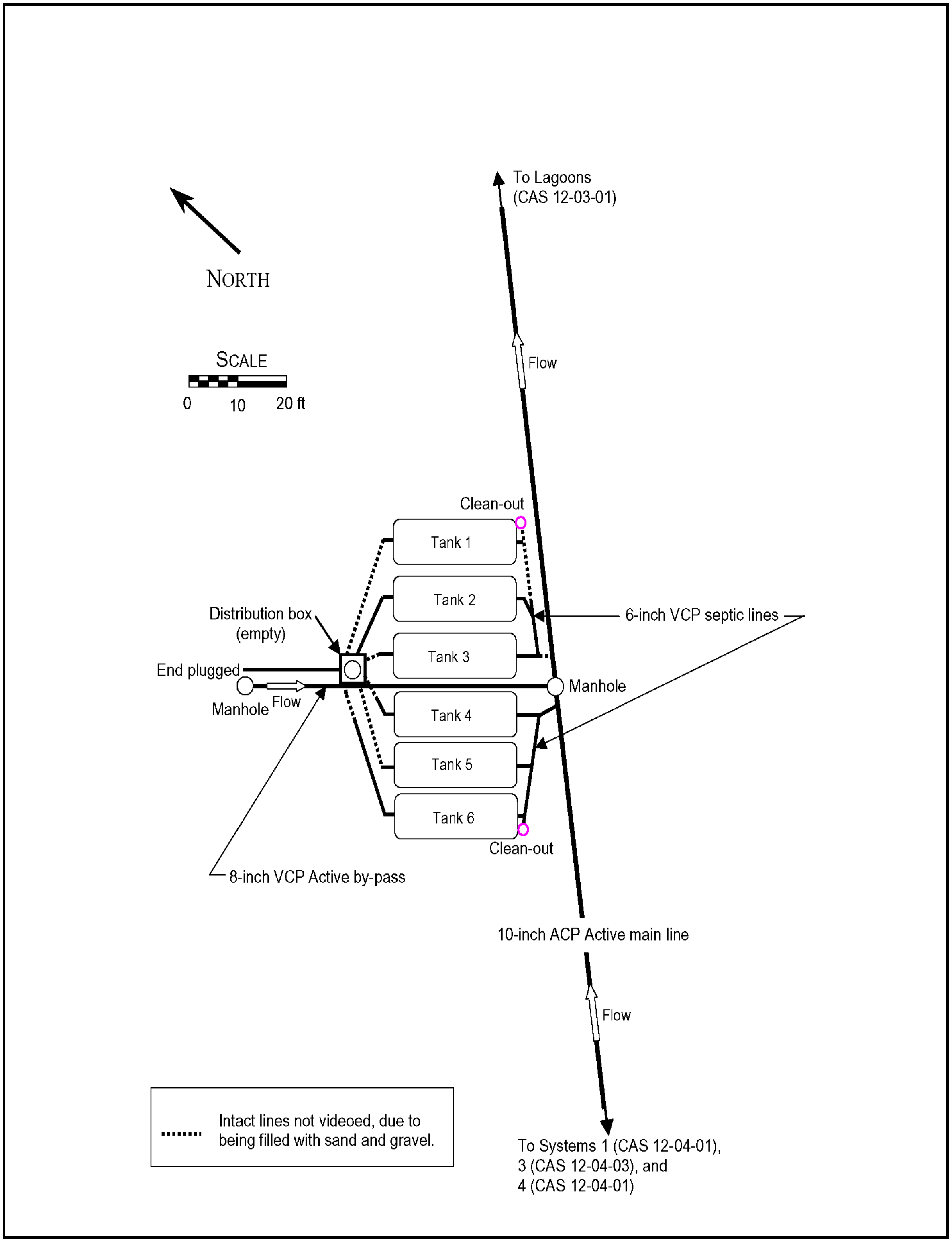

Figure A.5-7
Video-Survey Map of System #5, CAS 12-04-02

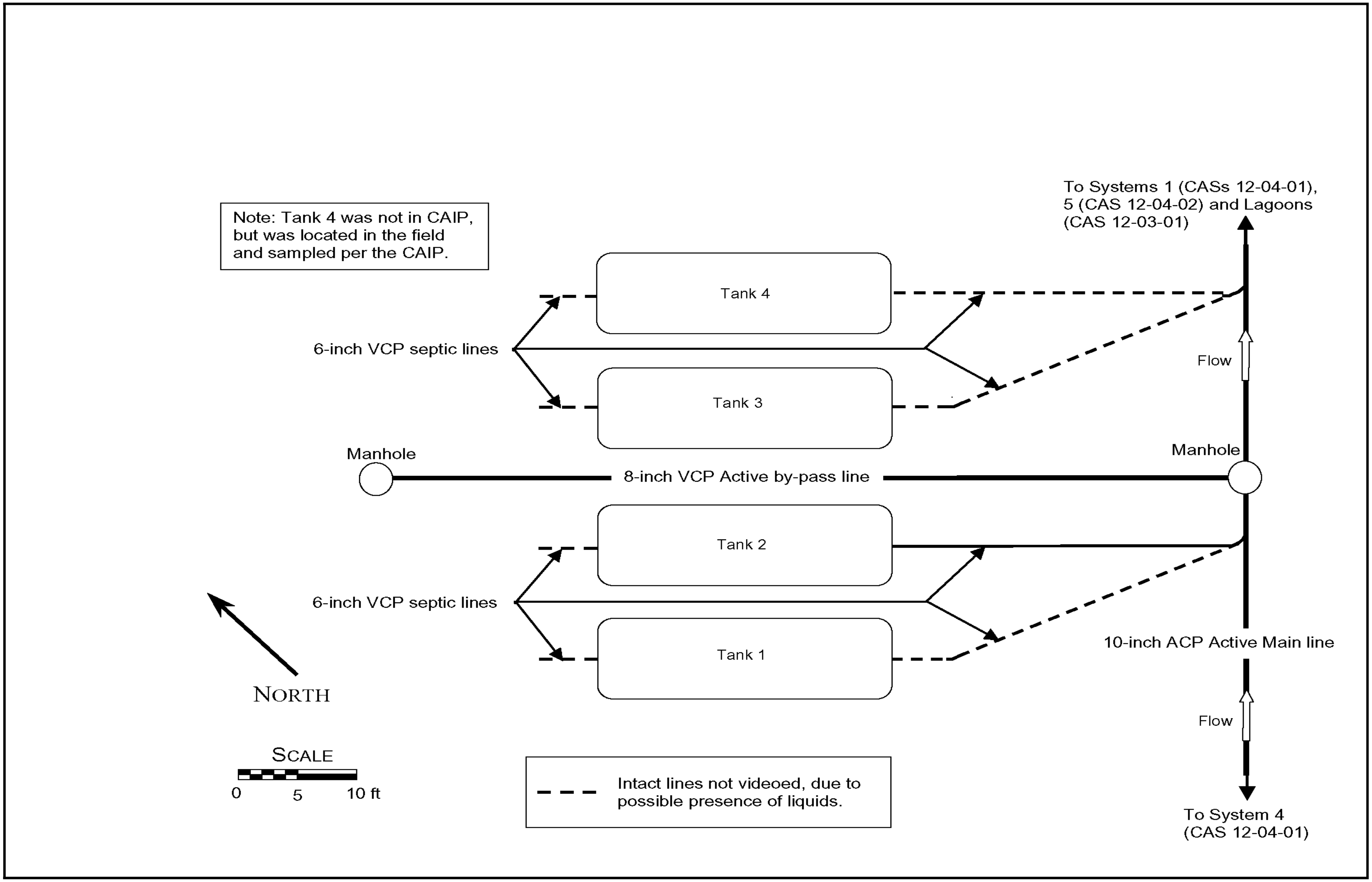

Figure A.5-8
Video-Survey Map of System #3, CAS 12-04-03

Decision I sampling activities at CAS 12-04-02 included the collection of environmental soil samples from 18 locations: D13 through D39. These locations represented areas of potential release as detailed in the CAU 151 CAIP. Locations included beneath inlet and outlet lines, and between tanks at a depth equivalent to the bottom of the tanks.

The contents of the six septic tanks were sampled through the access hatches of each tank. Samples D01 through D12 were collected to determine whether the contents constituted a potential contamination source and for waste management purposes.

Decision I sampling activities at CAS 12-04-03 included the collection of environmental soil samples from 12 locations: E09 through E20. These locations represented areas of potential release as detailed in the CAU 151 CAIP. Locations included beneath inlet and outlet lines, and between tanks at a depth equivalent to the bottom of the tanks.

The contents of the four septic tanks were sampled through the access hatches of each tank. Samples E01 through E08 were collected to determine whether the contents constituted a potential contamination source and for waste management purposes.

A.5.1.4 Deviations

There were two deviations to the CAIP requirements at this CAS. No field blank was collected at CAS 12-04-03. Because samples from 12-04-03 did not have any detections above PALs, there is no expected impact to the results.

Due to concerns over the potential of liquids in three of the tanks at CAS 12-04-03 only one line was video surveyed. Based on the results of the video surveys at the adjacent CASs, it was unlikely that any residual material was present in the lines. Therefore, there was no impact to CAI activities at CAS 12-04-03.

A.5.2 Investigation Results

The following sections provide analytical results from the samples collected to complete investigation activities as outlined in the CAIP. Environmental investigation samples were analyzed for the CAIP-specified COPCs, which included VOCs, SVOCs, pesticides, TPH-GRO, TPH-DRO, RCRA metals and beryllium, gamma-emitting radionuclides, isotopic uranium, isotopic plutonium, and Sr-90. An unedited set of all analytical data is retained in electronic format in the project files.

Analytical results from the soil samples with concentrations exceeding MDCs are summarized in the following sections. An evaluation was conducted on all contaminants detected above MDCs by comparing individual concentration or activity results against the FALs. Establishment of the FALs is presented in Appendix D. The FALs were established as the corresponding PAL concentrations or activities if the contaminant concentrations were below their respective PALs.

A total of 34 liquid samples (including four FDs and three MS/MSDs) (one from each tank chamber) were analyzed for the same set of analytes as the environmental soil samples. A total of 34 sludge samples (including three FD and three MS/MSDs) were analyzed for the same constituents as the environmental soil samples with the addition of TCLP VOCs, TCLP SVOCs, and TCLP metals.

A.5.2.1 Volatile Organic Compounds

Analytical results for VOCs detected in soil samples above MDCs are presented in Tables A.5-4 and A.5-5. No VOCs in soils were above MDCs at CAS 12-04-01. No VOCs in soils exceeded their respective PALs.

Analytical results for VOCs detected above MDCs in samples collected of septic tank contents are presented in Section A.8.0 on an individual tank basis. In the septic, tanks three contaminants (1,4-dichlorobenzene, methylene chloride, and trichloroethene) were detected above PALs.
1, 4-dicholorobenzene was detected above the PAL of 7,900 μg/kg, in sludge samples, in at least one chamber of almost every tank at the three CASs, but all concentrations were below the FAL of 3,060,000 μg/kg. Methylene chloride was detected above the PAL of 21,000 μg/kg in the outlet chamber of one tank (CAS 12-04-02, System #5, Tank #5), but the concentration was below the FAL of 1,390,000. The only VOC that prompted the identification of the sludge as potential source material was trichloroethene, as it was detected in sludge, above the FAL of 5,730 μg/kg, in the inlet chamber of one tank (CAS 12-04-01, System #1, Tank #5). These results are presented in Table A.5-6.

Table A.5-4
Sample Results for VOCs Detected Above
Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			2-Hexanone
Final Action Levels[a]			110,000,000
D20	151D004	2.5 - 3.0	91

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram

Table A.5-5
Sample Results for VOCs Detected Above
Minimum Detectable Concentrations at CAS 12-04-03, Septic Tank

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			2-Hexanone
Final Action Levels[a]			110,000,000
E09	151E007	2.5 - 3.0	22
E17	151E011	7.5 - 8.0	42

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram

A.5.2.2 Semivolatile Organic Compounds

Analytical results for SVOCs detected in soil samples above MDCs are presented in Tables A.5-7 through A.5-9.

Septic tank contents SVOC analytical results detected above MDCs are presented in Section A.8.0 on an individual tank basis. Only bis(2-ethylhexyl)phthalate and benzo(a)pyrene were detected above PALs.

Benzo(a)pyrene was also detected above the PAL in the inlet chamber of Tank #3 at CAS 12-04-03. Bis(2-ethylhexyl)phthalate was detected in the outlet chamber of System #1, Tank #5, at CAS 12-04-01. Both constituents were below FALs.

Table A.5-6
Sample Results for VOCs Detected above PALs in Septic Tanks for CASs 12-04-01, 12-04-02, and 12-04-03

Sample Number	Location	Tank Number/ Chamber	Constituent	Result	FAL[a]	Units
CAS 12-04-01, System #4						
151C512	C05	Tank #3 Inlet	1,4-dichlorobenzene	12,000	3,060,000	µg/kg
151C513	C08	Tank #4 Outlet	1,4-dichlorobenzene	35,000	3,060,000	µg/kg
CAS 12-04-01, System #1						
151C515	C09	Tank #5 Inlet	1,4-dichlorobenzene	2,300	3,060,000	µg/kg
			Trichloroethene	2,000,000	5,730	µg/kg
151C517	C10	Tank #5 Outlet	1,4-dichloroethene	16,000	3,060,000	µg/kg
			Trichloroethene	590	5,730	µg/kg
151C520	C11	Tank #6 Inlet	1,4-dichlorobenzene	37,000	3,060,000	µg/kg
151C521 (Duplicate of 151C520)	C11		1,4-dichlorobenzene	530,000	3,060,000	µg/kg
CAS 12-04-02						
151D508	D03	Tank #2 Inlet	1,4-dichlorobenzene	71,000	3,060,000	µg/kg
151D509	D05	Tank #3 Inlet	1,4-dichlorobenzene	38,000	3,060,000	µg/kg
151D510	D07	Tank #4 Inlet	1,4-dichlorobenzene	1,100,000	3,060,000	µg/kg
151D521	D09	Tank #5 Inlet	1,4-dichlorobenzene	500,000	3,060,000	µg/kg
			Methylene Chloride	100,000	1,390,000	µg/kg
151D520	D11	Tank #6 Inlet	1,4-dichlorobenzene	140,000	3,060,000	µg/kg
CAS 12-04-03						
151E502	E08	Tank #1 Outlet	1,4-dichlorobenzene	350,000	3,060,000	µg/kg
151E506	E07	Tank #1 Inlet	1,4-dichlorobenzene	300,000	3,060,000	µg/kg
151E510	E04	Tank #3 Inlet	1,4-dichlorobenzene	27,000	3,060,000	µg/kg

[a]Based on Oak Ridge National Laboratory Risk Assessment Information System (ORNL, 2005).

FAL = Final action level
µg/kg = micrograms pre kilogram.

Table A.5-7
Sample Results for SVOCs Detected Above
Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)	
			Bis(2-Ethylhexyl)Phthalate	Diethyl Phthalate
Final Action Levels[a]			120,000	100,000,000
D13	151D012	2.5 - 3.0	41 (J)	--
D14	151D001	2.5 - 3.0	370	--
D21	151D008	2.5 - 3.0	44 (J)	--
D23	151D007	2.5 - 3.0	27 (J)	--
D24	151D006	2.5 - 3.0	--	100 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

Table A.5-8
Sample Results for SVOCs Detected Above
Minimum Detectable Concentrations at CAS 12-04-03, Septic Tank

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)		
			Bis(2-Ethylhexyl)Phthalate	Dimethyl Phthalate	Di-N-Butyl Phthalate
Final Action Levels[a]			120,000	100,000,000	62,000,000
E10	151E009	2.5 - 3.0	--	--	24 (J)
E11	151E005	2.5 - 3.0	--	--	27 (J)
E17	151E011	7.5 - 8.0	31 (J)	49 (J)	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

A.5.2.3 Total Petroleum Hydrocarbons

Total petroleum hydrocarbon-DRO analytical results detected in soil samples above MDCs are presented in Tables A.5-10 and A.5-11. No TPH-DRO was detected above MDCs at CAS 12-04-03. Corrective action sites 12-04-01 and 12-04-02 each had one location with TPH-DRO values greater than PALs.

Table A.5-9
Sample Results for SVOCs Detected Above Minimum Detectable Concentrations at CAS 12-04-03, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)		
			Bis(2-Ethylhexyl)Phthalate	**Dimethyl Phthalate**	**Di-N-Butyl Phthalate**
Final Action Levels[a]			**120,000**	**100,000,000**	**62,000,000**
E10	151E009	2.5 - 3.0	--	--	24 (J)
E11	151E005	2.5 - 3.0	--	--	27 (J)
E17	151E011	7.5 - 8.0	31 (J)	49 (J)	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

Table A.5-10
Sample Results for TPH-DRO Detected Above Minimum Detectable Concentrations at CAS 12-04-01, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)
			Diesel-Range Organics
Preliminary Action Levels[a]			**100**
C19	151C004	4.0 - 4.5	17 (H)
C16	151C006	2.5 - 3.0	**110** (H)
C20	151C008	3.5 - 4.0	33 (H)
	151C009	3.5 - 4.0	16 (H, Z)
C21	151C010	2.0 - 2.5	76 (H)

[a]Based on *Nevada Administrative Code*; Contamination of soil: Establishment of action levels (NAC, 2002).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
H = Fuel pattern in the heavier end of retention time window.
Z = Result did not resemble any common TPH products.

Sample 151C006 was collected immediately beneath the outlet pipe from Septic Tank 2 of CAS 12-04-01. It was collected from a depth of approximately 2.5 to 3 ft bgs. The TPH-DRO was moved on to a Tier 2 evaluation and FALs were established for the hazardous constituents for TPH-DRO. Concentrations of the hazardous constituents of TPH-DRO did not exceed FALs.

Table A.5-11
Sample Results for TPH-DRO Detected Above Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)
			Diesel-Range Organics
Preliminary Action Levels[a]			**100**
D13	151D012	2.5 - 3.0	2.5 (J)
D14	151D001	2.5 - 3.0	**130** (M)

[a]Based on *Nevada Administrative Code*; Contamination of soil: Establishment of action levels (NAC, 2002).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
J = Estimated value.
M = A pattern resembling motor oil was detected.

Therefore, TPH-DRO is not considered a COC. The calculation of FALs for the hazardous constituents of TPH-DRO is presented in Appendix D.

Sample 151D001 came from immediately below the outlet pipe from Septic Tank 1 of CAS 12-04-02. It was collected from a depth of 2.5 to 3 ft bgs. The TPH-DRO was moved on to a Tier 2 evaluation, and FALs were established for the hazardous constituents for TPH-DRO. Concentrations of the hazardous constituents of TPH-DRO did not exceed FALs. Therefore, TPH-DRO is not considered a COC. The calculation of FALs for the hazardous constituents of TPH-DRO is presented in Appendix D.

Analytical results of septic tank contents for TPH-DRO and TPH-GRO detected above MDCs are presented in Section A.8.0 on an individual tank basis. The TPH-DRO and TPH-GRO were moved on to a Tier 2 evaluations and FALs were established for the hazardous constituents for TPH-DRO and TPH-GRO. Concentrations of the hazardous constituents of TPH-DRO and TPH-GRO are discussed in Sections A.5.2.1 and A.5.2.2. The calculation of FALs for the hazardous constituents of TPH-DRO are presented in Appendix D.

A.5.2.4 Pesticides

Analytical results for pesticides detected above MDCs are presented in Tables A.5-12, A.5-13, and A.5-14. No pesticides in soils were detected at concentrations exceeding the respective PALs in soils at any of the three CASs investigated. No pesticides are considered potential source material in any sludge sample at any of these CASs.

Table A.5-12
Sample Results for Pesticides Detected Above
Minimum Detectable Concentrations at CAS 12-04-01, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)					
			4,4'-DDT	Aldrin	Chlordane	Delta-BHC	Endrin	Heptachlor Epoxide
Final Action Levels			7,000[a]	100[a]	6,500[a]	360[a]	180,000[a]	190[a]
C13	151C023	0.0 - 1.0	--	--	1300 (J)	--	--	--
	151C013	3.0 - 3.5	0.85 (J)	--	83	--	--	1.1 (J)
C14	151C005	3.0 - 3.5	--	--	--	--	--	--
C15	151C001	2.5 - 3.0	--	--	--	--	--	--
C16	151C006	2.5 - 3.0	--	--	3,500 (J)	--	17 (J)	
C17	151C003	2.5 - 3.5	--	--	220 (J)	--	--	--
C18	151C007	2.5 - 3.0	--	--	200	--	--	3.4 (J)
C19	151C004	4.0 - 4.5	--	--	22 (J)	--	--	--
C20	151C008	3.5 - 4.0	--	--	750 (J)	--	--	--
	151C009	3.5 - 4.0	--	--	1300 (J)	--	--	--
C21	151C010	2.0 - 2.5	--	--	--	--	--	--
C22	151C011	2.0 - 2.5	1.2 (J)	1.1 (J)	--	2.4 (J)	--	--
C24	151C013	2.0 - 2.5	11 (J)	--	--	--	--	--
C26	151C015	8.0 - 8.5	--	--	--	--	--	--
C28	151C014	8.0 - 8.5	--	--	--	--	--	--
C29	151C018	4.0 - 4.5	--	--	--	--	--	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

Table A.5-13
Sample Results for Pesticides Detected Above
Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)		
			Beta-BHC	Delta-BHC	Dieldrin
Final Action Levels[a]			1,300	360	110
D14	151D001	2.5 - 3.0	--	--	3.2 (J)
D15	151D011	2.5 -3.0	--	2.3 (J)	--
D18	151D003	2.5 -3.0	--	--	--
D20	151D004	2.5 -3.0	--	1.7 (J)	--
D22	151D005	2.5 -3.0	--	1.5 (J)	--
D23	151D007	2.5 -3.0	3.2 (J)	4.3 (J)	--
D27	151D015	8.0 - 8.5	--	1.6 (J)	--
D28	151D018	8.0 - 8.5	0.47 (J)	--	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

Table A.5-14
Sample Results for Pesticides Detected Above
Minimum Detectable Concentrations at CAS 12-04-03, Septic Tank
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)			
			4,4'-DDT	Beta-BHC	Delta-BHC	Heptachlor
Final Action Levels[a]			7,000	1,300	360	380
E09	151E007	2.5 - 3.0	--	--	0.82 (J)	--
E10	151E008	2.5 - 3.0	6.2 (J)	--	--	--
	151E009	2.5 - 3.0	--	--	--	--
E11	151E005	2.5 - 3.0	--	--	--	--
E12	151E006	2.5 - 3.0	6.5 (J)	--	4.4 (J)	--
E13	151E003	2.5 - 3.0	--	--	--	--
E14	151E004	2.5 - 3.0	--	--	--	--
E16	151E002	2.5 - 3.0	--	--	--	--

Table A.5-14
Sample Results for Pesticides Detected Above
Minimum Detectable Concentrations at CAS 12-04-03, Septic Tank
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)			
			4,4'-DDT	Beta-BHC	Delta-BHC	Heptachlor
Final Action Levels[a]			7,000	1,300	360	380
E17	151E011	7.5 - 8.0	--	0.48 (J)	--	2.3 (J)
E18	151E012	8.0 - 8.5	5.4 (J)	--	--	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

A.5.2.5 Polychlorinated Biphenyls

Analytical results for PCBs exceeding the MDCs in soil samples are presented in Tables A.5-15 and A.5-16. Concentrations of PCBS were not detected at concentrations exceeding the respective PALs in soils at CAS 12-04-01 or CAS 12-04-02. No PCBs were detected above MDCs at CAS 12-04-03.

Table A.5-15
Sample Results for PCBs Detected Above
Minimum Detectable Concentrations at CAS 12-04-01, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			Aroclor 1260
Final Action Levels[a]			740
C13	151C013	3.0 - 3.5	12 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value.

Table A.5-16
Sample Results for PCBs Detected Above
Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			Aroclor 1254
Final Action Levels[a]			**740**
D14	151D001	2.5 - 3.0	65 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value.

Analytical results for PCBs detected above MDCs in samples collected of septic tank contents are presented in Section A.8.0 on an individual tank basis. In the septic tanks, three PCBs (aroclor-1254, aroclor-1260, and aroclor-1268) were detected above respective PALs in sludge samples in eight chambers of five tanks at CASs 12-04-01 and 12-04-03. The only PCB that prompted the identification of the sludge as potential source material was aroclor-1254, as it was detected in sludge above the FAL of 27,700 µg/kg in the outlet chamber of one tank (CAS 12-04-01, System #1, Tank #5). These results are presented in Table A.5-17.

A.5.2.6 RCRA Metals and Beryllium

Analytical results for RCRA metals and beryllium detected in soil samples above MDCs are presented in Tables A.5-18, A.5-19, and A.5-20. No metals were detected at concentrations exceeding the respective PALs in soils at any of the three CASs investigated.

Metals and beryllium analytical results from septic tank contents detected above MDCs are presented in Section A.8.0 on an individual tank basis. Two metals arsenic and lead were each detected in five sludge samples above their PALs. Only the tanks at CAS 12-04-01 contained these contaminants. System #1, Tank #5 and #6, contained lead, while only the inlet chambers of Tanks #3 and #4, System #4, contained arsenic. Both contaminants were below FALs and are not considered potential source material.

Table A.5-17
Sample Results for PCBs Detected above PALs in Septic Tanks for CASs 12-04-01 and 12-04-03

Sample Number	Location	Tank Number/ Chamber	Constituent	Result	FAL[a]	Units
CAS 12-04-01, Systems #1 and #4						
151C513	C08	Tank #4 Outlet	Aroclor-1254	1,200	27,700	µg/kg
151C515	C09	Tank #5 Inlet	Aroclor-1254	6,400	27,700	µg/kg
151C517	C10	Tank #5 Outlet	Aroclor-1254	37,000	27,700	µg/kg
151C520	C11	Tank #6 Inlet	Aroclor-1254	2,200	27,700	µg/kg
151C521 (Duplicate of 151C520)	C11		Aroclor-1254	4,700	27,700	µg/kg
CAS 12-04-03						
151E508	E03	Tank #3 Outlet	Aroclor-1260	5,300	28,800	µg/kg
151E510	E04	Tank #3 Inlet	Aroclor-1260	930	28,800	µg/kg
151E512	E01	Tank #4 Inlet	Aroclor-1268	5,700	28,800	µg/kg
151E514	E02	Tank #4 Outlet	Aroclor-1268	2,500	28,800	µg/kg

[a]Based on Oak Ridge National Laboratory Risk Assessment Information System (ORNL, 2005).

FAL = Final action level
µg/kg = micrograms pre kilogram.

A.5.2.7 Gamma-Emitting Radionuclides

Gamma-emitting radionuclide analytical results for soil samples detected above MDCs are presented in Tables A.5-21, A.5-22, and A.5-23. No radionuclides were detected at concentrations exceeding the respective PALs in soils at any of the three CASs investigated.

Table A.5-18
Sample Results for Metals Detected Above Minimum Detectable Concentrations at CAS 12-04-01, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)							
			Arsenic	Barium	Beryllium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			23[a]	67,000[b]	1,900[b]	450[b]	750[b]	310[b]	5,100[b]	5,100[b]
C13	151C023	0.0 - 1.0	3.4	170	0.85	3.5	13	0.0065 (J)	--	--
	151C013	3.0 - 3.5	3.1	90	1	3.4	11	--	--	--
C14	151C005	3.0 - 3.5	2.6	100	1	3.2	14	--	--	--
C15	151C001	2.5 - 3.0	2.5	100	0.98	3.1	11	--	--	--
C16	151C006	2.5 - 3.0	2.3	130	1	5.2	14	0.094	--	0.23 (B)
C17	151C003	2.5 - 3.5	3.2	120	1	3.8	12	--	--	--
C18	151C007	2.5 - 3.0	2.8	99	1.1	3.6	10	--	--	--
C19	151C004	4.0 - 4.5	2.8	97	1	3.3	9.9	--	--	--
C20	151C008	3.5 - 4.0	4.3	120	1.1	4.9	14	--	--	--
	151C009	3.5 - 4.0	3.5	110	1.1	3.6	11	--	--	--
C21	151C010	2.0 - 2.5	4.1	120	0.95	4.4	21	--	--	--
C22	151C011	2.0 - 2.5	3.7	110	0.95	3.8	32	0.044	--	--
C23	151C012	2.0 - 2.5	4.5	76	1	4.6	11	0.041	--	--
C24	151C013	2.0 - 2.5	5	140	0.8	9.6	24	0.057	--	--
C25	151C016	8.0 - 8.5	4.2	100	1.6	5 (J)	15	0.099	--	--
C26	151C015	8.0 - 8.5	2.4	86	0.97	3.6	8	--	--	--
C27	151C017	8.0 - 8.5	2.6	96	1	4	14	--	0.57 (J+)	--
C28	151C014	8.0 - 8.5	3	95	0.99	4 (J)	9.7	--	--	--
C29	151C018	4.0 - 4.5	2.9	94	0.95	4.8	11	--	--	--
C30	151C019	7.5 - 8.0	4.3	70	0.78	2.7	8.3	--	0.4 (J+)	--
C31	151C021	8.0 - 8.5	2.9	150	0.82	2.1	15	--	--	--
C32	151C020	7.5 - 8.0	2.4	94	0.73	1.7	6.9	0.037	--	--
C33	151C022	8.0 - 8.5	2.5	79	0.71	1.6	11	--	--	--

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum detectable concentrations.
B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.

Table A.5-19
Sample Results for Metals Detected Above Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)							
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium
Final Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**750[b]**	**310[b]**	**5,100[b]**
D13	151D012	2.5 - 3.0	2.2	100	1.2	--	3.6	17	0.02 (J-)	--
D14	151D001	2.5 - 3.0	3.2	130 (J)	1.2	--	3.4	49 (J)	0.016 (J-)	--
D15	151D011	2.5 - 3.0	2.6	100	1.3	--	3	11	0.023 (J-)	--
D16	151D002	2.5 - 3.0	3.3	89 (J)	1	--	6.5	14 (J)	0.022 (J-)	--
D17	151D010	2.5 - 3.0	3.1	120 (J)	1.3	--	3.5	22 (J)	0.017 (J-)	--
D18	151D003	2.5 - 3.0	2.8	92 (J)	1.1	--	3.6	22 (J)	0.016 (J-)	--
D19	151D009	2.5 - 3.0	2.9	96 (J)	1.2	--	3.7	12 (J)	0.039 (J-)	--
D20	151D004	2.5 - 3.0	3.2	92 (J)	1.1	--	4.2	19 (J)	0.023 (J-)	--
D21	151D008	2.5 - 3.0	2.7	99 (J)	0.99	--	3.1	20 (J)	0.025 (J-)	--
D22	151D005	2.5 - 3.0	3.2	130 (J)	1.1	0.13 (J-)	3.3	12 (J)	0.019 (J-)	--
D23	151D007	2.5 - 3.0	2.3 (J-)	130 (J)	1.1	--	3.1	16 (J)	0.015 (J-)	--
D24	151D006	2.5 - 3.0	2.3	100 (J)	1.1	--	3.6	11 (J)	0.018 (J-)	--
D25	151D016	8.0 - 8.5	3	73	0.94	--	2.7	9.5	0.021 (J-)	0.36 (B)
D26	151D019	8.0 - 8.5	3.3	92	1.2	--	3.2	11	0.019 (J-)	--
D27	151D014	8.0 - 8.5	3	190	1.3	--	3.3	25	0.019 (J-)	--
	151D015	8.0 - 8.5	2.8	90	1.1	--	2.8	13	0.018 (J-)	--
D28	151D018	8.0 - 8.5	2.4	120	1	--	2.8	21	0.02 (J-)	--
D29	151D013	8.0 - 8.5	2.8	82	1	--	2.7	10	0.026 (J-)	--
D30	151D017	8.0 - 8.5	2.6	98	0.97	--	2.7	11	0.033 (J-)	--

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum detectable concentrations.
B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
J = Estimated value.
J- = The result is an estimated quantity, but the result may be biased low.

Table A.5-20
Sample Results for Metals Detected Above Minimum Detectable Concentrations at CAS 12-04-03, Septic Tank

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)						
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury
Final Action Levels			23[a]	67,000[b]	1,900[b]	450[b]	450[b]	750[b]	310[b]
E09	151E007	2.5 - 3.0	5.1	87	0.74	--	4.5 (J)	13	--
E10	151E008	2.5 - 3.0	4.3	71	0.79	--	3.3 (J)	13	--
	151E009	2.5 - 3.0	4.1	94	0.82	0.04 (J-)	3.3 (J)	26	--
E11	151E005	2.5 - 3.0	3.6	120	0.85	--	3.7 (J)	17	0.041
E12	151E006	2.5 - 3.0	3.6	86	1	--	4.2 (J)	12	0.055
E13	151E003	2.5 - 3.0	4.6	88	1.3	--	9 (J)	17	0.05
E14	151E004	2.5 - 3.0	3.7	66	0.84	--	3.2 (J)	9.7	0.042
E15	151E001	2.5 - 3.0	3.2	77	0.9	--	3.1 (J)	17	--
E16	151E002	2.5 - 3.0	3.1	85	0.95	--	5.3 (J)	12	0.04
E17	151E011	7.5 - 8.0	4.2	65	0.78	--	3.7	9.8	0.043
E18	151E012	8.0 - 8.5	2.6	76	0.87	--	2.7	16	0.047
E19	151E010	8.0 - 8.5	4.7	67	0.83	--	3	9.3	0.045
E20	151E013	8.0 - 8.5	3.3	90	1	--	2.7	9.9	0.049

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum detectable concentrations.
J = Estimated value.
J- = The result is an estimated quantity, but the result may be biased low.

Table A.5-21
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-01, Septic Tanks
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)						
			Actinium-22[a]	Bismuth-214[a]	Cesium-137[b]	Lead-212[a]	Lead-214[a]	Thallium-208[a]	Thorium-234[b]
Final Action Levels			15	15	12.2	15	15	15	105
Depth bgs (cm)			>15	>15		>15	>15	>15	
C13	151C023	0.0 - 1.0	1.93 (G)	1.26 (G, J)	--	1.66 (J)	1.45 (G, J)	0.63 (G)	--
	151C013	3.0 - 3.5	1.87 (G)	--	--	1.82 (J)	0.87 (G, J)	0.58 (G)	--
C14	151C005	3.0 - 3.5	1.87 (G)	--	--	1.88 (J)	--	--	--
C15	151C001	2.5 - 3.0	--	--	--	2.24 (J)	0.88 (G, J)	--	--
C16	151C006	2.5 - 3.0	1.84 (G)	1.11 (G, J)	--	1.99 (J)	0.88 (G, J)	0.69 (G)	--
C17	151C003	2.5 - 3.5	1.53 (G)	--	--	2.21 (J)	1.13 (G, J)	0.59 (G)	--
C18	151C007	2.5 - 3.0	2.23 (G)	--	--	2.34 (J)	1.08 (G, J)	0.48 (G)	--
C19	151C004	4.0 - 4.5	2.25 (G)	--	--	1.67 (J)	1.2 (G, J)	0.8 (G)	--
C20	151C008	3.5 - 4.0	1.5 (G)	--	--	2.17 (J)	0.87 (G, J)	--	--
	151C009	3.5 - 4.0	--	--	--	2.33 (J)	0.87 (G, J)	0.58 (G)	--
C21	151C010	2.0 - 2.5	1.85 (G)	0.86 (G, J)	--	2.52 (J)	1.22 (G, J)	0.62 (G)	--
C22	151C011	2.0 - 2.5	2.04 (G)	0.89 (G, J)	--	2.42 (J)	1.28 (G, J)	0.69 (G)	--
C23	151C012	2.0 - 2.5	2.09 (G)	1.18 (G, J)	--	2.33 (J)	0.99 (G, J)	0.69 (G)	--
C24	151C013	2.0 - 2.5	2.57 (G)	1.05 (G, J)	0.42 (G, LT)	2.75 (J)	1.36 (G, J)	0.88 (G)	--
C25	151C016	8.0 - 8.5	2.25 (G)	0.92 (G, J)	--	2.56 (J)	1.19 (G, J)	0.79 (G)	--
C26	151C015	8.0 - 8.5	2.41 (G)	0.86 (G, J)	--	2.74 (J)	1 (G, J)	0.81 (G)	--
C27	151C017	8.0 - 8.5	2.5 (G)	1.17 (G, J)	0.223 (G, LT)	2.32 (J)	1.27 (G, J)	0.66 (G)	--

Table A.5-21
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-01, Septic Tanks
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)						
			Actinium-228[a]	Bismuth-214[a]	Cesium-137[b]	Lead-212[a]	Lead-214[a]	Thallium-208[a]	Thorium-234[b]
Final Action Levels			15	15	12.2	15	15	15	105
Depth bgs (cm)			>15	>15		>15	>15	>15	
C28	151C014	8.0 - 8.5	1.96 (G)	1.12 (G, J)	--	2.52 (J)	1.3 (G, J)	0.71 (G)	--
C29	151C018	4.0 - 4.5	1.81 (G)	1.11 (G, J)	--	2.36 (J)	1.46 (G, J)	0.75 (G)	--
C30	151C019	7.5 - 8.0	1.5 (G)	0.8 (G, J)	--	2.33 (J)	1.13 (G, J)	0.74 (G)	2.9 (G, TI)
C31	151C021	8.0 - 8.5	1.95 (G)	0.89 (G, J)	--	2.31 (J)	1.09 (G, J)	0.73 (G)	--
C32	151C020	7.5 - 8.0	1.71 (G)	1.05 (G, J)	--	2.41 (J)	1.18 (G, J)	0.71 (G)	--
C33	151C022	8.0 - 8.5	2.21 (G)	0.98 (G, J)	--	2.18 (J)	1.12 (G, J)	0.72 (G)	--

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, as found in Chapter IV of DOE Order 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PALs for these isotopes are specified as 5 pCi/g averaged over the first 15 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 in); therefore, 5 pCi/g represents the PALs for these radionuclides in the surface soil (0 to 0.5 ft bgs).
[b]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

cm = Centimeter
ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above minimum detectable concentrations.
> = Greater than
G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.
LT = Result is less than requested minimum detectable concentration, but greater than sample specific minimum detectable concentration.
TI = Nuclide identification is tentative.

Table A.5-22
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Actinium-228[a]	Bismuth-214[a]	Cesium-137[b]	Lead-212[a]	Lead-214[a]	Thallium-208[a]
Final Action Levels			15	15	12.2	15	15	15
Depth bgs (cm)			>15	>15		>15	>15	>15
D13	151D012	2.5 - 3.0	2.19 (G)	1.12 (G, J)	0.323 (G, LT)	2.5 (J)	1.42 (G, J)	0.76 (G)
D14	151D001	2.5 - 3.0	2.09 (G)	1.23 (G, J)	0.61 (G)	2.35 (J)	1.15 (G, J)	0.68 (G)
D15	151D011	2.5 - 3.0	1.98 (G)	1 (G, J)	0.99 (G)	2.07 (J)	1.33 (G, J)	0.67 (G)
D16	151D002	2.5 - 3.0	2.25 (G)	1.42 (G, J)	--	2.1 (J)	1.08 (G, J)	0.59 (G)
D17	151D010	2.5 - 3.0	2.02 (G)	1.05 (G, J)	--	2.35 (J)	1.18 (G, J)	0.82 (G)
D18	151D003	2.5 - 3.0	1.58 (G)	--	--	1.88 (J)	1.14 (G, J)	0.76 (G)
D19	151D009	2.5 - 3.0	2.01 (G)	1.07 (G, J)	--	2.23 (J)	1.31 (G, J)	0.84 (G)
D20	151D004	2.5 - 3.0	2.19 (G)	0.94 (G, J)	--	2.63 (J)	1.41 (G, J)	0.56 (G)
D21	151D008	2.5 - 3.0	1.93 (G)	1.09 (G, J)	--	2.46 (J)	1.45 (G, J)	0.58 (G)
D22	151D005	2.5 - 3.0	2.06 (G)	0.93 (G, J)	--	2.59 (J)	1.36 (G, J)	0.63 (G)
D23	151D007	2.5 - 3.0	2.4 (G)	1.24 (G, J)	0.371 (G, LT)	2.49 (J)	1.28 (G, J)	0.66 (G)
D24	151D006	2.5 - 3.0	2.18 (G)	1.06 (G, J)	--	2.41 (J)	1.31 (G, J)	0.69 (G)
D25	151D016	8.0 - 8.5	1.98 (G)	0.96 (G, J)	--	1.8 (J)	1.21 (G, J)	0.63 (G)
D26	151D019	8.0 - 8.5	1.6 (G)	--	--	2.01 (J)	0.88 (G, J)	0.52 (G)
D27	151D014	8.0 - 8.5	2.07 (G)	0.9 (G, J)	--	2.33 (J)	1.19 (G, J)	0.71 (G)
	151D015	8.0 - 8.5	1.93(G)	1.1 (G, J)	--	2.06 (J)	1.02 (G, J)	0.59 (G)
D28	151D018	8.0 - 8.5	1.6 (G)	1.28 (G, J)	--	1.81 (J)	0.99 (G, J)	0.75 (G)
D29	151D013	8.0 - 8.5	1.88 (G)	1.2 (G, J)	--	2.18 (J)	1.06 (G, J)	0.78 (G)

Table A.5-22
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Actinium-228[a]	Bismuth-214[a]	Cesium-137[b]	Lead-212[a]	Lead-214[a]	Thallium-208[a]
Final Action Levels			**15**	**15**	**12.2**	**15**	**15**	**15**
Depth bgs (cm)			**>15**	**>15**		**>15**	**>15**	**>15**
D30	151D017	8.0 - 8.5	1.68 (G)	1.05 (G, J)	--	1.61 (J)	1.03 (G, J)	0.63 (G)

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, as found in Chapter IV of DOE Order 5400.5, Change 2, “Radiation Protection of the Public and Environment” (DOE, 1993). The PALs for these isotopes are specified as 5 pCi/g averaged over the first 15 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 in.); therefore, 5 pCi/g represents the PALs for these radionuclides in the surface soil (0 to 0.5 ft bgs).
[b]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

cm = Centimeter
ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above minimum detectable concentrations.
> = Greater than
G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.
LT = Result is less than requested minimum detectable concentration, but greater than sample specific minimum detectable concentration.

Table A.5-23
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-03, Septic Tank

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Actinium-228	Bismuth-214	Lead-212	Lead-214	Thallium-208
Final Action Levels[a]			5	5	5	5	5
Depth bgs (cm)			>15	>15	>15	>15	>15
E09	151E007	2.5 - 3.0	1.71 (G)	1.06 (G, J)	2.1 (J)	0.93 (G, J)	0.65 (G)
E10	151E008	2.5 - 3.0	2 (G)	0.94 (G, J)	2.16 (J)	1.16 (G, J)	0.6 (G)
	151E009	2.5 - 3.0	1.85 (G)	1.01 (G, J)	2.05 (J)	1.16 (G, J)	0.78 (G)
E11	151E005	2.5 - 3.0	1.88 (G)	1.07 (G, J)	2.41 (J)	1.01 (G, J)	0.7 (G)
E12	151E006	2.5 - 3.0	2.36 (G)	1.25 (G, J)	2.08 (J)	1.04 (G, J)	0.92 (G)
E13	151E003	2.5 - 3.0	2.35 (G)	1.26 (G, J)	2.33 (J)	1.35 (G, J)	0.81 (G)
E14	151E004	2.5 - 3.0	1.68 (G)	1.1 (G, J)	1.76 (J)	1.01 (G, J)	0.52 (G)
E15	151E001	2.5 - 3.0	2.35 (G)	1.13 (G, J)	2.97 (J)	1.19 (G, J)	0.82 (G)
E16	151E002	2.5 - 3.0	1.83 (G)	1.01 (G, J)	2.09 (J)	1.18 (G, J)	0.69 (G)
E17	151E011	7.5 - 8.0	2.06 (G)	0.97 (G, J)	1.75 (J)	1.08 (G, J)	0.63 (G)
E18	151E012	8.0 - 8.5	1.7 (G)	0.93 (G, J)	2.42 (J)	1.23 (G, J)	0.81 (G)
E19	151E010	8.0 - 8.5	2.33 (G)	--	1.5 (J)	1.27 (G, J)	--
E20	151E013	8.0 - 8.5	1.87 (G)	0.81 (G, J)	2.28 (J)	1.11 (G, J)	0.77 (G)

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, as found in Chapter IV of DOE Order 5400.5, Change 2, “Radiation Protection of the Public and Environment” (DOE, 1993). The FALs for these isotopes are specified as 5 pCi/g averaged over the first 15 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 in.); therefore, 5 pCi/g represents the FALs for these radionuclides in the surface soil (0 to 0.5 ft bgs).

cm = Centimeter
ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above minimum detectable concentrations.
> = Greater than
G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.

Gamma-emitting radionuclide analytical results from septic tank contents detected above MDCs are presented in Section A.8.0 on an individual tank basis. Cesium-137 in the sludge of the outlet chamber in System #1, Tank #5, of CAS 12-04-01 was detected above the FAL, and is shown in bold type in Table A.8-3 in Section A.8.4.1. This results in the sludge within this tank being considered as potential source material for contamination if released. No other radionuclides were detected in any septic tank sample.

A.5.2.8 Isotopic Radionuclides

Isotopic radionuclide analytical results for soil samples detected above MDCs are presented in Tables A.5-24, A.5-25, and A.5-26. No isotopic radionuclides in soils were detected at concentrations exceeding the respective PALs at any of the three CASs investigated.

Isotopic radionuclide analytical results from septic tank contents detected above MDCs are presented in Section A.8.0 on an individual tank basis. No isotopic radionuclides were detected at concentrations exceeding the respective PALs at any of the three CASs investigated.

A.5.3 Nature and Extent of Contamination

Based on the analytical results, no COCs were identified in the environmental soil samples at any of these CASs.

Septic tank content analytical results indicate that all liquid contents are below action levels in all 16 tanks. Potential source material is present in only one of 16 tanks (Tank #5, System #1, CAS 12-04-01). All other sludge results were below FALs. See Section A.8.0 for additional detail on waste management results.

A.5.4 Revised Conceptual Site Model

The results of the CAI at CASs 12-04-01, 12-04-02, and 12-04-03 did not contradict the CSM. No revision of the CSM was necessary.

Table A.5-24
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-01, Septic Tanks
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			**13**	**12.7**	**838**	**143**	**17.5**	**105**
C13	151C013	3.0 - 3.5	--	--	--	1.07	0.067	1.02
C15	151C001	2.5 - 3.0	--	--	--	1.12	0.086	1.13
C17	151C003	2.5 - 3.5	0.053	0.206	--	1.18	0.078	1.08
C19	151C004	4.0 - 4.5	0.242	0.73	--	1.12	--	1.17
C14	151C005	3.0 - 3.5	0.311	0.85	--	1.11	0.063	1.08
C16	151C006	2.5 - 3.0	0.101	0.253	--	1.2	0.069	1.3
C18	151C007	2.5 - 3.0	0.134	0.4	--	1.12	--	1.17
C20	151C008	3.5 - 4.0	0.068	0.272	--	1.21	0.049 (LT)	1.24
	151C009	3.5 - 4.0	--	0.079	--	0.99	0.057	1.22
C21	151C010	2.0 - 2.5	--	0.053 (J)	--	0.99	--	1.17
C22	151C011	2.0 - 2.5	0.068	0.51 (J)	--	0.95	0.067	1.15
C23	151C012	2.0 - 2.5	--	0.065 (J)	--	0.97	0.047 (LT)	1.08
C24	151C013	2.0 - 2.5	--	0.075 (J)	--	1.06	--	1.22
C28	151C014	8.0 - 8.5	--	--	--	1.19	0.054	1.08
C26	151C015	8.0 - 8.5	--	--	--	1.27	--	1.14
C25	151C016	8.0 - 8.5	--	--	--	0.97 (M3)	--	1.1
C27	151C017	8.0 - 8.5	--	--	--	0.96	0.057	1.12
C29	151C018	4.0 - 4.5	0.257	0.68	0.36 (LT)	1.11	--	1.22
C30	151C019	7.5 - 8.0	--	--	--	0.86	0.081	1.02
C32	151C020	7.5 - 8.0	--	--	--	1.14	--	1.08
C31	151C021	8.0 - 8.5	--	--	--	0.83	0.052	1.14
C33	151C022	8.0 - 8.5	--	--	--	0.82	--	0.95

Table A.5-24
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-01, Septic Tanks
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			13	12.7	838	143	17.5	105

[a]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
J = Estimated value.
LT = Result is less than requested minimum detectable concentration, but greater than sample specific minimum detectable concentration.
-- = Not detected above minimum detectable concentrations.

Table A.5-25
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Plutonium-238	Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			13	12.7	143	17.5	105
D13	151D012	2.5 - 3.0	--	0.083 (J)	0.9	--	1.04
D14	151D001	2.5 - 3.0	0.308	0.97 (J)	0.92	0.048 (LT)	1.03
D15	151D011	2.5 -3.0	0.327	1.43 (J)	1.04	0.077	1.09
D16	151D002	2.5 - 3.0	--	0.075 (J)	0.98	0.086	1.06
D17	151D010	2.5 - 3.0	0.38	1.03 (J)	0.91	0.07	1
D18	151D003	2.5 -3.0	--	--	0.96	0.066	1.04
D19	151D009	2.5 - 3.0	0.085	0.282 (J)	0.94	--	1.1 (M3)
D20	151D004	2.5 - 3.0	0.051	0.125 (J)	1.01	0.085	1.17

Table A.5-25
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-02, Septic Tanks
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Plutonium-238	Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			**13**	**12.7**	**143**	**17.5**	**105**
D21	151D008	2.5 - 3.0	--	0.091 (J)	1.16	0.091	1.24
D22	151D005	2.5 -3.0	--	--	0.85	0.078	0.92
D23	151D007	2.5 - 3.0	0.178	0.93 (J)	0.93	0.058	1.07
D24	151D006	2.5 - 3.0	--	--	1.19	0.081	1.09
D25	151D016	8.0 - 8.5	--	0.087 (J)	1.14	0.07	1.17
D26	151D019	8.0 - 8.5	0.13	0.48 (J)	0.92	--	0.95
D27	151D014	8.0 - 8.5	0.229	0.57 (J)	0.92	--	1
	151D015	8.0 - 8.5	--	--	0.99 (M3)	--	1
D28	151D018	8.0 - 8.5	--	--	1.02	--	0.91
D29	151D013	8.0 - 8.5	0.121	0.32 (J)	1	--	1.01
D30	151D017	8.0 - 8.5	--	0.313 (J)	0.92	0.08	1.06

[a]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
J = Estimated value.
LT = Result is less than requested minimum detectable concentration, but greater than sample specific minimum detectable concentration.
M3 = The requested minimum detectable concentration was not met, but the reported activity is greater than the reported minimum detectable concentration.
-- = Not detected above minimum detectable concentrations.

Table A.5-26
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-04-03, Septic Tank

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Plutonium-238	Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			**13**	**12.7**	**143**	**17.5**	**105**
E09	151E007	2.5 - 3.0	--	--	1.07	--	1.15
E10	151E008	2.5 - 3.0	--	--	1.11	0.071	1.27
	151E009	2.5 - 3.0	--	--	1.22	0.071	0.96
E11	151E005	2.5 - 3.0	--	0.225 (J)	1.23	0.089	1.19
E12	151E006	2.5 - 3.0	--	--	0.93	0.053	1.07
E13	151E003	2.5 - 3.0	--	0.179 (J)	0.82	0.066	1.02
E14	151E004	2.5 - 3.0	--	--	1.11	0.076	1.05
E15	151E001	2.5 - 3.0	--	--	1.13	0.134	1.17
E16	151E002	2.5 - 3.0	0.145	0.47 (J)	0.95	0.049 (LT)	1.14
E17	151E011	7.5 - 8.0	--	--	1.12	0.048 (LT)	1.15
E18	151E012	8.0 - 8.5	--	--	1	0.09	1.33
E19	151E010	8.0 - 8.5	--	--	0.85	--	1.05
E20	151E013	8.0 - 8.5	--	--	1.07	--	1.1

[a]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
J = Estimated value.
LT = Result is less than requested minimum detectable concentrations, but greater than sample specific minimum detectable concentrations.
-- = Not detected above minimum detectable concentrations.

A.6.0 Corrective Action Site 12-47-01, Wastewater Pond

Corrective Action Site 12-47-01, Wastewater Pond is located in the south-central portion of the Area 12 camp. This CAS consists of two sumps (evaporation ponds) and associated inactive piping located at the Area 12 Fleet Operations. It is documented that three buildings and a women's restroom trailer fed into these sumps. Building 12-8, Area 12 Construction Shops, was constructed before 1964 and demolished in 2002; Building 12-16, Motor Pool Equipment Maintenance Shop, was constructed around 1965 and was demolished in 2002; and the women's restroom trailer was added in 1971. Building 12-910, Crafts Building, was constructed in 1987 and its wastewater has since been diverted to the new septic collection system that was constructed in the late 1980s or early 1990s. Both sumps were constructed for the purpose of receiving sewage waste from Buildings 12-8 and 12-16. However, when the new sump was built in 1970, sewage from both buildings was diverted to the new sump, as were Building 12-910 and the women's restroom trailer.

The CSM as developed in the CAU 151 CAIP (NNSA/NSO, 2004a) demonstrates the most probable scenario for current conditions, pathways, and features at this CAS. Conceptual site model pathways include discharges to the unlined pond areas, potential leaks from piping, and potentially the arroyos and washout area around where the pond has been reported to have overflowed. Release mechanisms for this CAS are sanitary effluent and possible industrial discharge into sanitary collection systems (e.g., lagoon, sump, or pond).

A.6.1 Corrective Action Investigation

A total of 12 environmental soil characterization samples (including one FD and one MS/MSD) were collected during investigation activities. Six additional samples were collected for Decision II step-out sampling around the one location with analytical results above FALs. The sample locations are shown on Figure A.6-1. The sample identification numbers, locations, depth, types, and analyses are listed in Table A.6-1. The specific CAI activities conducted to satisfy the CAIP requirements are described in the following sections.

Table A.6-1
Soil Samples Collected at CAS 12-47-01, Wastewater Pond

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
F01	151F001	5.75 – 6.0	Soil	Environmental	Set 1
	151F004	7.0 – 7.5	Soil	Environmental, MS/MSD	Set 1
F02	151F002	5.5 – 6.0	Soil	Environmental	Set 1
	151F003	7.0 – 7.5	Soil	Environmental	Set 1
F03	151F005	5.0 – 5.75	Soil	Environmental	Set 1
	151F006	5.0 – 5.75	Soil	Field Duplicate of #151F005	Set 1
	151F007	7.0 – 7.5	Soil	Environmental	Set 1
F03A	151F013	2.0 – 3.0	Soil	Environmental	Set 2
	151F014	4.0 – 5.0	Soil	Environmental	Set 2
F03B	151F015	4.0 – 5.0	Soil	Environmental	Set 2
F03C	151F016	2.0 – 3.0	Soil	Environmental	Set 2
F03C	151F017	5.0 – 6.0	Soil	Environmental	Set 2
F03D	151F018	4.0 – 5.0	Soil	Environmental	Set 2
F03E	151F019	4.0 – 5.0	Soil	Environmental	Set 2
F04	151F008	1.5 – 1.75	Soil	Environmental	Set 1
	151F009	3.0 – 3.25	Soil	Environmental	Set 1
F05	151F010	1.75 – 2.0	Soil	Environmental	Set 1
F06	151F011	4.0 – 4.25	Soil	Environmental	Set 1
	151F012	6.0 – 6.25	Soil	Environmental	Set 1
N/A	151F300	N/A	Water	Trip Blank	Total VOCs
N/A	151F301	N/A	Water	Trip Blank	Total VOCs
N/A	151F302	N/A	Water	Field Blank	Set 1
N/A	151F303	N/A	Water	Equipment Rinsate Blank	Set 1
N/A	151F304	N/A	Water	Trip Blank	Total VOCs
N/A	151F305	N/A	Water	Field Blank	Set 2
N/A	151F501	N/A	Water	Equipment Rinsate Blank	Set 3

Set 1 = Total VOCs, Total SVOCs, TPH-DRO, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90.
Set 2 = Total SVOCs.
Set 3 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gross Alpha/Beta
.
ft bgs = Feet below ground surface
MS/MSD = Matrix spike/matrix spike duplicate
N/A = Not applicable

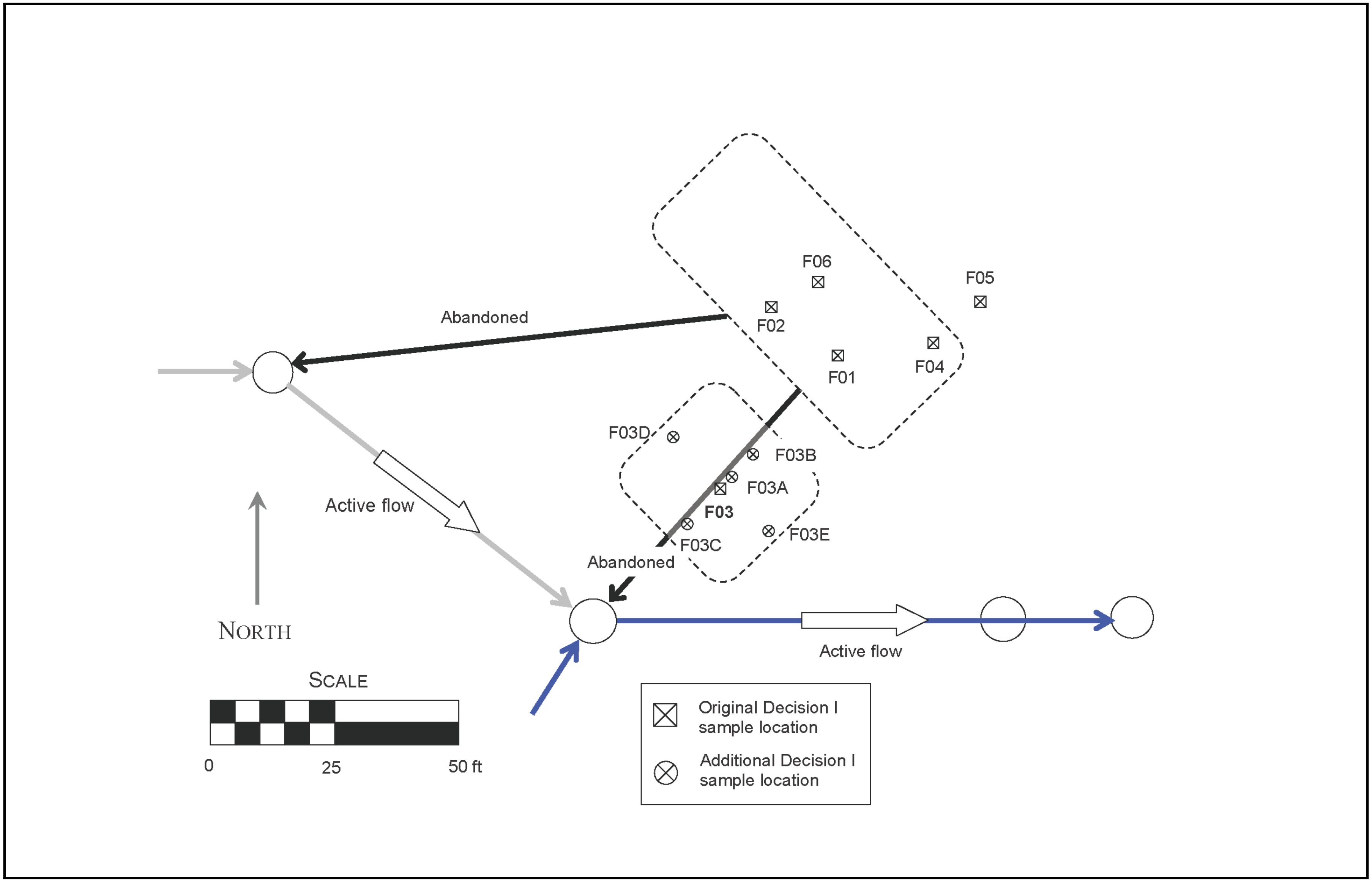

Figure A.6-1
Soil Sample Locations at CAS 12-47-01

A.6.1.1 Video Surveying

Figure A.6-2 shows the lines that were video surveyed during CAI activities at this CAS. Video surveying began in the westernmost cleanout. This line angled steeply downward for the first 8 ft, then leveled off for an additional 4 ft. At this point, the line took a 90-degree turn down. Because of the steep angle, it was not possible to get the video camera around this bend. Surveying then moved to the first manhole to the east. This manhole had three lines entering it: one entering from the west and one exiting to the east, and one coming in at a 45-degree angle from the southwest. All three lines were surveyed. According to the engineering drawings, the line from the southwest leads to Building 12-910. This is an 8-in. polyvinyl chloride sewer line and is currently considered active. The lines west and east are 6-in. ACP and were surveyed to 101 ft and 141 ft, respectively. A breach in the east line was noted at approximately 100 ft. Contact with facility personnel concluded that this was still an active line, thus no sampling was performed. Facility maintenance personnel will carry out repairs prior to use of the septic system.

Access was made into the next manhole east. This manhole showed two lines: one coming in from the west and one going out to the southeast. It appeared that a third line to the east might have existed, but had been previously plugged. The visible lines were video surveyed to 60 ft to the west, overlapping the previous days run by approximately 40 ft. The line to the southeast went 70 ft into the next manhole. The lid was removed from this manhole, at which time the video camera head was clearly visible in the manhole. This manhole had three lines: the one from the previous manhole coming in from the northwest, one leading out to the east, and one coming in from the southwest. It appeared that a fourth outlet to the northeast might have existed but had been previously plugged. The lines leading to the east and southwest were video surveyed to distances of 100 ft and 91.5 ft, respectively. The line to the east extended through the next manhole at 83 ft and finished just short of the first septic tank at 100 ft. Access through covers in both locations revealed the video head. No breaches were detected in any lines video surveyed on this day.

Video surveying from adjacent to the Building 12-16 pad was started at the manhole. This line could only be surveyed for 6 ft before material washed in through the open tie-ins was encountered. The tie-in from the women’s restroom trailer was located and excavated by hand. Because this was a 6-in. VCP pipe, a field breach was made in the pipe, and the line was video surveyed for a total distance of 141 ft. At 16 ft, this line elbowed down at 45 degrees and tied into the mainline from Building 12-16.

At 141 ft, the video entered the manhole accessed from the previous day from the line leading to the southwest. This was confirmed visually by opening the manhole to view the video head.

Excavation was also performed to locate the former sumps. During this trenching, the two abandoned discharge lines were located. Each line was video surveyed back to a blockage at the two manholes shown in Figure A.6-2.

All abandoned lines and field breaches were grouted closed after video surveying.

A.6.1.2 Field Screening

Decision I soil samples (151F001 through 151F012) were field screened for VOCs and alpha and beta/gamma radiation as specified in the CAU 151 CAIP. Alpha and beta/gamma radiation FSLs were not exceeded during sampling activities. Volatile organic compound headspace FSLs were also not exceeded.

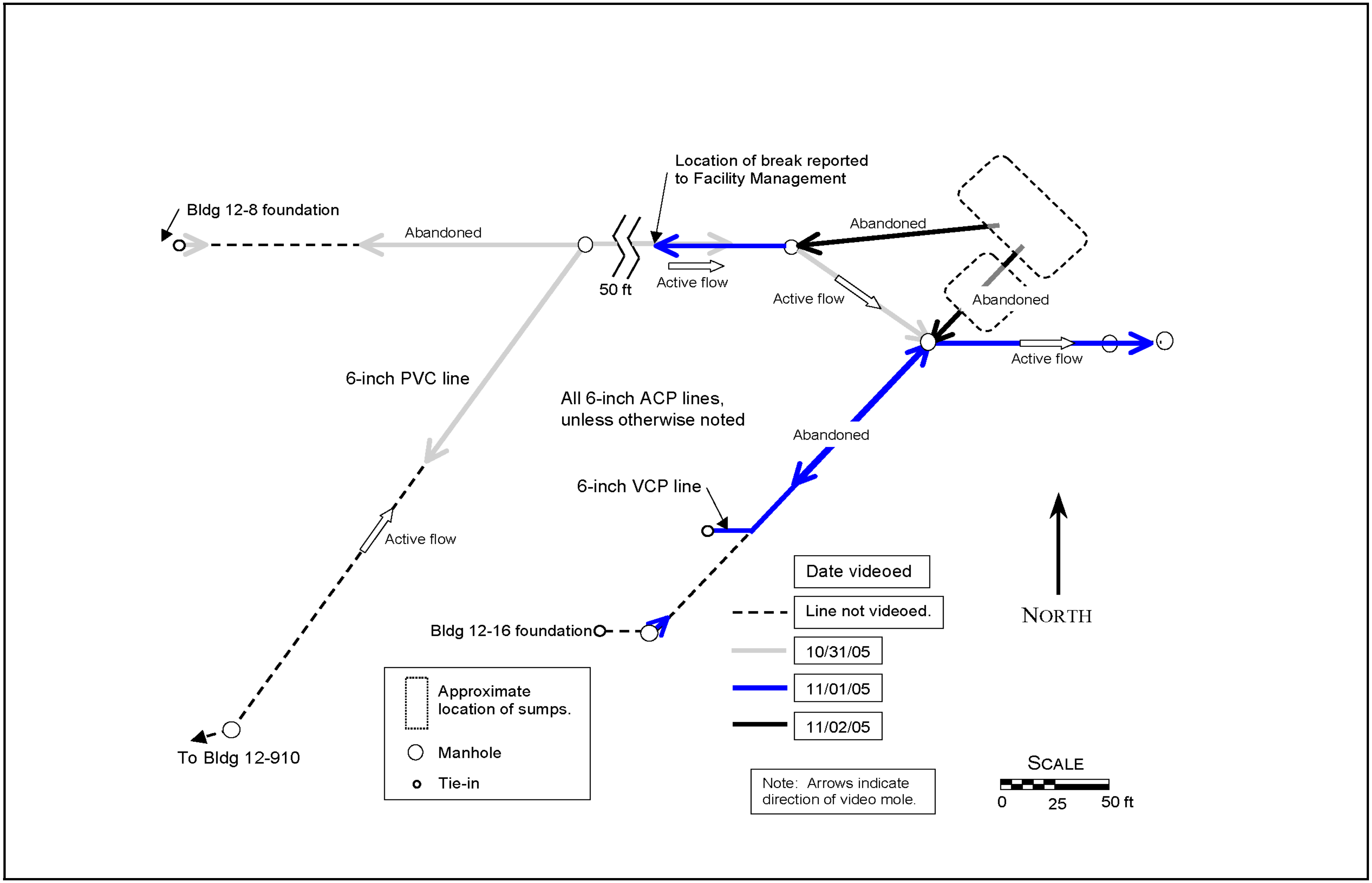

Figure A.6-2
Video Survey Map of CAS 12-47-01

A.6.1.3 Sample Collection

Surface and shallow subsurface soil samples were collected using hand auger sampling equipment, directly from the trench face, or from a backhoe bucket for sampling depths greater than 4 ft bgs.

Decision I sampling activities included the collection of environmental soil samples from six locations: F01 through F06. These locations represented the presumed proximal, midpoint, and distal locations of the larger sump and the midpoint of the smaller sump. After exposure of the abandoned inlet pipes to the large sump, the engineering drawings were used to approximate locations of the midpoint and outlet pipe for sampling. These drawings also allowed for measurements to the midpoint of the old sump to be made for sampling purposes.

Decision II sampling was performed on January 10, 2006, to verify and constrain the detections of SVOCs, TPH-DRO, and PCBs. Details of the step-out sampling are shown in Figure A.6-3.

A.6.1.4 Deviations

There were no significant deviations to the CAIP requirements at this CAS. Trenching across the berm at the estimated overflow of the new sump was conducted in an effort to locate the 6-in. overflow pipe. A single 10-ft length of mangled 6-in. steel pipe was detected and assumed to be the overflow remains. Subsurface and geomorphic evidence suggest that the overflow pipe was destroyed when the berms where used to backfill the sumps. Extensive out-of-channel overland flow has occurred since the backfilling of the berms and has effectively removed the surface to which the ponds overflowed. For this reason, no samples were collected from the outwash area.

A.6.2 Investigation Results

The following sections provide analytical results from the soil samples collected to complete investigation activities as outlined in the CAIP. Investigation samples were analyzed for the CAIP-specified COPCs, which included VOCs, SVOCs, TPH-DRO, pesticides, PCBs, RCRA metals and beryllium, gamma-emitting radionuclides, isotopic uranium, isotopic plutonium, and Sr-90. An unedited set of all analytical data is retained in electronic format in the project files.

Analytical results from the soil samples with concentrations exceeding MDCs are summarized in the following sections. An evaluation was conducted on all contaminants detected above MDCs by

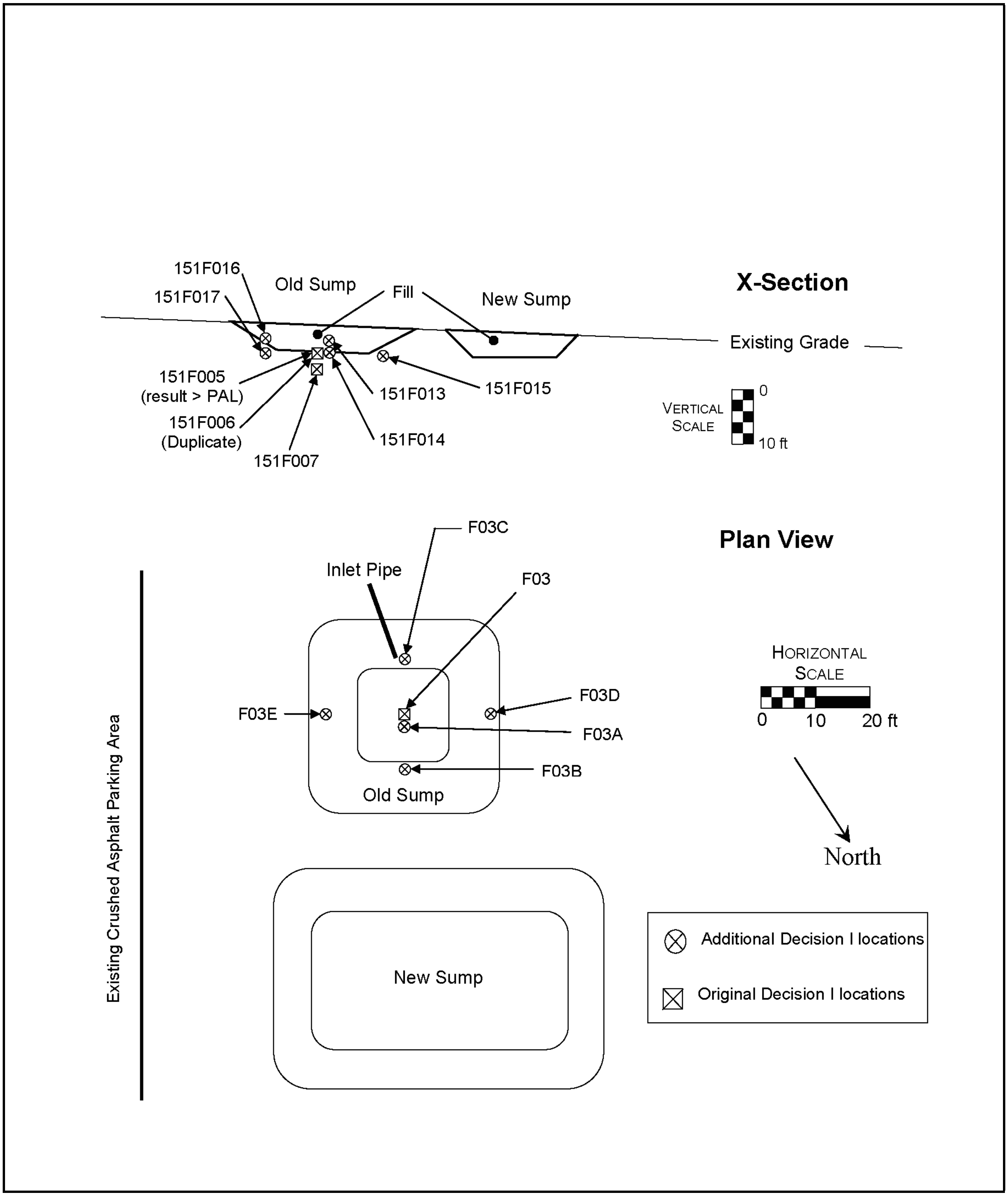

Figure A.6-3
Additional Decision I Soil Sampling Locations

comparing individual concentration or activity results against the FALs. Establishment of the FALs is presented in Appendix D. The FALs were established as the corresponding PAL concentrations or activities if the contaminant concentrations were below their respective PALs.

A.6.2.1 Volatile Organic Compounds

Analytical results for VOCs detected above MDCs are presented in Table A.6-2. No VOCs were detected at concentrations exceeding the respective PALs at this CAS.

Table A.6-2
Sample Results for VOCs Detected Above Minimum Detectable Concentrations at CAS 12-47-01, Wastewater Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			Methylene Chloride
Final Action Levels[a]			160,000
F03	151F007	7.0 - 7.5	1.8 (J)
F04	151F008	1.5 - 1.75	1.7 (J)
	151F009	3.0 - 3.25	2.3 (J)
F05	151F010	1.75 - 2.0	3.3 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value.

A.6.2.2 Semivolatile Organic Compounds

Analytical results for SVOCs detected above MDCs are presented in Table A.6-3. Subsurface samples 151F005 and the associated FD 151F006 had detections of four SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene) above their respective PALs.

Table A.6-3
Sample Results for SVOCs Detected Above Minimum Detectable Concentrations at CAS 12-47-01, Wastewater Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)																
			Acenaphthene	Anthracene	Benzo(a)Anthracene	Benzo(a)Pyrene	Benzo(b)Fluoranthene	Benzo(g,h,i)Perylene	Benzo(k)Fluoranthene	Bis(2-Ethylhexyl)Phthalate	Butyl Benzyl Phthalate	Carbazole	Chrysene	Dibenzofuran	Fluoranthene	Fluorene	Indeno(1,2,3-cd)Pyrene	Phenanthrene	Pyrene
Final Action Levels			29,000,000[a]	100,000,000[a]	64,300[b]	6,470[b]	64,700[b]	29,000,000[a]	21,000[a]	120,000[a]	100,000,000[a]	86,000[a]	210,000[a]	1,600,000[a]	22,000,000[a]	26,000,000[a]	64,700[b]	100,000,000[a]	29,000,000[a]
F03	151F005	5.0 - 5.75	42 (J)	140 (J)	440	240 (J)	380 (J)	120 (J)	270 (J)	43 (J)	--	79 (J)	500	24 (J)	1,100	50 (J)	120 (J)	740	1,400
	151F006	5.0 - 5.75	3,400 (J)	13,000 (J)	20,000 (J)	11,000 (J)	13,000 (J)	3,100 (J)	8,900 (J)	--	--	4,500 (J)	19,000 (J)	1,900 (J)	51,000 (J)	3,900 (J)	3,500 (J)	51,000 (J)	47,000 (J)
F03A	151F013	2.0 - 3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35 (J)
F03B	151F015	4.0 - 5.0	--	--	--	--	--	--	--	--	180 (J)	--	--	--	--	--	--	--	--
F03C	151F016	2.0 - 3.0	--	57 (J)	220 (J)	140 (J)	170 (J)	--	120 (J)	--	--	--	230 (J)	--	500	--	41 (J)	210 (J)	580
F03E	151F019	4.0 - 5.0	--	--	--	--	--	--	--	270 (J)	--	--	--	--	--	--	--	--	--
F04	151F008	1.5 - 1.75	--	--	--	--	--	--	--	70 (J)	--	--	--	--	--	--	--	--	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).
[b]Based on Oak Ridge National Laboratory Risk Assessment Information System (ORNL, 2005).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
-- = Not detected above minimum detectable concentrations.
J = Estimated value.

Sample 151F005 was collected from of 5 to 5.75 ft bgs in the estimated center of the old sump. The sample was composed of carbonate-rich, gravelly sand. Lumps of a black material were also included in the sample. It is likely that this material is not related to effluent discharge to the sump but is from degraded asphalt from a nearby parking area (Figure A.6-3)

A.6.2.3 Total Petroleum Hydrocarbons

Analytical results for TPH-DRO detected above MDCs are presented in Table A.6-4. Samples 151F005 and 151F006 showed TPH-DRO greater than the PAL. The TPH-DRO was moved on to a Tier 2 evaluation, and FALs were established for the hazardous constituents for TPH-DRO. Concentrations of the hazardous constituents of TPH-DRO did not exceed FALs. Therefore, TPH-DRO is not considered a COC. The calculation of FALs for the hazardous constituents of TPH-DRO is presented in Appendix D.

Table A.6-4
Sample Results for TPH-DRO Detected Above
Minimum Detectable Concentrations at CAS 12-47-01, Wastewater Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)
			Diesel-Range Organics
Final Action Levels[a]			100
F01	151F004	7.0 - 7.5	2.8 (J)
F02	151F002	5.5 - 6.0	36 (H)
	151F003	7.0 - 7.5	9.3 (H)
F03	151F005	5.0 - 5.75	**190** (M, Z)
	151F006	5.0 - 5.75	**190** (M, Z)
	151F007	7.0 - 7.5	3.6 (J)
F04	151F008	1.5 - 1.75	16 (M, Z)
	151F009	3.0 - 3.25	4.1 (J)
F06	151F011	4.0 - 4.25	19 (M, Z)

[a]Based on *Nevada Administrative Code*; Contamination of soil: Establishment of action levels (NAC, 2002).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
J = Estimated value.
H = Fuel pattern in the heavier end of retention time window.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

A.6.2.4 Pesticides

Analytical results for pesticides detected above MDCs are presented in Table A.6-5. No pesticides were detected at concentrations exceeding the respective PALs at this CAS.

Table A.6-5
Sample Results for Pesticides Detected Above Minimum Detectable Concentrations at CAS 12-47-01, Wastewater Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			Delta-BHC
Final Action Levels[a]			**360**
F03	151F005	5.0 - 5.75	4.9 (J)
	151F006	5.0 - 5.75	6.9 (J)

[a]Based on *Nevada Administrative Code*; Contamination of soil: Establishment of action levels (NAC, 2002).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value.

A.6.2.5 Polychlorinated Biphenyls

Analytical results for PCBs detected above MDCs are presented in Table A.6-6. One PCB (aroclor-1254) was detected above PALs at this CAS. Samples 151F005 and 151F006 had analytical results above the PAL. These results are below FALs; therefore, aroclor-1254 is not considered COCs at this CAS.

Table A.6-6
Sample Results for PCBs Detected Above Minimum Detectable Concentrations at CAS 12-47-01, Wastewater Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			Aroclor 1254
Final Action Levels[a]			**28,800**
F03	151F005	5.0 - 5.75	2,000 (J)
	151F006	5.0 - 5.75	2,200 (J)

[a]Based on Oak Ridge National Laboratory Risk Assessment Information System (ORNL, 2005).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value.

A.6.2.6 RCRA Metals and Beryllium

Analytical results for RCRA metals and beryllium detected above MDCs are presented in Table A.6-7. No metals were detected at concentrations exceeding the respective PALs at this CAS.

Table A.6-7
Sample Results for Metals Detected Above Minimum Detectable Concentrations at CAS 12-47-01, Wastewater Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)							
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Silver
Final Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**750[b]**	**310[b]**	**5,100[b]**
F01	151F001	5.75 - 6.0	3.9	51	0.55 (J)	--	2.6	8.9	--	--
	151F004	7.0 - 7.5	4.9	58	0.61 (J)	--	2.5	9	--	--
F02	151F002	5.5 - 6.0	3.5	91	0.77 (J)	--	3	16	--	--
	151F003	7.0 - 7.5	3.8	76	0.8 (J)	--	4.1	13	--	--
F03	151F005	5.0 - 5.75	5.1	110	0.88 (J)	1.4	6	58	0.22	0.66 (B)
	151F006	5.0 - 5.75	4.7	110	0.87 (J)	1.2	7.1	66	0.19	0.67 (B)
	151F007	7.0 - 7.5	3.1	82	0.71 (J)	--	2.5	12	0.037	--
F04	151F008	1.5 - 1.75	4.7	390	1.1 (J)	--	5.5	32	--	0.16 (B)
	151F009	3.0 - 3.25	3.6	52	0.65 (J)	--	2.5	8	0.038	--
F05	151F010	1.75 - 2.0	4.8	83	1.5 (J)	--	6.2	18	0.045	--
F06	151F011	4.0 - 4.25	4.3	90	0.87 (J)	--	4.4	16	--	--
	151F012	6.0 - 6.25	3.4	150	0.75 (J)	--	2.5	28	--	--

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum detectable concentrations.
B = Value less than contract required detection limit, but greater than or equal to the instrument detection limit.
J = Estimated value.

A.6.2.7 Gamma-Emitting Radionuclides

Gamma-emitting radionuclide analytical results for soil samples detected above MDCs are presented in Table A.6-8. No radionuclides were detected at concentrations exceeding the respective PALs at this CAS.

A.6.2.8 Isotopic Radionuclides

Isotopic radionuclide analytical results for soil samples detected above MDCs are presented in Table A.6-9. No radionuclides were detected at concentrations exceeding the respective PALs at this CAS.

A.6.3 Nature and Extent of Contamination

Analytical results from Location F03 identified four SVOCs, TPH-DRO, and aroclor-1254 in the soil above their associated PALs. Benzo(a)pyrene from sample 151F006 exceeded the FAL. This compound has been shown to be a common component of asphalt, and there is a crushed asphalt parking area approximately 30-ft upslope from this location. Positive detections of these SVOCs are likely related to a black material included with the sample. This material is most likely degraded asphalt. In addition, this sample failed the QA/QC requirement for sensitivity, and is therefore considered rejected and not used for DQO decision making (see Section B.1.1.1.1 in Appendix B). For these reasons, benzo(a)pyrene is not considered a COC at this CAS.

Aroclor-1254 and TPH-DRO, while exceeding their PALs, did not exceed FALs and are not considered COCs at this CAS.

A.6.4 Revised Conceptual Site Model

The results of the CAI at CAS 12-47-01 did not contradict the projected CSM. No revision of the CSM was necessary.

Table A.6-8
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-47-01, Wastewater Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Actinium-228[a]	Bismuth-214[a]	Cesium-137[b]	Lead-212[a]	Lead-214[a]	Thallium-208[a]
Final Action Levels			**5**	**5**	**12.2**	**5**	**5**	**5**
Depth bgs (cm)			**>15**	**>15**		**>15**	**>15**	**>15**
F01	151F001	5.75 - 6.0	1.62	1.07 (J)	--	1.26	1.09 (J)	0.45
	151F004	7.0 - 7.5	1.95	0.95 (J)	--	1.96	1.08 (J)	0.58
F02	151F002	5.5 - 6.0	--	--	--	1.64 (J)	0.99 (G, J)	0.48 (G)
	151F003	7.0 - 7.5	1.82 (G)	1.02 (G, J)	--	1.5 (J)	1.02 (G, J)	0.5 (G)
F03	151F005	5.0 - 5.75	1.67 (G)	1.06 (G, J)	0.56 (G)	1.75 (J)	1.29 (G, J)	0.55 (G)
	151F006	5.0 - 5.75	1.57 (G)	1.11 (G, J)	--	1.47 (J)	1 (G, J)	--
	151F007	7.0 - 7.5	1.99 (G)	1.09 (G, J)	--	1.55 (J)	0.93 (G, J)	0.53 (G)
F04	151F008	1.5 - 1.75	1.66 (G)	1 (G, J)	0.82 (G)	1.74 (J)	1.12 (G, J)	0.54 (G)
	151F009	3.0 - 3.25	--	0.82 (G, J)	--	1.67 (J)	0.8 (G, J)	0.45 (G)
F05	151F010	1.75 - 2.0	2.54 (G)	1.08 (G, J)	--	1.7 (J)	1.18 (G, J)	0.67 (G)
F06	151F011	4.0 - 4.25	1.76 (G, TI)	0.85 (G, J)	--	1.65 (J)	1.2 (G, J)	0.51 (G)
	151F012	6.0 - 6.25	1.59 (G)	1.02 (G, J)	--	2.14 (J)	1.15 (G, J)	0.75 (G)

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, as found in Chapter IV of DOE Order 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The FALs for these isotopes are specified as 5 pCi/g averaged over the first 15 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 in.); therefore, 5 pCi/g represents the FALs for these radionuclides in the surface soil (0 to 0.5 ft bgs).
[b]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

cm = Centimeter
ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above minimum detectable concentrations.
> = Greater than
G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.
TI = Nuclide identification is tentative.

Table A.6-9
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 12-47-01, Wastewater Pond

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Plutonium-238	Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			**13**	**12.7**	**143**	**17.5**	**105**
F01	151F001	5.75 - 6.0	--	--	1.08	0.057	1.16
	151F004	7.0 - 7.5	--	--	1.1	0.063	1.18
F02	151F002	5.5 - 6.0	0.095	0.324	1.08	0.083	1.12
	151F003	7.0 - 7.5	0.43	1.01	1.08	0.055	1.09
F03	151F005	5.0 - 5.75	0.107	0.87	1.16	0.082	1.04
	151F006	5.0 - 5.75	0.048 (LT)	0.76	1.34	0.064	1.23
	151F007	7.0 - 7.5	--	--	0.99	--	1.15
F04	151F008	1.5 - 1.75	0.61	2.64	0.97	0.071	1.06
	151F009	3.0 - 3.25	--	--	1.04	0.058	0.98
F05	151F010	1.75 - 2.0	--	--	0.9	0.072	0.95
F06	151F011	4.0 - 4.25	0.074	0.263	0.93	0.054	1.04
	151F012	6.0 - 6.25	--	--	0.89	--	0.92

[a]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above minimum detectable concentrations.
LT = Result is less than requested minimum detectable concentration, but greater than sample specific minimum detectable concentrations.

A.7.0 Corrective Action Sites 18-03-01, Sewage Lagoon; and 18-99-09, Sewer Line (Exposed)

Corrective Action Sites 18-03-01, Sewage Lagoon, and 18-99-09, Sewer Line (Exposed), are located in Area 18 at the Area 17 Camp. Corrective Action Site 18-03-01 consists of two sewage lagoons and associated collection piping that were constructed during the early 1960s and were active until the late 1980s. These lagoons were used to collect sanitary effluent from the Area 17 Camp administrative offices, and the sanitary and possibly industrial effluent from the construction support area to the east of the lagoons (AEC, Date Unknown). Corrective Action Site 18-99-09 is a 6-in. VCP in the vicinity of CAS 18-03-01. This CAI documented that the pipe is attached to the system associated with the sewage lagoons (CAS 18-03-01).

The CSM as developed in the CAU 151 CAIP (NNSA/NSO, 2004a) demonstrates the most probable scenario for current conditions, pathways, and features at this CAS. Conceptual site model pathways include discharges to the bermed sewage lagoons, arroyos, and washouts where the lagoons may have overflowed, potential discharge to an active channel, and potential discharges from broken lines. Release mechanisms at these CASs are sanitary effluent and possible industrial discharge into a collection system (e.g., lagoon, sump, or pond).

A.7.1 Corrective Action Investigation

A total of 36 environmental soil characterization samples (including two FDs and two MS/MSDs) were collected during investigation activities. The sample locations are shown on Figure A.7-1. The sample identification numbers, locations, depth, matrices, purpose, and analyses are listed in Table A.7-1. The specific CAI activities conducted to satisfy the CAIP requirements are described in the following sections.

A.7.1.1 Video Surveying

Figures A.7-1 through A.7-6 show the lines that were video surveyed during CAI activities at these CASs. Engineering drawings were initially used to guide video surveys. However, a note on these drawings stated that “House sewers and laterals to trunks to be field routed.” As such, there are no drawings showing tie-ins to the trunk lines.

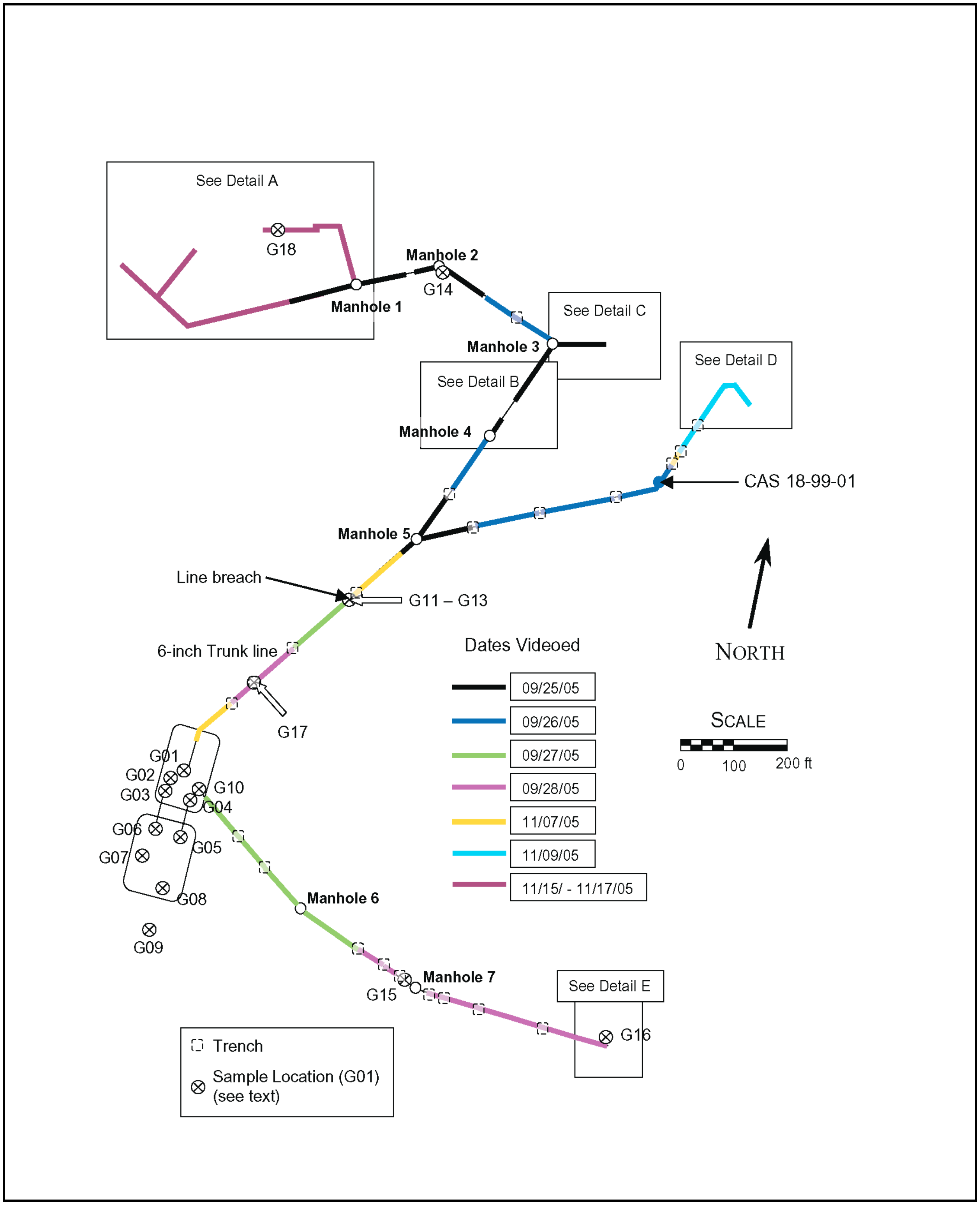

Figure A.7-1
Soil Sample Locations and Trunk Line Video Survey of CAS 18-03-01

Table A.7-1
Soil Samples Collected at CAS 18-03-01, Sewage Lagoon
(Page 1 of 2)

Sample Number	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
G01	151G010	0.0 – 0.5	Soil	Environmental	Set 1
	151G012	0.5 – 1.0	Soil	Environmental	Set 1
G02	151G009	0.0 – 0.5	Soil	Environmental	Set 1
	151G013	0.5 – 1.0	Soil	Environmental	Set 1
G03	151G008	0.0 – 0.5	Soil	Environmental	Set 1
	151G014	1.0 – 1.5	Soil	Environmental, MS/MSD	Set 1
G04	151G007	0.0 – 0.5	Soil	Environmental	Set 1
	151G015	0.5 – 1.0	Soil	Environmental	Set 1
G05	151G005	0.0 – 0.5	Soil	Environmental	Set 1
	151G006	2.0 – 2.5	Soil	Environmental	Set 1
G06	151G004	0.0 – 0.5	Soil	Environmental	Set 1
	151G017	0.5 – 1.0	Soil	Environmental	Set 1
G07	151G003	0.0 – 0.5	Soil	Environmental	Set 1
	151G018	1.25 – 2.0	Soil	Environmental	Set 1
	151G019	1.25 – 2.0	Soil	Field Duplicate of #151G018	Set 1
G08	151G002	0.0 – 0.5	Soil	Environmental	Set 1
	151G020	1.5 – 2.0	Soil	Environmental	Set 1
G09	151G001	0.0 – 0.5	Soil	Environmental	Set 1
	151G021	2.0 – 2.5	Soil	Environmental	Set 1
G10	151G011	0.0 – 0.5	Soil	Environmental	Set 1
	151G016	1.5 – 2.0	Soil	Environmental	Set 1
G11	151G022	0.0 – 0.5	Soil	Environmental	Set 1
	151G023	1.25 –1.75	Soil	Environmental	Set 1
G12	151G024	0.0 – 0.5	Soil	Environmental	Set 1
	151G025	2.0 – 2.5	Soil	Environmental	Set 1
G13	151G026	0.0 – 0.5	Soil	Environmental	Set 1
	151G027	1.25 – 1.75	Soil	Environmental	Set 1
G14	151G028	6.5 – 7.0	Soil	Environmental	Set 1
G15	151G029	Pipe Contents	Soil	Environmental	Set 1
	151G030	1.0 – 1.5	Soil	Environmental	Set 1

Table A.7-1
Soil Samples Collected at CAS 18-03-01, Sewage Lagoon
(Page 2 of 2)

Sample Number	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
G16	151G033	1.5 – 2.0	Soil	Environmental	Set 1
	151G034	1.5 – 2.0	Soil	Field Duplicate of #151G033	Set 1
	151G035	4.0 – 4.5	Soil	Environmental	Set 1
G17	151G031	3.0 – 3.5	Soil	Environmental, MS/MSD	Set 1
	151G032	5.5 – 6.0	Soil	Environmental	Set 1
G18	151G036	0.25 – 1.0	Soil	Environmental	Set 1
N/A	151G301	N/A	Water	Trip Blank	Total VOCs
N/A	151G302	N/A	Water	Trip Blank	Total VOCs
N/A	151G303	N/A	Water	Field Blank	Set 1
N/A	151G304	N/A	Water	Trip Blank	Total VOCs
N/A	151G305	N/A	Water	Source Blank	Set 1
N/A	151G306	N/A	Water	Trip Blank	Total VOCs
N/A	151G307	N/A	Water	Trip Blank	Total VOCs
N/A	151G308	N/A	Water	Equipment Rinsate Blank	Set 1
N/A	151G309	N/A	Water	Trip Blank	Total VOCs
N/A	151G310	N/A	Water	Trip Blank	Total VOCs
N/A	151G311	N/A	Water	Trip Blank	Total VOCs

Set 1 = Total VOCs, Total SVOCs, PCBs, Total Pesticides, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90

ft bgs = Feet below ground surface
MS/MSD = Matrix spike/matrix spike duplicate
N/A = Not applicable

Video surveying initially began by accessing lines in manholes. The trunk line from Manhole 1 to Manhole 2 was video surveyed for 83 percent of its total length. Because the line was in the access road and no buildings or trailers were in the immediate area, it was determined that video surveying of the remaining 23 ft was not necessary. The trunk line from Manhole 2 to Manhole 3 was video surveyed for 97 percent of its length. The line from Manhole 3 to Manhole 4 received 100 percent video survey. Three tie-ins related to the dining hall were noted along this line. The tie-in lines of the dining area were video surveyed at a later date. Figure A.7-2 shows the details of these lines.

The trunk line from Manhole 4 to Manhole 5 received 100 percent video inspection, as did the trunk line from Manhole 5 to the lagoons. The trunk line from Manhole 5 to the east also received 100 percent inspection. A tie-in and cleanout were noted near the east end of this line. Field access was made to the exposed sewer line at CAS 18-99-09. Video surveying from this access confirmed that this line tied into the trunk line going to Manhole 5. During the CAI, it was confirmed that this pipe served the USGS trailers (CAS 18-03-01). Activities performed at CAS 18-99-09 were sufficient to meet the DQO requirements. The line north from CAS 18-99-09 received 100 percent video survey. Two tie-ins were noted near the north end of this line before it turned to the northeast. This portion of the sanitary lines is associated with the USGS trailers. Details of the tie-ins in this area are shown in Figure A.7-3.

Another discharge pipe comes into the north lagoon near the southeast corner. This line was not shown on the engineering drawings but is assumed to be associated with later construction of the field support area south of the original camp. This line received 100 percent video survey except for approximately 60 ft of line around Manhole 7 that was filled with soil. Two tie-ins and a cleanout were noted at the east end of this line. Figure A.7-4 shows details of these tie-ins that were video surveyed.

A line running from Manhole 3 to the east as video surveyed for approximately 47 ft but could not go beyond a pipe sticking into the line. Additional excavation and video surveying were performed at a later date. This line is from the area fire station. Figure A.7-5 shows the details of this line.

The lines north and west of Manhole 1 were video surveyed for 0.5 and 120 ft, respectively. The remaining parts of these lines received 100 percent survey coverage. These lines served the main camp housing and administrative trailers. Figure A.7-6 shows the details detected during this survey.

The 6-in. ACP that remains beneath the inlet walkway was not video surveyed. There were no indications of breaks in the pipe or evidence of past leakage from the pipe. This pipe was not further investigated. Figure A.7-1 shows this as the line segment between the input to the north lagoon and location G01.

All abandoned lines and field breaches were grouted closed after video surveying.

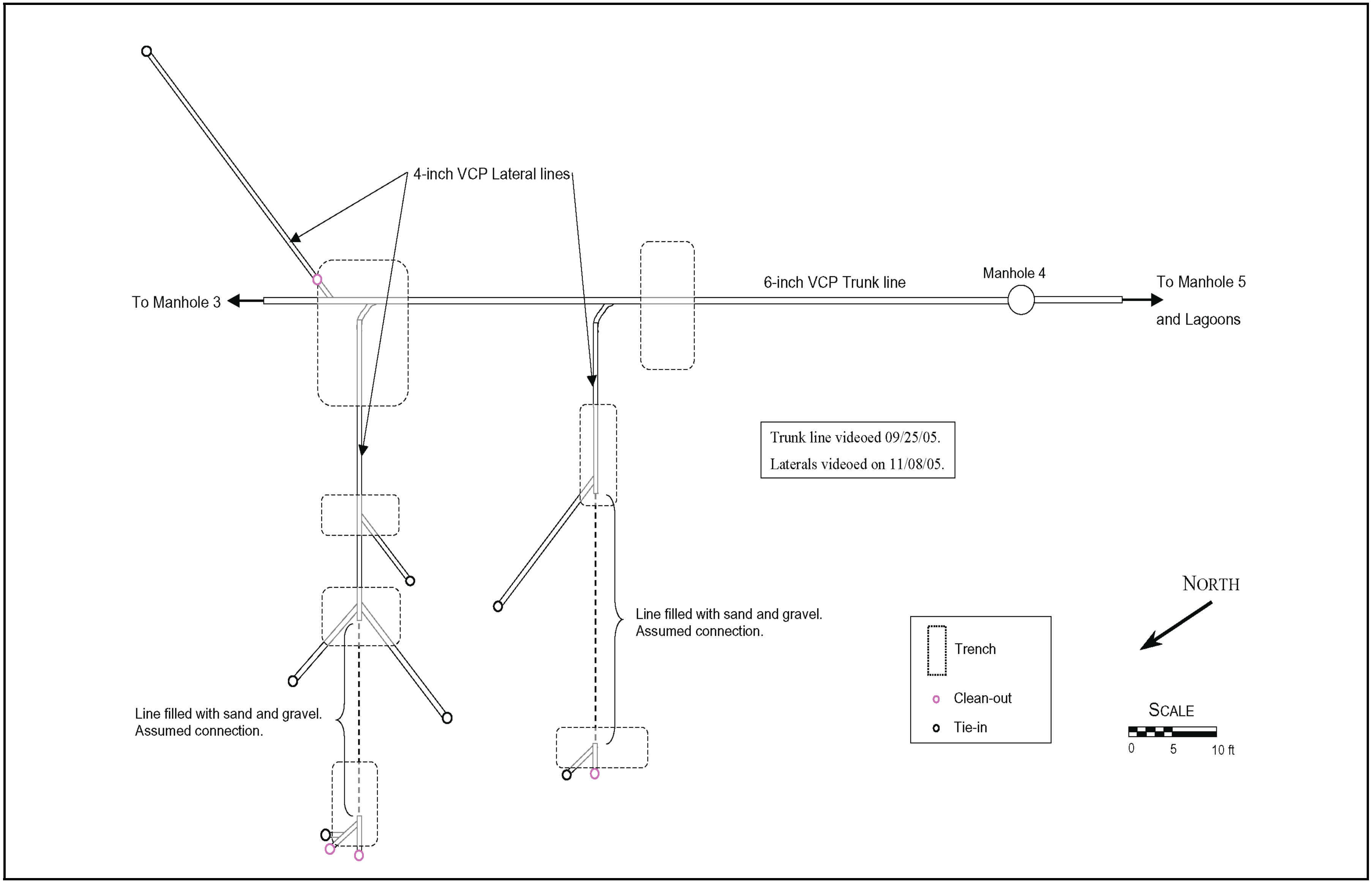

Figure A.7-2
Video Survey of Dining Hall Area, Detail B of Figure A.7-1

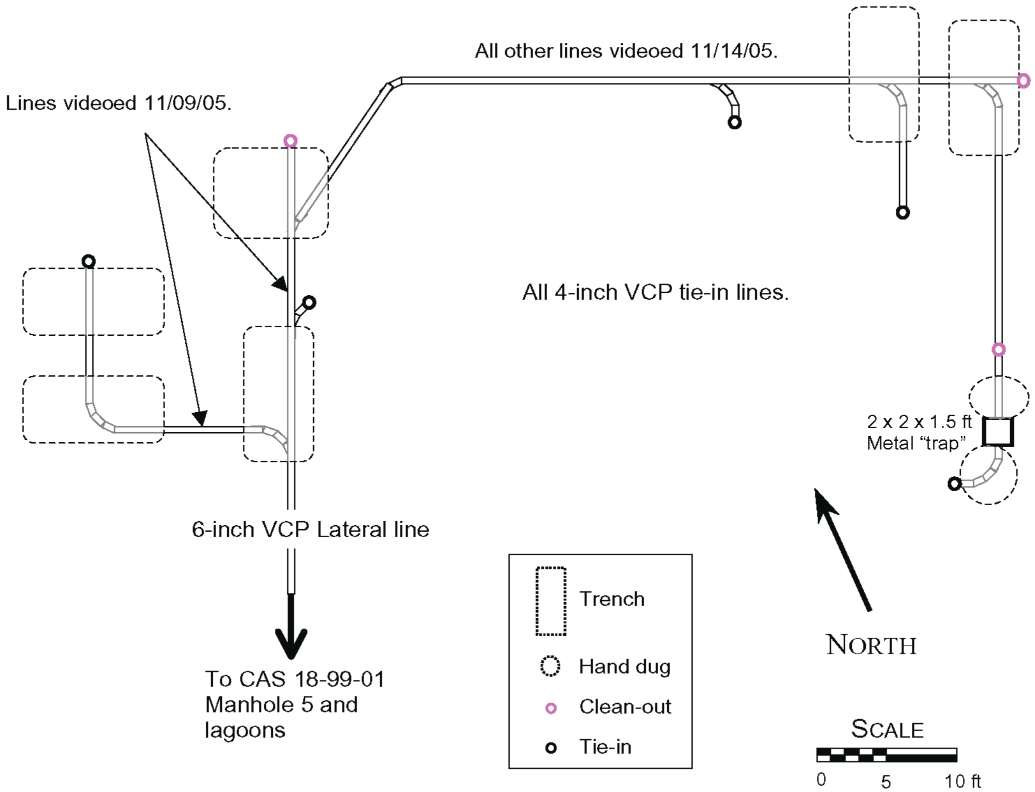

Figure A.7-3
Video Survey of USGS Trailer Area, Detail D of Figure A.7-1

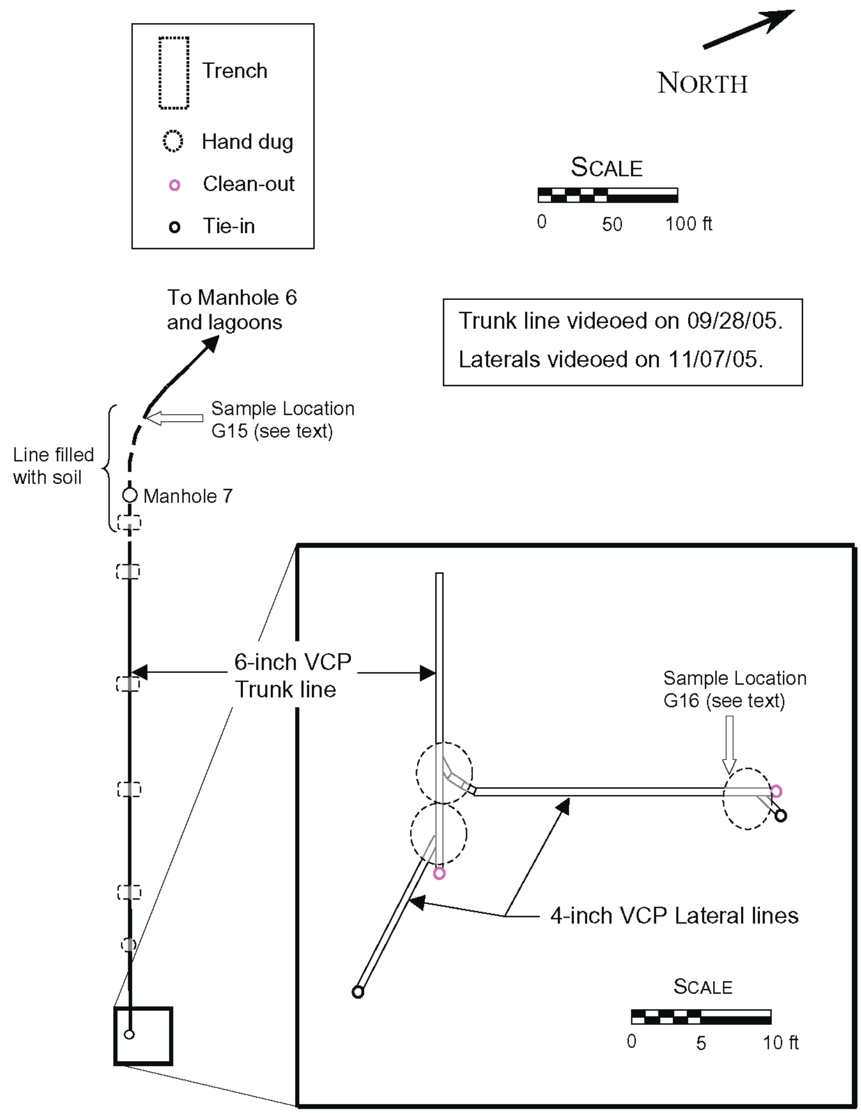

Figure A.7-4
Video Survey of Construction Support Area, Detail E of Figure A.7-1

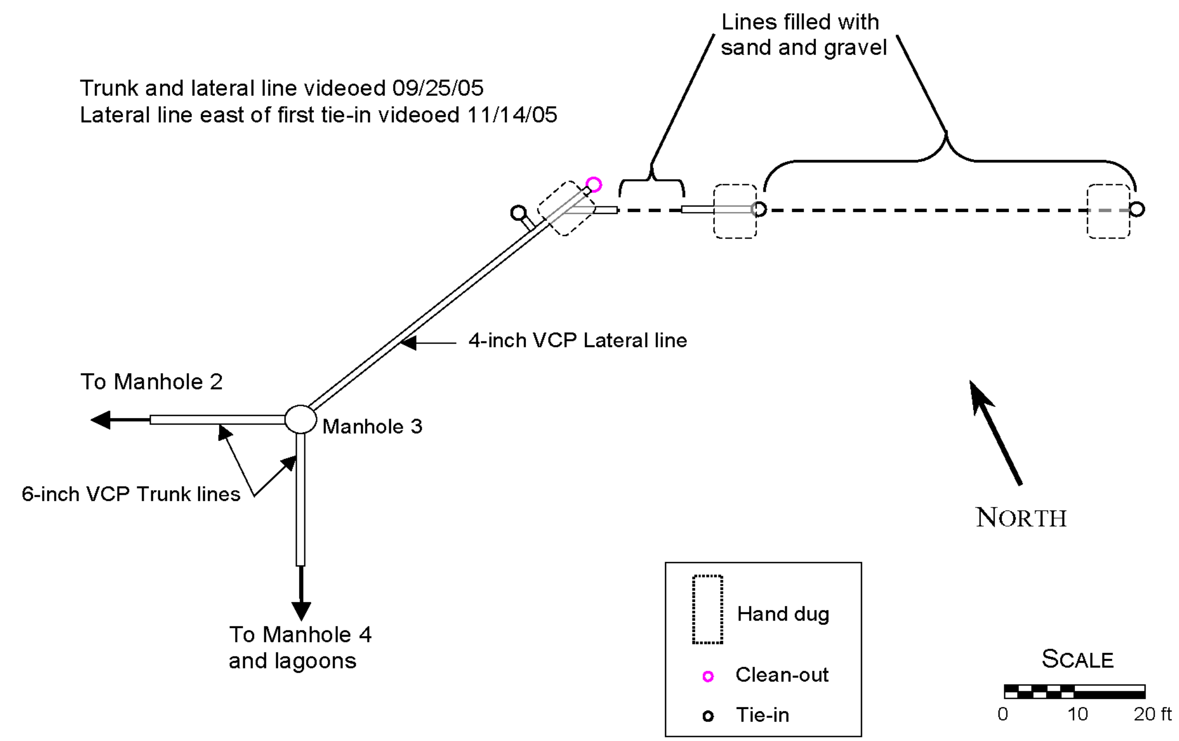

Figure A.7-5
Video Survey of Fire Station Line, Detail C of Figure A.7-1

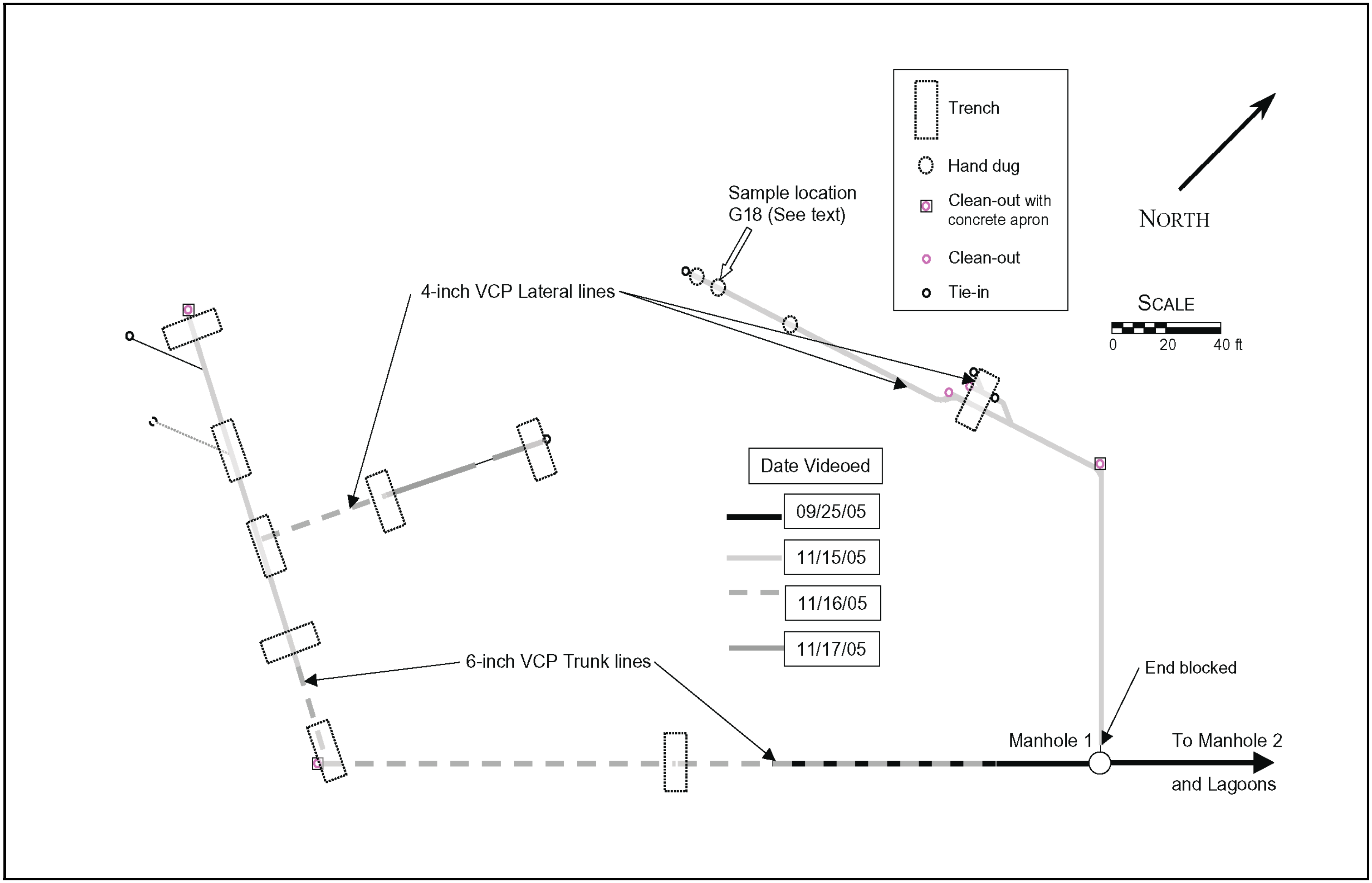

Figure A.7-6
Video Survey of Main Trailer Area, Detail A on Figure A.7-1

A.7.1.2 Field Screening

Decision I soil samples (151G001 through 151G036) were field screened for VOCs and alpha and beta/gamma radiation as specified in the CAU 151 CAIP. The FSRs were compared to FSLs to guide subsequent sampling decisions where appropriate.

Alpha and beta/gamma radiation FSLs were exceeded during sampling activities on two dates. Details are discussed in Section A.7.1.4. Volatile organic compound headspace FSRs were not exceeded.

A.7.1.3 Sample Collection

Surface and shallow subsurface soil samples were collected using hand auger sampling equipment.

Decision I sampling activities included the collection of environmental soil samples from 18 locations: G01 through G18. These locations represented the proximal, low-point, and distal portions of the lagoons; the overflow ditch from the south lagoon; the location of a known line breach exposed in a dry channel; and four field located line breaches.

A.7.1.4 Deviations

There was one deviation to the CAIP requirements at this CAS. Radiological FSLs were exceeded on two dates and step-out samples were not collected as specified in the CAU-151 CAIP (NNSA/NSO, 2004a). On both occasions, soil samples used to establish daily FSLs contained some volume of moisture due to precipitation. This would result in lower FSLs than for dry soil. Samples that exceeded FSLs were dry, either being collected at depths greater than 1 ft bgs or well-drained surface soils. The lack of step-out sampling does not have any impact on the closure recommendations as laboratory results from the original locations showed no radionuclides above their associated PALs.

A.7.2 Investigation Results

The following sections provide analytical results from the soil samples collected to complete investigation activities as outlined in the CAIP. Investigation samples were analyzed for the CAIP-specified COPCs, which included VOCs, SVOCs, pesticides, PCBs, RCRA metals and beryllium, gamma-emitting radionuclides, isotopic uranium, isotopic plutonium, and Sr-90. An unedited set of all analytical data is retained in electronic format in the project files.

Analytical results from the soil samples with concentrations exceeding MDCs are summarized in the following sections. An evaluation was conducted on all contaminants detected above MDCs by comparing individual concentration or activity results against the FALs. Establishment of the FALs is presented in Appendix D. The FALs were established as the corresponding PAL concentrations or activities if the contaminant concentrations were below their respective PALs.

A.7.2.1 Volatile Organic Compounds

Analytical results for VOCs detected above MDCs are presented in Table A.7-2. No VOCs were detected at concentrations exceeding the respective PALs at either CAS.

Table A.7-2
Sample Results for VOCs Detected Above
Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)	
			2-Hexanone	Acetone
Final Action Levels[a]			110,000,000	54,000,000
G08	151G020	1.5 - 2.0	20 (J)	--
G09	151G001	0.0 - 0.5	--	7.3 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

A.7.2.2 Semivolatile Organic Compounds

Analytical results for SVOCs detected above MDCs are presented in Table A.7-3. No SVOCs were detected at concentrations exceeding the respective PALs at either CAS.

A.7.2.3 Pesticides

Analytical results for pesticides detected above MDCs are presented in Table A.7-4. No pesticides were detected at concentrations exceeding the respective PALs at either CAS.

Table A.7-3
Sample Results for SVOCs Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)		
			Bis(2-Ethylhexyl)Phthalate	Di-N-Octyl Phthalate	Pentachlorophenol
Final Action Levels			120,000[a]	25,000,000[a]	462[b]
G01	151G010	0.0 - 0.5	1,100	32 (J)	--
G02	151G013	0.5 - 1.0	250 (J)	--	--
G10	151G011	0.0 - 0.5	65 (J)	--	--
	151G016	1.5 - 2.0	44 (J)	--	--
G12	151G024RR1	0.0 - 0.5	14,000 (B)	330 (J)	--
G15	151G029	Pipe Contents	91 (J)	--	--
	151G030	1.0 - 1.5	300 (J)	--	--
G16	151G033	1.5 - 2.0	67 (J)	25 (J)	--
	151G034	1.5 - 2.0	75 (J)	--	260 (J)
G17	151G031	3.0 - 3.5	140 (J)	--	--
G18	151G036	0.25 - 1.0	2,000	--	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).
[b]Based on Oak Ridge National Laboratory Risk Assessment Information System (ORNL, 2005).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
B = Analyte detected in both sample and associated blank.
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

Table A.7-4
Sample Results for Pesticides Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)						
			4,4'-DDE	4,4'-DDT	Alpha-BHC	Chlordane	Delta-BHC	Dieldrin	Endosulfan Sulfate
Final Action Levels			7,000[a]	7,000[a]	360[a]	6,500[a]	360[a]	110[a]	3,700,000[a]
G01	151G010	0.0 - 0.5	120 (J)	26 (J)	--	660 (J)	--	--	--
	151G012	0.5 - 1.0	18 (J)	19 (J)	--	170 (J)	--	3.9 (J)	--
G02	151G009	0.0 - 0.5	--	--	--	6,000 (J)	--	--	--
	151G013	0.5 - 1.0	--	--	--	2,800 (J)	--	--	--
G03	151G008	0.0 - 0.5	--	--	--	--	--	--	1.3 (J)
G05	151G005	0.0 - 0.5	1.1 (J)	0.45 (J)	--	--	--	--	--
G10	151G011	0.0 - 0.5	--	--	0.76 (J)		1 (J)	0.72 (J)	--
	151G016	1.5 - 2.0	0.27 (J)	1.2 (J)	--	--	--	--	--
G11	151G023	1.25 - 1.75		0.51 (J)	--	--	--	--	--
G12	151G024	0.0 - 0.5	2.2 (J)	0.97 (J)	--	--	0.87 (J)	--	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

A.7.2.4 Polychlorinated Biphenyls

Analytical results for PCBs detected above MDCs are presented in Table A.7-5. No PCBs were detected at concentrations exceeding the respective PALs at either CAS.

Table A.7-5
Sample Results for PCBs Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)	
			Aroclor 1254	Aroclor 1260
Final Action Levels[a]			740	740
G01	151G012	0.5 - 1.0	--	110 (J)
G10	151G011	0.0 - 0.5	--	12 (J)
G11	151G023	1.25 - 1.75	--	19
G15	151G029	Pipe Contents	--	13 (J)
G16	151G033	1.5 - 2.0	21 (J)	--
	151G034	1.5 - 2.0	20	--
G18	151G036	0.25 - 1.0	--	15 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value.
-- = Not detected above minimum detectable concentrations.

A.7.2.5 RCRA Metals and Beryllium

Analytical results for RCRA metals and beryllium detected above MDCs are presented in Table A.7-6. No metals were detected at concentrations exceeding the respective PALs at either CAS.

A.7.2.6 Gamma-Emitting Radionuclides

Gamma-emitting radionuclide analytical results for soil samples detected above MDCs are presented in Table A.7-7. No radionuclides were detected at concentrations exceeding the respective PALs at either CAS.

A.7.2.7 Isotopic Radionuclides

Isotopic radionuclide analytical results for soil samples detected above MDCs are presented in Table A.7-8. No radionuclides were detected at concentrations exceeding the respective PALs at this CAS.

Table A.7-6
Sample Results for Metals Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
(Page 1 of 3)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			23[a]	67,000[b]	1,900[b]	450[b]	450[b]	750[b]	310[b]	5,100[b]	5,100[b]
G01	151G010	0.0 - 0.5	2.2	79	0.65	0.14 (J-)	3.7	23	0.45	--	--
	151G012	0.5 - 1.0	1.5	58 (J)	--	--	2.2	12	0.4	--	--
G02	151G009	0.0 - 0.5	2.7	110	1	0.37 (J-)	5.1	39	0.33	--	0.22 (J-)
	151G013	0.5 - 1.0	1.6	78 (J)	0.6	--	3	8.3	0.07	--	--
G03	151G008	0.0 - 0.5	2.2	70	0.72	--	3.6	9.8	--	--	--
	151G014	1.0 - 1.5	1.8	71 (J)	0.8	--	4.2	5.5	--	--	0.079 (J-)
G04	151G007	0.0 - 0.5	2.5	72	0.93	--	4.7	9.5	--	--	0.17 (J-)
	151G015	0.5 - 1.0	2.6	110 (J)	0.58	--	1.9	4.6	--	0.49 (B)	--
G05	151G005	0.0 - 0.5	2	54	0.63	--	5.4	8.2	--	--	--
	151G006	2.0 - 2.5	2	55	1	--	12	7.7	--	--	--
G06	151G004	0.0 - 0.5	1.8	57	0.61	--	4	6.8	--	--	--
	151G017	0.5 - 1.0	2 (J+)	38	0.56	--	2.5	4.3	0.021 (J-)	--	--
G07	151G003	0.0 - 0.5	2	51	0.55	--	4.1	5.9	--	--	--
	151G018	1.25 - 2.0	1.2 (J+)	25	--	--	2.3	3.8	--	--	--
	151G019	1.25 - 2.0	1.1 (J+)	26	--	--	2.5	3.1	--	--	--
G08	151G002	0.0 - 0.5	1.9	54	0.57	--	4.5	8.5	--	--	--
	151G020	1.5 - 2.0	1.4 (J+)	28		--	4.8	3.4	0.0082 (J-)	--	--

Table A.7-6
Sample Results for Metals Detected Above
Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
(Page 2 of 3)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**750[b]**	**310[b]**	**5,100[b]**	**5,100[b]**
G09	151G001	0.0 - 0.5	2.5	79	0.72	--	5.3	12	--	--	0.11 (J-)
	151G021	2.0 - 2.5	2.5	77	0.8	--	5.6	8.6	0.014 (J-)	--	--
G10	151G011	0.0 - 0.5	2.7	75	0.66	--	5.6	13	0.64	--	0.37 (J-)
	151G016	1.5 - 2.0	1.9	54 (J)	1	--	4.7	7	0.039	--	0.13 (J-)
G11	151G022	0.0 - 0.5	1 (J+)	44	--	--	1.2	4.2	--	--	--
	151G023	1.25 - 1.75	1.6 (J+)	48	--	--	3.1	7	0.0021 (J-)	--	--
G12	151G024	0.0 - 0.5	0.75 (J+)	40	--	--	1.3	3.7	0.004 (J-)	--	--
	151G025	2.0 - 2.5	1 (J+)	52	--	--	2	5.3	0.0015 (J-)	--	--
G13	151G026	0.0 - 0.5	1.1 (J+)	41	--	--	1.7	3.9	--	--	--
	151G027	1.25 - 1.75	1.3 (J+)	48	--	--	2.3	5.2	0.002 (J-)	--	--
G14	151G028	6.5 - 7.0	--	21	--	--	0.52 (B)	2.3	--	--	--
G15	151G029	Pipe Contents	--	67	--	--	3.5	14	--	0.35 (B)	--
	151G030	1.0 - 1.5	--	33	--	--	1.9	5	--	--	--

Table A.7-6
Sample Results for Metals Detected Above
Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
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Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**750[b]**	**310[b]**	**5,100[b]**	**5,100[b]**
G16	151G033	1.5 - 2.0	2.2	67	0.54	--	3.2	7.2	--	--	--
	151G034	1.5 - 2.0	2.3	63	0.53	--	3.3	7.7	--	--	--
	151G035	4.0 - 4.5	1.5	55	--	--	2.6	4.8	--	--	--
G17	151G031	3.0 - 3.5	1.1	39	--	--	2.8	3.8	--	--	--
	151G032	5.5 - 6.0	1.4	44	--	--	3.9	3.9	--	--	--
G18	151G036	0.25 - 1.0	3.7	54	0.87	--	5.2	12	0.047	--	--

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004b)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum detectable concentrations.
B = Value less than contract required detection limit, but greater than or equal to the instrument detection limit.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
J- = The result is an estimated quantity, but the result may be biased low.

Table A.7-7
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
(Page 1 of 4)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)													
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]
Final Action Levels			5	15	5	15	5	15	12.2	5	15	5	15	5	15	105[c]
Depth bgs (cm)			<15	>15	<15	>15	<15	>15		<15	>15	<15	>15	<15	>15	
G01	151G010	0.0 - 0.5	2.35 (G)	N/A	--	N/A	1.37 (G, J)	N/A	--	2.42 (J)	N/A	1.74 (G, J)	N/A	0.88 (J)	N/A	--
	151G012	0.5 - 1.0	N/A	2.18 (G)	N/A	--	N/A	1.1 (G, J)	--	N/A	2.87 (J)	N/A	--	N/A	0.79 (G)	--
G02	151G009	0.0 - 0.5	2.81 (G)	N/A	--	N/A	1.48 (G, J)	N/A	0.63 (G)	3.25 (J)	N/A	1.54 (G, J)	N/A	0.69 (J)	N/A	--
	151G013	0.5 - 1.0	N/A	2.61 (G)	N/A	--	N/A	--	--	N/A	2.49 (J)	N/A	0.96 (G, J)	N/A	0.76 (G)	--
G03	151G008	0.0 - 0.5	2.4 (G)	N/A	3.1 (G)	N/A	1.12 (G, J)	N/A	0.194 (G, LT)	2.79 (J)	N/A	1.3 (G, J)	N/A	0.79 (J)	N/A	--
	151G014	1.0 - 1.5	N/A	1.82 (G)	N/A	--	N/A	1.3 (G, J)	--	N/A	2.8 (J)	N/A	1.32 (G, J)	N/A	0.74 (G)	--
G04	151G007	0.0 - 0.5	2.49 (G)	N/A	--	N/A	1.41 (G, J)	N/A	0.29 (G, LT)	2.7 (J)	N/A	1.45 (G, J)	N/A	0.77 (J)	N/A	--
	151G015	0.5 - 1.0	N/A	2.32 (G)	N/A	--	N/A	--	--	N/A	2.31 (J)	N/A	1.24 (G, J)	N/A	0.88 (G)	--
G05	151G005	0.0 - 0.5	2.7 (G)	N/A	--	N/A	1.12 (G, J)	N/A	--	3.25 (J)	N/A	1.14 (G, J)	N/A	0.83(J)	N/A	--
	151G006	2.0 - 2.5	N/A	2.79 (G)	N/A	--	N/A	1.33 (G, J)	--	N/A	3.3 (J)	N/A	1.47 (G, J)	N/A	0.79 (J)	--
G06	151G004	0.0 - 0.5	1.98 (G)	N/A	--	N/A	1.16 (G, J)	N/A	--	2.62 (J)	N/A	1.2 (G, J)	N/A	0.92 (J)	N/A	--
	151G017	0.5 - 1.0	N/A	2.59	N/A	--	N/A	0.95 (J)	--	N/A	2.27	N/A	1.32 (J)	N/A	0.89	--

Table A.7-7
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
(Page 2 of 4)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)														
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]
Final Action Levels			5	15	5	15	5	15	12.2	5	15	5	15	5	15	105[c]
Depth bgs (cm)			<15	>15	<15	>15	<15	>15		<15	>15	<15	>15	<15	>15	
G07	151G003	0.0 - 0.5	2.64 (G)	N/A	3.2 (G)	N/A	1.26 (G, J)	N/A	--	2.85 (J)	N/A	1.36 (G, J)	N/A	0.77 (J)	N/A	--
	151G018	1.25 - 2.0	N/A	2.05	N/A	--	N/A	1.14 (J)	--	N/A	2.41	N/A	1.36 (J)	N/A	0.8	--
	151G019	1.25 - 2.0	N/A	2.14	N/A	--	N/A	1.28 (J)	--	N/A	2.47	N/A	1.34 (J)	N/A	0.75	--
G08	151G002	0.0 - 0.5	2.64	N/A	--	N/A	0.78 (J)	N/A	--	2.3	N/A	1.08 (J)	N/A	0.9	N/A	--
	151G020	1.5 - 2.0	N/A	2.44	N/A	--	N/A	1.32 (J)	--	N/A	1.97	N/A	1.09 (J)	N/A	0.72	--
G09	151G001	0.0 - 0.5	2.25 (G)	N/A	2.91 (G)	N/A	1.26 (G, J)	N/A	0.189 (G, LT)	2.52 (J)	N/A	1.22 (G, J)	N/A	0.68 (J)	N/A	--
	151G021	2.0 - 2.5	N/A	2.06	N/A	--	N/A	1.07 (J)	--	N/A	2.62	N/A	1.04 (J)	N/A	0.76	--
G10	151G011	0.0 - 0.5	2.31 (G)	N/A	--	N/A	1.03 (G, J)	N/A	--	2.41 (J)	N/A	1.05 (G, J)	N/A	0.77 (J)	N/A	--
	151G016	1.5 - 2.0	N/A	2.3 (G)	N/A	--	N/A	1.19 (G, J)	--	N/A	2.43 (J)	N/A	1.12 (G, J)	N/A	0.83 (G)	--
G11	151G022	0.0 - 0.5	2.07 (G)	N/A	--	N/A	1.06 (G, J)	N/A	--	2.55 (J)	N/A	1.16 (G, J)	N/A	0.63 (G)	N/A	--
	151G023	1.25 - 1.75	N/A	1.71 (G)	N/A	--	N/A	1.29 (G, J)	--	N/A	2.46 (J)	N/A	1.1 (G, J)	N/A	0.65 (G)	--

Table A.7-7
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
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Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)														
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]
Final Action Levels			5	15	5	15	5	15	12.2	5	15	5	15	5	15	105[c]
Depth bgs (cm)			<15	>15	<15	>15	<15	>15		<15	>15	<15	>15	<15	>15	
G12	151G024	0.0 - 0.5	1.81 (G)	N/A	--	N/A	0.92 (G, J)	N/A	--	2.23 (J)	N/A	0.97 (G, J)	N/A	0.53 (G)	N/A	--
G12	151G025	2.0 - 2.5	N/A	2.51 (G)	N/A	--	N/A	1.26 (G, J)	--	N/A	2.34 (J)	N/A	1.29 (G, J)	N/A	0.64 (G)	--
G13	151G026	0.0 - 0.5	2.54 (G)	N/A	--	N/A	0.97 (G, J)	N/A	--	2.46 (J)	N/A	1.13 (G, J)	N/A	0.59 (G)	N/A	--
G13	151G027	1.25 - 1.75	N/A	2.32 (G)	N/A	--	N/A	0.93 (G, J)	--	N/A	2.62 (J)	N/A	1.01 (G, J)	N/A	0.72 (G)	--
G14	151G028	6.5 - 7.0	N/A	2.62 (G)	N/A	--	N/A	1.34 (G, J)	--	N/A	2.19 (J)	N/A	1.6 (G, J)	N/A	0.66 (G)	--
G15	151G029	Pipe Contents	2.15 (G)	N/A	--	N/A	1.09 (G, J)	N/A	--	2.45 (J)	N/A	1.13 (G, J)	N/A	0.63 (G)	N/A	--
G15	151G030	1.0 - 1.5	N/A	--	N/A	--	N/A	0.91 (G, J)	--	N/A	2.04 (J)	N/A	1.24 (G, J)	N/A	0.64 (G)	--
G16	151G033	1.5 - 2.0	N/A	2.47 (G)	N/A	3.7 (G)	N/A	1.58 (G, J)	--	N/A	2.93 (J)	N/A	1.71 (G, J)	N/A	0.92 (G)	--
G16	151G034	1.5 - 2.0	N/A	2.55 (G)	N/A	--	N/A	1.2 (G, J)	--	N/A	2.74 (J)	N/A	1.8 (G, J)	N/A	0.92 (G)	--
G16	151G035	4.0 - 4.5	N/A	2.1 (G)	N/A	--	N/A	1.22 (G, J)	--	N/A	2.4 (J)	N/A	1.44 (G, J)	N/A	0.64 (G)	--

Table A.7-7
Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
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Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)													
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]
Final Action Levels			5	15	5	15	5	15	12.2	5	15	5	15	5	15	105[c]
Depth bgs (cm)			<15	>15	<15	>15	<15	>15		<15	>15	<15	>15	<15	>15	
G17	151G031	3.0 - 3.5	N/A	2.22 (G)	N/A	--	N/A	1.32 (G, J)	--	N/A	2.56 (J)	N/A	1.35 (G, J)	N/A	0.84 (G)	4.4 (G, TI)
	151G032	5.5 - 6.0	N/A	2.67 (G)	N/A	3.9 (G, TI)	N/A	1.14 (G, J)	--	N/A	2.94 (J)	N/A	1.55 (G, J)	N/A	0.91 (G)	--
G18	151G036	0.25 - 1.0	N/A	--	N/A	--	N/A	0.87 (G, J)	--	N/A	2 (J)	N/A	1.38 (G, J)	N/A	0.63 (G)	--

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, as found in Chapter IV of DOE Order 5400.5, Change 2, “Radiation Protection of the Public and Environment” (DOE, 1993). The FALs for these isotopes are specified as 5 pCi/g averaged over the first 15 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 in.); therefore, 5 pCi/g represents the FALs for these radionuclides in the surface soil (0 to 0.5 ft bgs).
[b]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

cm = Centimeter
ft bgs = Feet below ground surface
N/A = Not applicable
pCi/g = Picocuries per gram
-- = Not detected above minimum detectable concentrations.
< = Less than
> = Greater than
G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.
LT = Result is less than requested minimum detectable concentration, but greater than sample specific minimum detectable concentration.
TI = Nuclide identification is tentative.

Table A.7-8
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
(Page 1 of 3)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			13	12.7	838	143	17.5	105
G01	151G010	0.0 - 0.5	0.154	0.342 (J)	--	1.38	0.055	1.16
	151G012	0.5 - 1.0	--	--	--	1.02	--	1.04
G02	151G009	0.0 - 0.5	0.073	0.209 (J)	--	1.55	0.115	1.37
	151G013	0.5 - 1.0	--	0.034 (LT)	--	1.5	0.145	1.48
G03	151G008	0.0 - 0.5	--	0.091 (J)	--	1.16	0.119	1.16
	151G014	1.0 - 1.5	--	--	--	1.3	--	1.27
G04	151G007	0.0 - 0.5	0.181	0.4 (J)	--	1.3	--	1.26
	151G015	0.5 - 1.0	--	--	--	1.22	--	1.21
G05	151G005	0.0 - 0.5	--	--	--	1.17	0.042 (LT)	1.17
	151G006	2.0 - 2.5	--	--	--	1.13	0.064	1.13
G06	151G004	0.0 - 0.5	0.07	0.135 (J)	--	1.34	0.1	1.28
	151G017	0.5 - 1.0	--	--	--	1.55	0.084	1.52
G07	151G003	0.0 - 0.5	--	--	--	1.3	0.08	1.14
	151G018	1.25 - 2.0	--	--	--	1.22	0.076	1.15
	151G019	1.25 - 2.0	--	--	--	1.14	0.061	1.1

Table A.7-8
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
(Page 2 of 3)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			**13**	**12.7**	**838**	**143**	**17.5**	**105**
G08	151G002	0.0 - 0.5	--	0.134 (J)	--	1.23	0.072	1.18
	151G020	1.5 - 2.0	--	--	--	1.24	0.066	1.17
G09	151G001	0.0 - 0.5	--	0.078 (J)	--	1.14	0.107	1.14
	151G021	2.0 - 2.5	--	0.07	--	1.26	--	0.99
G10	151G011	0.0 - 0.5	--	--	--	1.03	0.081	0.98
	151G016	1.5 - 2.0	--	--	--	1.14	0.07	1.18
G11	151G022	0.0 - 0.5	--	0.045 (LT)	--	1.4	0.077	1.33
	151G023	1.25 - 1.75	--	0.034 (LT)	--	1.15	0.082	1.27
G12	151G024	0.0 - 0.5	0.062	0.154	--	1.3	0.084	1.29
	151G025	2.0 - 2.5		0.05 (LT)	--	1.29	0.079	1.18
G13	151G026	0.0 - 0.5	0.072	0.178	--	1.15	--	1.2
	151G027	1.25 - 1.75	--	0.067	--	1.24	--	1.29
G14	151G028	6.5 - 7.0	--	--	0.35 (LT, Y1)	1.47	0.089	1.52
G15	151G029	Pipe Contents	0.15	0.43 (J)	--	1.19	0.046 (LT)	1.11
	151G030	1.0 - 1.5	--	--	--	1.16	0.053	1.09

Table A.7-8
Sample Results for Isotopic Radionuclides Detected Above Minimum Detectable Concentrations at CAS 18-03-01, Sewage Lagoon
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Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Final Action Levels[a]			**13**	**12.7**	**838**	**143**	**17.5**	**105**
G16	151G033	1.5 - 2.0	--	--	--	1.45	--	1.29
	151G034	1.5 - 2.0	--	0.052	--	1.52	0.069	1.41
	151G035	4.0 - 4.5	--	--	--	1.19	0.089	1.21
G17	151G031	3.0 - 3.5	--	0.039 (LT)	--	1.04 (M3)	--	1.25
	151G032	5.5 - 6.0	--	--	--	1.28	--	1.37
G18	151G036	0.25 - 1.0	--	--	--	1.34 (M3)	--	1.26

[a]Taken from the construction, commercial, industrial land use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 25-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above minimum detectable concentrations.
J = Estimated value.
LT = Result is less than requested minimum detectable concentrations, but greater than sample specific minimum detectable concentrations.
M3 = The requested minimum detectable concentration was not met, but the reported activity is greater than the reported minimum detectable concentration.
Y1 = Chemical yield is in control at 100-110%. Quantitive yield is assumed.

A.7.3 Nature and Extent of Contamination

Based on the analytical results, it was determined that results from all locations were below FALs; therefore, no COCs were identified at this CAS.

A.7.4 Revised Conceptual Site Model

The results of the CAI at CASs 18-03-01 and 18-99-09 did not contradict the CSM. No revision of the CSM was necessary.

A.8.0 Waste Characterization

Sections A.8.1 through A.8.3 address IDW whereas Section A.8.4 addresses the results of the waste characterization samples collected from various potential remediation waste streams.

A.8.1 Investigation-Derived Waste Generated

Investigation-derived waste was generated during the field investigation activities of CAU 151. The waste streams generated include decontamination rinsate, disposable personal protective equipment (PPE), and disposable sampling equipment.

Investigation-derived waste was segregated to the greatest extent possible, and waste minimization techniques were integrated into the field activities to reduce the amount of waste generation of hazardous and/or mixed waste. Decontamination activities were planned and executed to minimize the volume of rinsate generated.

Four hazardous waste accumulation areas (HWAAs) were established to manage hazardous and potentially hazardous waste generated during the CAI. The amount, type, and source of waste placed into each drum were recorded in waste management logbooks that are maintained in the project file. Nine drums generated during the CAI were stored and managed as potentially hazardous waste. They were labeled as “Hazardous Waste - Pending Analysis” until the analytical data from the site characterization samples were received, at which time the waste was characterized; one drum was hazardous and eight drums were declared non-hazardous.

A.8.2 Waste Streams

Investigation-derived waste generated during the CAI was segregated into the following waste streams:

- Disposable PPE/debris (including, but not limited to: plastic sheeting, glass/plastic sample jars, soil, sampling scoops, aluminum foil, pans, and soil).
- Decontamination rinsate.

A.8.3 Investigation-Derived Waste Generated

A total of nine drums of IDW were generated during the investigation. The analytical data of the environment samples associated with the IDW were used as process knowledge for characterization. One drum of PPE/plastic/debris was characterized as hazardous waste exceeding regulatory levels per RCRA. The recommended disposal of this drum is at the permitted Treatment, Storage, Disposal Facility. The remaining eight drums of IDW (rinsate and PPE/debris) meet the landfill acceptance criteria and have been declared sanitary waste. The recommendation for disposal of drums containing rinsate is to solidify the contents and send them to the industrial waste landfill. The results of waste management samples collected from IDW that were detected above MDCs are presented in the following subsections.

Office waste and lunch trash were disposed of in designated sanitary waste bins allocated for disposal at the NTS sanitary landfill. Sanitary industrial waste was inspected and disposed of in designated sanitary industrial waste bins located at Building 23-153 and allocated for disposal at the NTS industrial waste landfill.

A.8.4 Non-IDW Waste Characterization

Samples were collected of septic tank contents at CASs 12-04-01, 12-04-02, and 12-04-03 for waste characterization and environmental purposes. Samples of both liquid and sludge, when present, were collected to determine the concentrations of the chemical constituents and/or radiological isotopes present in the associated material. The analytical suite was tailored to characterize the waste for disposal if removed and to support recommended action. All analytical results were reviewed against federal regulations, state regulations, and DOE directives/policies/guidance and waste disposal criteria for NTS facilities for waste characterization purposes. Results were also compared to FALs to determine whether the contents were deemed potential source material.

A.8.4.1 Corrective Action Site 12-04-01, Septic Tanks, Systems #1 and #4

Six septic tanks were sampled through the access hatches of each tank. A total of 14 liquid samples (including two FDs and one MS/MSD) from each tank were analyzed for VOCs, SVOCs, PCBs, TPH-DRO, TPH-GRO, RCRA metals, beryllium, isotopic uranium and plutonium, Sr-90, and gamma-emitting radionuclides. A total of 16 sludge samples (including one FD and one MS/MSD) were analyzed for the same constituents as well as TCLP VOCs, TCLP SVOCs, and TCLP metals. Table A.8-1 presents the thickness and corresponding volumes for all phases of tank contents for System #1. Table A.8-2 presents the thickness and volumes for System #4.

Table A.8-1
Waste Characterization Volumes for CAS 12-04-01, Septic Tanks, System #1

Sample Location	Sample Number	Thickness (ft)	Volume (gallons)	Sample Matrix	Purpose	Analyses
C09 (Tank 5 Inlet)	151C514	1.0	645	Liquid	Waste Management	Set 1
	151C515	1.5	610	Sludge	Waste Management	Set 2
C10 (Tank 5 Outlet)	151C516	1.0	488	Liquid	Waste Management	Set 1
	151C517	0.5	122	Sludge	Waste Management	Set 2
C11 (Tank 6 Inlet)	151C518	3.0	2,011	Liquid	Waste Management, MS/MSD	Set 1
	151C519	3.0	2,011	Liquid	Field Duplicate of #151C518	Set 1
	151C520	1.0	339	Sludge	Waste Management, MS/MSD	Set 2
	151C521	1.0	339	Sludge	Field Duplicate of #151C520	Set 2
C12 (Tank 6 Outlet)	151C522	4.0	2600	Liquid	Waste Management	Set 1

Set 1 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90.
Set 2 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90, TCLP VOCs, TCLP SVOCs, TCLP RCRA Metals.

ft = Foot
MS/MSD = Matrix spike/matrix spike duplicate

Table A.8-2
Waste Characterization Volumes for CAS 12-04-01, Septic Tanks, System #4
(Page 1 of 2)

Sample Location	Sample Number	Thickness (ft)	Volume (gallons)	Sample Matrix	Purpose	Analyses
C01 (Tank 1 Inlet)	151C501	5.5	3,437	Liquid	Waste Management	Set 1
	151C502	5.5	3,437	Liquid	Field Duplicate of #151C501	Set 1
C02 (Tank 1 Outlet)	151C503	5.5	3,437	Liquid	Waste Management	Set 1
C03 (Tank 2 Inlet)	151C504	4.0	2,342	Liquid	Waste Management	Set 1
C04 (Tank 2 Outlet)	151C505	4.0	2,342	Liquid	Waste Management	Set 1

Table A.8-2
Waste Characterization Volumes for CAS 12-04-01, Septic Tanks, System #4
(Page 2 of 2)

Sample Location	Sample Number	Thickness (ft)	Volume (gallons)	Sample Matrix	Purpose	Analyses
C05 (Tank 3 Inlet)	151C506	1.0	690	Liquid	Waste Management	Set 1
	151C512	2.0	920	Sludge	Waste Management	Set 1
C06 (Tank 3 Outlet)	151C507	3.0	1,855	Liquid	Waste Management	Set 1
	151C511	0.5	122	Sludge	Waste Management	Set 1
C07 (Tank 4 Inlet)	151C508	4.5	3,106	Liquid	Waste Management	Set 1
	151C510	1.0	3,40	Sludge	Waste Management	Set 1
C08 (Tank 4 Outlet)	151C509	4.0	2,751	Liquid	Waste Management	Set 1
	151C513	1.0	340	Sludge	Waste Management	Set 1

Set 1 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90.

ft = Foot

Tables A.8-3 and A.8-4 present the analytical results detected above MDCs for CAS 12-04-01, System #1. The only gamma-emitting radionuclide detected was Cs-37, in the outlet chamber of Tank #5. No isotopic radionuclides were detected above waste acceptance criteria.

The inlet chamber of both Tanks #5 and #6 contain sludge that failed the TCLP test (exceeds the TCLP limit) for 1,4-dichlorobenzene (17 mg/L and 7.8 mg/L, respectively, above the TCLP limit of 7.5 mg/L) and trichloroethene (36 mg/L in Tank #5 above the TCLP limit of 0.5 mg/L), and if removed would likely need to be managed as a hazardous waste. The sludge in these tanks is also considered potential source material due to these results.

The sludge within inlet chambers of Tanks #3, #4, and #6 had lead concentrations, based on the total metals analyses, that would exceed the RCRA limit based on a theoretical maximum obtained if the results were divided by twenty. However, the TCLP lead analyses for these samples had results less than TCLP limits, but were non-detect and are therefore not presented in the data tables. In conclusion, lead is not a hazardous waste constituent in these chambers.

Table A.8-3
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #5 at CAS 12-04-01, System #1
(Page 1 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #5 Inlet	C09	151C514	Liquid	Strontium-90	0.49 (LT, Y1)	pCi/L
		151C514		Uranium-238	0.137	pCi/L
		151C514		Uranium-234	0.39	pCi/L
		151C514		Cis-1,2-Dichloroethene	79	µg/L
		151C514		Trichloroethene	0.93 (J)	µg/L
		151C515	Sludge	Diesel-Range Organics	6,400 (H, Z)	mg/kg
		151C515		Cesium-137	2.94 (J)	pCi/g
		151C515		Gasoline-Range Organics	3,000 (Z)	mg/kg
		151C515		Lead	2,300 (J)	mg/kg
		151C515		Mercury	0.98	mg/kg
		151C515		Silver	7	mg/kg
		151C515		Arsenic	9.4	mg/kg
		151C515		Barium	1,600	mg/kg
		151C515		Cadmium	12	mg/kg
		151C515		Chromium	26	mg/kg
		151C515		Selenium	2 (J+)	mg/kg
		151C515		Aroclor-1254	6,400 (J)	µg/kg
		151C515		Bix(2-Ethylhexyl)Phthalate	26,000 (J)	µg/kg
		151C515		Pyrene	440 (J)	µg/kg
		151C515		Fluorene	130 (J)	µg/kg
		151C515		Naphthalene	210 (J)	µg/kg
		151C515		Phenanthrene	590 (J)	µg/kg
		151C515		TCLP Lead	1.3	mg/L
		151C515		TCLP Chromium	0.006 (B)	mg/L
		151C515		2-Methylnaphthalene	470 (J)	µg/kg
		151C515		TCLP Tetrachloroethene	0.006 (J)	mg/L
		151C515		Plutonium-238	0.094	pCi/g
		151C515		Plutonium-239	0.74	pCi/g
		151C515		Uranium-238	1.58	pCi/g
		151C515		Uranium-235	0.088 (J)	pCi/g
		151C515		Uranium-234	1.98	pCi/g
		151C515		**1,4-Dichlorobenzene**	**2,300,000 (B)**	**µg/kg**
		151C515		Cis-1,2-Dichloroethene	100,000	µg/kg
		151C515		**Trichloroethene**	**2,000,000**	**µg/kg**
		151C515RR2		3+4-Methylphenol	80,000	µg/kg

Table A.8-3
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #5 at CAS 12-04-01, System #1
(Page 2 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #5 Inlet (continued)	C09 (continued)	151C515RR1	Sludge	3+4-Methylphenol	1.6	mg/L
		151C515RR1		**TCLP 1,4-Dichlorobenzene**	**17**	**mg/L**
		151C515RR1		**TCLP Trichloroethene**	**36**	**mg/L**
Tank #5 Outlet	C10	151C516	Liquid	TCLP cis-1,2-Dichloroethene	55	µg/L
		151C516		Lead	0.0034	mg/L
		151C516		Strontium-90	0.47 (LT)	pCi/L
		151C516		Uranium-238	0.112	pCi/L
		151C516		Uranium-234	0.34	pCi/L
		151C516	Sludge	Trichloroethene	2.4 (J)	µg/L
		151C517		Diesel-Range Organics	12,000 (H, M, Z)	mg/kg
		151C517		Americium-241	1.27 (J)	pCi/g
		151C517		**Cesium-137**	**13.6 (J)**	**pCi/g**
		151C517		Gasoline-Range Organics	90 (H)	mg/kg
		151C517		Lead	2,100 (J)	mg/kg
		151C517		Mercury	2.4	mg/kg
		151C517		Silver	53	mg/kg
		151C517		Arsenic	20	mg/kg
		151C517		Barium	1,700	mg/kg
		151C517		Cadmium	58	mg/kg
		151C517		Chromium	120	mg/kg
		151C517		Selenium	5.4	mg/kg
		151C517		**Aroclor-1254**	**37,000 (J)**	**µg/kg**
		151C517		2,4-Dimethylphenol	360 (J)	µg/kg
		151C517		Anthracene	380 (J)	µg/kg
		151C517		Pyrene	2,700 (J)	µg/kg
		151C517		Fluoranthene	780 (J)	µg/kg
		151C517		Chrysene	580 (J)	µg/kg
		151C517		Benzo(a)Anthracene	330 (J)	µg/kg
		151C517		Acenaphthene	370 (J)	µg/kg
		151C517		Di-N-Butyl Phthalate	370 (J)	µg/kg
		151C517		Di-N-Octyl Phthalate	3,100 (J)	µg/kg
		151C517		Butyl Benzyl Phthalate	2,100 (J)	µg/kg

Table A.8-3
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #5 at CAS 12-04-01, System #1
(Page 3 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #5 Outlet (continued)	C10 (continued)	151C517	Sludge	Fluorene	860 (J)	µg/kg
		151C517		Naphthalene	900 (J)	µg/kg
		151C517		Phenanthrene	4,400	µg/kg
		151C517		2-Methylnaphthalene	3,000 (J)	µg/kg
		151C517		TCLP Lead	0.54	mg/L
		151C517		TCLP Barium	1.1	mg/L
		151C517		TCLP Chromium	0.0067 (B)	mg/L
		151C517		TCLP 1,4-Dichlorobenzene	0.11	mg/L
		151C517		TCLP Trichloroethene	0.0043 (J)	mg/L
		151C517		Plutonium-238	0.12	pCi/g
		151C517		Plutonium-239	3.94	pCi/g
		151C517		Uranium-238	4.66	pCi/g
		151C517		Uranium-235	0.323 (J)	pCi/g
		151C517		Uranium-234	10.9	pCi/g
		151C517		Ethylbenzene	74 (J)	µg/kg
		151C517		N-Propylbenzene	290 (J)	µg/kg
		151C517		N-Butylbenzene	720 (J)	µg/kg
		151C517		1,3,5-Trimethylbenzene	990 (J)	µg/kg
		151C517		Toluene	1,700 (J)	µg/kg
		151C517		Chlorobenzene	81 (J)	µg/kg
		151C517		1,2,4-Trichlorobenzene	260 (J)	µg/kg
		151C517		Total Xylenes	510 (J)	µg/kg
		151C517		Sec-Butylbenzene	410 (J)	µg/kg
		151C517		Cis-1,2-Dichloroethene	580 (J)	µg/kg
		151C517		1,3-Dichlorobenzene	210 (J)	µg/kg
		151C517		Acetone	890 (J)	µg/kg
		151C517		Carbon Disulfide	83 (J)	µg/kg
		151C517		Trichloroethene	590 (J)	µg/kg
		151C517		1,2,4-Trimethylbenzene	3,400 (J)	µg/kg
		151C517		Tert-Butylbenzene	26 (J)	µg/kg
		151C517		Isopropylbenzene	40 (J)	µg/kg
		151C517RR1		Bix(2-Ethylhexyl)Phthalate	130,000 (J)	µg/kg
		151C517RR1		1,4-Dichlorobenzene	16,000	µg/kg
		151C517RR1		1,2-Dichlorobenzene	2,200	µg/kg

Table A.8-3
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #5 at CAS 12-04-01, System #1
(Page 4 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
μg/kg = Micrograms per kilogram
μg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
LT = Result is less than the requested minimum detectable concentration, but greater than the sample specific minimum detectable concentration.
M = A pattern resembling motor oil was detected.
Y1 = Chemical yield is in control at 100-110%. Quantitive yield is assumed.
Z = Result did not resemble any common TPH products.

Table A.8-4
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #6 at CAS 12-04-01, System #1
(Page 1 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #6 Inlet	C11	151C518	Liquid	Uranium-234	0.115	pCi/L
		151C519		Selenium	0.0032 (B)	mg/L
		151C520	Sludge	Diesel-Range Organics	2,700 (J)	mg/kg
		151C520		Cesium-137	2.35 (J)	pCi/g
		151C520		Lead-212	1.66 (J)	pCi/g
		151C520		Lead-214	1.23 (G, J)	pCi/g
		151C520		Gasoline-Range Organics	29 (J)	mg/kg
		151C520		Lead	730 (J)	mg/kg
		151C520		Mercury	0.61	mg/kg
		151C520		Silver	5.6	mg/kg
		151C520		Arsenic	9.6	mg/kg
		151C520		Barium	330	mg/kg
		151C520		Cadmium	9.3	mg/kg
		151C520		Chromium	19	mg/kg
		151C520		Aroclor 1254	2,200	μg/kg

Table A.8-4
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #6 at CAS 12-04-01, System #1
(Page 2 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #6 Inlet (continued)	C11 (continued)	151C520	Sludge	Bix(2-Ethylhexyl)Phthalate	7,100 (J)	µg/kg
		151C520		Pyrene	470 (J)	µg/kg
		151C520		Benzo(b)Fluoranthene	140 (J)	µg/kg
		151C520		Fluoranthene	190 (J)	µg/kg
		151C520		Benzo(a)Pyrene	93 (J)	µg/kg
		151C520		Phenanthrene	220 (J)	µg/kg
		151C520		TCLP Chlorobenzene	0.0027 (J)	mg/L
		151C520		Plutonium-239	0.56	pCi/g
		151C520		Uranium-238	1.35	pCi/g
		151C520		Uranium-235	0.09 (J)	pCi/g
		151C520		Uranium-234	1.71	pCi/g
		151C520		1,4-Dichlorobenzene	37,000 (B)	µg/kg
		151C520		1,2,4-Trimethylbenzene	330 (J)	µg/kg
		151C521		Diesel-Range Organics	2,600 (M, Z)	mg/kg
		151C521		Cesium-137	6.2 (J)	pCi/g
		151C521		Lead-212	1.57 (J)	pCi/g
		151C521		Gasoline-Range Organics	480 (Z)	mg/kg
		151C521		Lead	1,300 (J)	mg/kg
		151C521		Mercury	1.1	mg/kg
		151C521		Silver	7.2	mg/kg
		151C521		Arsenic	10	mg/kg
		151C521		Barium	470	mg/kg
		151C521		Cadmium	12	mg/kg
		151C521		Chromium	26	mg/kg
		151C521		Selenium	1.4 (J+)	mg/kg
		151C521		Aroclor 1254	4,700 (J)	µg/kg
		151C521		Bix(2-Ethylhexyl)Phthalate	10,000 (J)	µg/kg
		151C521		Pyrene	180 (J)	µg/kg
		151C521		Phenanthrene	100 (J)	µg/kg
		151C521		2-Methylnaphthalene	81 (J)	µg/kg
		151C521		TCLP Mercury	0.00094 (J-)	mg/L
		151C521		TCLP Barium	1.2	mg/L

Table A.8-4
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #6 at CAS 12-04-01, System #1
(Page 3 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #6 Inlet (continued)	C11 (continued)	151C521	Sludge	TCLP Chlorobenzene	0.0046 (J)	mg/L
		151C521		Plutonium-238	0.107	pCi/g
		151C521		Plutonium-239	2.94	pCi/g
		151C521		Uranium-238	1.54	pCi/g
		151C521		Uranium-235	0.076 (J)	pCi/g
		151C521		Uranium-234	2.32	pCi/g
		151C521		1,4-Dichlorobenzene	530,000	μg/kg
		151C520RR1		TCLP 1,4-Dichlorobenzene	2.5	mg/L
		151C521RR1		**TCLP 1,4-Dichlorobenzene**	**7.8**	**mg/L**

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
μg/kg = Micrograms per kilogram

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
J- = The result is an estimated quantity, but the result may be biased low.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

Tables A.8-5 through A.8-8 present the analytical results detected above MDCs for CAS 12-04-01, System #4. No samples exceeded TCLP limits or other NTS waste acceptance criteria. Disposable plastic samplers were placed inside the tanks after sampling and will be dispositioned with final tank disposal.

Table A.8-5
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #1 at CAS 12-04-01, System #4

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #1 Inlet	C01	151C501	Liquid	Lead	0.0013 (B)	mg/L
		151C501		Silver	0.00078 (B)	mg/L
		151C501		Barium	0.0056 (J-)	mg/L
		151C502		Barium	0.0053 (J-)	mg/L
		151C501		Uranium-234	0.138	pCi/L
		151C502		Uranium-234	0.198	pCi/L
		151C501		1,2-Dichlorobenzene	1.1 (J)	µg/L
		151C502		Chlorobenzene	1.2 (J)	µg/L
		151C502		1,2-Dichlorobenzene	1.2 (J)	µg/L
	C02	151C503		Gasoline-Range Organics	0.32 (Z)	mg/L
		151C503		Barium	0.0046 (J-)	mg/L
		151C503		Strontium-90	1.02	pCi/L
		151C503		Uranium-234	0.196	pCi/L
		151C503		1,4-Dichlorobenzene	81	µg/L
		151C503		Toluene	0.56 (J)	µg/L
		151C503		Chlorobenzene	140	µg/L
		151C503		1,3-Dichlorobenzene	6.7	µg/L
		151C503		Benzene	6.6	µg/L
		151C503		1,2-Dichlorobenzene	46	µg/L

mg/L = Milligrams per liter
pCi/L = Picocuries per liter
µg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
J = Estimated value.
J- = The result is an estimated quantity, but the result may be biased low.
Z = Result did not resemble any common TPH products.

Table A.8-6
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #2 at CAS 12-04-01, System #4

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #2 Inlet	C03	151C504	Liquid	Gasoline-Range Organics	0.019 (J)	mg/L
		151C504		Silver	0.00081 (B)	mg/L
		151C504		Barium	0.0052 (J-)	mg/L
		151C504		1,4-Dichlorobenzene	22	µg/L
		151C504		Chlorobenzene	1.9 (J)	µg/L
		151C504		1,2-Dichlorobenzene	11	µg/L
Tank #2 Outlet	C04	151C505	Liquid	Lead	0.017	mg/L
		151C505		Silver	0.0037 (B)	mg/L
		151C505		Barium	0.017 (J-)	mg/L
		151C505		Cadmium	0.00084 (J-)	mg/L
		151C505		Strontium-90	2.33	pCi/L
		151C505		1,4-Dichlorobenzene	6.8	µg/L
		151C505		1,2-Dichlorobenzene	4 (J)	µg/L

mg/L = Milligrams per liter
pCi/L = Picocuries per liter
µg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
J = Estimated value.
J- = The result is an estimated quantity, but the result may be biased low.

Table A.8-7
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-01, System #4
(Page 1 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #3 Inlet	C05	151C506	Liquid	Barium	0.022 (J-)	mg/L
		151C506		Uranium-234	0.24	pCi/L
		151C506		Chlorobenzene	4.8 (J)	μg/L
		151C506		Benzene	0.75 (J)	μg/L
		151C512	Sludge	Diesel-Range Organics	280 (M)	mg/kg
		151C512		Lead-212	1.7 (J)	pCi/g
		151C512		Gasoline-Range Organics	25 (Z)	mg/kg
		151C512		Lead	210	mg/kg
		151C512		Mercury	0.13 (J-)	mg/kg
		151C512		Arsenic	24	mg/kg
		151C512		Barium	1,400	mg/kg
		151C512		Beryllium	8	mg/kg
		151C512		Chromium	16	mg/kg
		151C512		Bix(2-Ethylhexyl)phthalate	8,800	μg/kg
		151C512A		TCLP 1,4-Dichlorobenzene	0.13	mg/L
		151C512A		TCLP Chlorobenzene	0.019 (J)	mg/L
		151C512A		TCLP Benzene	0.006 (J)	mg/L
		151C512		Uranium-238	1.02	pCi/g
		151C512		Uranium-235	0.063	pCi/g
		151C512		Uranium-234	1.01	pCi/g
		151C512		1,4-Dichlorobenzene	12,000	μg/kg
		151C512RR1		Ethylbenzene	180 (J)	μg/kg
		151C512RR1		1,3,5-Trimethylbenzene	72 (J)	μg/kg
		151C512RR1		Toluene	430	μg/kg
		151C512RR1		Chlorobenzene	82 (J)	μg/kg
		151C512RR1		1,2,4-Trichlorobenzene	230 (J)	μg/kg
		151C512RR1		1,3-Dichlorobenzene	1,600	μg/kg
		151C512RR1		Acetone	700 (J)	μg/kg
		151C512RR1		Carbon Disulfide	120 (J)	μg/kg
		151C512RR1		1,2-Dichlorobenzene	13,000	μg/kg
		151C512RR1		1,2,4-Trimethylbenzene	170 (J)	μg/kg

Table A.8-7
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-01, System #4
(Page 2 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #3 Inlet (continued)	C05 (continued)	151C512RR2	Sludge	N-Propylbenzene	15 (J)	µg/kg
		151C512RR2		N-Butylbenzene	33 (J)	µg/kg
		151C512RR2		Sec-Butylbenzene	21 (J)	µg/kg
		151C512RR2		Methylene Chloride	59 (J)	µg/kg
Tank #3 Outlet	C06	151C507	Liquid	Barium	0.012 (J-)	mg/L
		151C507		Uranium-234	0.21	pCi/L
		151C507		1,4-Dichlorobenzene	1.6 (J)	µg/L
		151C507		1,2-Dichlorobenzene	0.8 (J)	µg/L
		151C511	Sludge	Diesel-Range Organics	43 (M, Z)	mg/kg
		151C511		Cesium-137	3.01 (G, M3)	pCi/g
		151C511		Lead	15	mg/kg
		151C511		Mercury	0.019 (J-)	mg/kg
		151C511		Arsenic	8	mg/kg
		151C511		Barium	120	mg/kg
		151C511		Chromium	9.7	mg/kg
		151C511A		TCLP 1,4-Dichlorobenzene	0.072	mg/L
		151C511		Plutonium-239	0.286	pCi/g
		151C511		Uranium-238	1.28	pCi/g
		151C511		Uranium-235	0.127	pCi/g
		151C511		Uranium-234	3.1	pCi/g
		151C511		1,4-Dichlorobenzene	370	µg/kg
		151C511		Chlorobenzene	1,200	µg/kg
		151C511		Benzene	41	µg/kg
		151C511		1,2-Dichlorobenzene	29 (J)	µg/kg
		151C511RR1		Ethylbenzene	1.6 (J)	µg/kg
		151C511RR1		1,3-Dichlorobenzene	1.2 (J)	µg/kg
		151C511RR1		Acetone	17 (J)	µg/kg
		151C511RR1		Methylene Chloride	3.7 (J)	µg/kg

Table A.8-7
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-01, System #4
(Page 3 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter

G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.
J- = The result is an estimated quantity, but the result may be biased low.
M = A pattern resembling motor oil was detected.
M3 = The requested minimum detectable concentration was not met, but the reported activity is greater than the reported minimum detectable concentration.
Z = Result did not resemble any common TPH products.

Table A.8-8
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #4 at CAS 12-04-01, System #4
(Page 1 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #4 Inlet	C07	151C508	Liquid	Lead	0.0065	mg/L
		151C508		Barium	0.018 (J-)	mg/L
		151C508		Uranium-234	0.121	pCi/L
		151C508		1,4-Dichlorobenzene	9.6	µg/L
		151C508		Chlorobenzene	18	µg/L
		151C508		1,3-Dichlorobenzene	0.85 (J)	µg/L
		151C508		Benzene	0.67 (J)	µg/L
		151C508		1,2-Dichlorobenzene	4.1 (J)	µg/L
		151C510	Sludge	Diesel-Range Organics	1,800 (M, Z)	mg/kg
		151C510		Cesium-137	1.05 (G)	pCi/g
		151C510		Gasoline-Range Organics	9.5 (H, Z)	mg/kg
		151C510		Lead	110	mg/kg
		151C510		Mercury	1.7	mg/kg
		151C510		Silver	2.9 (B)	mg/kg
		151C510		Arsenic	23	mg/kg

Table A.8-8
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #4 at CAS 12-04-01, System #4
(Page 2 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #4 Inlet (continued)	C07 (continued)	151C510	Sludge	Barium	69	mg/kg
		151C510		Chromium	36	mg/kg
		151C510		Selenium	6.3	mg/kg
		151C510		Aroclor 1260	210 (J)	µg/kg
		151C510		Bix(2-Ethylhexyl)phthalate	6,800 (J)	µg/kg
		151C510		Pyrene	810 (J)	µg/kg
		151C510		2-Methylnaphthalene	1,500 (J)	µg/kg
		151C510A		TCLP 1,4-Dichlorobenzene	0.14	mg/L
		151C510A		TCLP Chlorobenzene	0.038	mg/L
		151C510A		TCLP Benzene	0.0037 (J)	mg/L
		151C510		Plutonium-238	0.155	pCi/g
		151C510		Plutonium-239	3.91	pCi/g
		151C510		Uranium-238	1.13	pCi/g
		151C510		Uranium-234	2.02	pCi/g
		151C510		Ethylbenzene	26 (J)	µg/kg
		151C510		1,4-Dichlorobenzene	1,900	µg/kg
		151C510		Toluene	19 (J)	µg/kg
		151C510		1,2,4-Trichlorobenzene	34 (J)	µg/kg
		151C510		1,3-Dichlorobenzene	36 (J)	µg/kg
		151C510		Acetone	160 (J)	µg/kg
		151C510		Carbon Disulfide	22 (J)	µg/kg
		151C510		2-Chlorotoluene	16 (J)	µg/kg
		151C510		1,2-Dichlorobenzene	440	µg/kg
		151C510		1,2,4-Trimethylbenzene	41 (J)	µg/kg
		151C510RR1		N-Butylbenzene	7.1 (J)	µg/kg
		151C510RR1		1,3,5-Trimethylbenzene	10 (J)	µg/kg
		151C510RR1		Methylene Chloride	27	µg/kg
Tank #4 Outlet	C08	151C509	Liquid	Uranium-238	0.081 (LT)	pCi/L
		151C509		Uranium-234	0.202	pCi/L
		151C509		1,4-Dichlorobenzene	5 (J)	µg/L
		151C509		Chlorobenzene	2.4 (J)	µg/L
		151C509		1,2-Dichlorobenzene	1.2 (J)	µg/L

Table A.8-8
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #4 at CAS 12-04-01, System #4
(Page 3 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #4 Outlet (continued)	C08 (continued)	151C509	Liquid	Lead	0.0042	mg/L
		151C509		Barium	0.02 (J-)	mg/L
		151C513	Sludge	Diesel-Range Organics	1,900 (J)	mg/kg
		151C513		Cesium-137	0.81 (G)	pCi/g
		151C513		Gasoline-Range Organics	550 (Z)	mg/kg
		151C513		Lead	96	mg/kg
		151C513		Mercury	0.86	mg/kg
		151C513		Silver	2.5 (B)	mg/kg
		151C513		Arsenic	9	mg/kg
		151C513		Barium	53	mg/kg
		151C513		Cadmium	3.4	mg/kg
		151C513		Chromium	19	mg/kg
		151C513		Selenium	1.5 (B)	mg/kg
		151C513		Aroclor 1254	1,200 (J)	µg/kg
		151C513		Bix(2-Ethylhexyl)Phthalate	8,400 (J)	µg/kg
		151C513		Pyrene	3,000 (J)	µg/kg
		151C513		Fluoranthene	1,100 (J)	µg/kg
		151C513		Chrysene	990 (J)	µg/kg
		151C513		Benzo(a)Anthracene	680 (J)	µg/kg
		151C513		Naphthalene	1,100 (J)	µg/kg
		151C513		Phenanthrene	1,000 (J)	µg/kg
		151C513		Plutonium-239	0.121	pCi/g
		151C513		Uranium-238	0.61	pCi/g
		151C513		2-Methylnaphthalene	2,400 (J)	µg/kg
		151C513		Uranium-234	1.43	pCi/g
		151C513		Toluene	170 (J)	µg/kg
		151C513		Benzene	340 (J)	µg/kg
		151C513		Methylene Chloride	2,100	µg/kg
		151C513A		TCLP Arsenic	0.054 (B)	mg/L
		151C513A		TCLP 1,4-Dichlorobenzene	0.062	mg/L
		151C513RR1		1,4-Dichlorobenzene	35,000	µg/kg
		151C513RR1		Chlorobenzene	37,000	µg/kg
		151C513RR1		1,3-Dichlorobenzene	2,200	µg/kg
		151C513RR1		1,2-Dichlorobenzene	17,000	µg/kg

Table A.8-8
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #4 at CAS 12-04-01, System #4
(Page 4 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
G = Sample density differs by more than 15% of laboratory control sample density.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J- = The result is an estimated quantity, but the result may be biased low.
LT = Result is less than the requested minimum detectable concentration, but greater than the sample specific minimum detectable concentration.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

A.8.4.2 Corrective Action Site 12-04-02, Septic Tanks, System #5

Six septic tanks were sampled and a total of 13 liquid samples (including one FD and one MS/MSD) from each tank were analyzed for VOCs, SVOCs, PCBs, TPH DRO, TPH-GRO, RCRA metals, beryllium, isotopic uranium and plutonium, Sr-90, and gamma-emitting radionuclides. A total of 11 sludge samples (including one FD and one MS/MSD) were analyzed for the same constituents as well as TCLP VOCs, TCLP SVOCs, and TCLP metals. Table A.8-9 presents the thickness and corresponding volumes for all phases of tank contents for System #5.

Table A.8-9
Waste Characterization Volumes for CAS 12-04-02, Septic Tanks, System #5
(Page 1 of 2)

Sample Location	Sample Number	Thickness (ft)	Volume (gallons)	Sample Matrix	Purpose	Analyses
D01 (Tank 1 Inlet)	151D501	4.0	2,751	Liquid	Waste Management	Set 1
	151D507	1.0	340	Sludge	Waste Management	Set 3
	151D507A	1.0	340	Sludge	Waste Management	Set 2
D02 (Tank 1 Outlet)	151D519	4.5	2,776	Liquid	Waste Management	Set 1

Table A.8-9
Waste Characterization Volumes for CAS 12-04-02, Septic Tanks, System #5
(Page 2 of 2)

Sample Location	Sample Number	Thickness (ft)	Volume (gallons)	Sample Matrix	Purpose	Analyses
D03 (Tank 2 Inlet)	151D502	5.0	3,187	Liquid	Waste Management	Set 1
	151D508	< 0.2	24	Sludge	Waste Management	Set 3
	151D508A	< 0.2	24	Sludge	Waste Management	Set 2
D04 (Tank 2 Outlet)	151D515	3.0	2,228	Liquid	Waste Management	Set 1
D05 (Tank 3 Inlet)	151D503	3.0	2,171	Liquid	Waste Management	Set 1
	151D509	2.0	919	Sludge	Waste Management	Set 3
D06 (Tank 3 Outlet)	151D511	3.0	2,171	Liquid	Waste Management, MS/MSD	Set 1
	151D512	3.0	2,171	Liquid	Field Duplicate of #151D511	Set 1
	151D513	2.0	919	Sludge	Waste Management, MS/MSD	Set 3
	151D514	2.0	919	Sludge	Field Duplicate of #151D513	Set 3
D07 (Tank 4 Inlet)	151D504	4.5	3,106	Liquid	Waste Management	Set 1
	151D510	1.0	340	Sludge	Waste Management	Set 3
D08 (Tank 4 Outlet)	151D505	4.0	2,751	Liquid	Waste Management	Set 1
D09 (Tank 5 Inlet)	151D517	4.0	2,751	Liquid	Waste Management	Set 1
	151D521	1.0	340	Sludge	Waste Management	Set 3
D10 (Tank 5 Outlet)	151D518	5.0	3,442	Liquid	Waste Management	Set 1
	151D522	1.0	340	Sludge	Waste Management	Set 3
D11 (Tank 6 Inlet)	151D506	3.5	2,835	Liquid	Waste Management	Set 1
	151D520	1.5	610	Sludge	Waste Management	Set 3
D12 (Tank 6 Outlet)	151D516	4.0	2,751	Liquid	Waste Management	Set 1

Set 1 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90
Set 2 = TCLP VOCs, TCLP SVOCs, TCLP RCRA Metals
Set 3 = Total VOCs, Total SVOCs, TPH-DRO and TPH-GRO, PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90, TCLP VOCs, TCLP SVOCs, TCLP RCRA Metals

ft = Foot
MS/MSD = Matrix spike/matrix spike duplicate

Tables A.8-10 through A.8-15 present the analytical results detected above MDCs for CAS 12-04-02. No samples exceeded TCLP limits or other NTS waste acceptance criteria. The sludge within the inlet chamber of Tank #5 had a lead concentration, based on the total metals analysis, that would exceed the RCRA limit based on a theoretical maximum obtained if the result was divided by twenty. However, the TCLP lead analysis for this sample had a result less than the TCLP limit, but was non-detect and therefore not presented in the data table. In conclusion, lead is not a hazardous waste constituent in this chamber.

Disposable plastic samplers were placed inside the tanks after sampling and will be dispositioned with final tank disposal.

A.8.4.3 Corrective Action Site 12-04-03, Septic Tank

Four septic tanks were sampled and a total of seven liquid samples (including one FD and one MS/MSD) from each tank were analyzed for VOCs, SVOCs, PCBs, TPH-DRO, TPH-GRO, RCRA metals, beryllium, isotopic uranium and plutonium, Sr-90, and gamma-emitting radionuclides. The sediment filling Tank #2 received the same analyses. A total of seven sludge samples (including one FD and one MS/MSD) were analyzed for the same constituents as well as TCLP VOCs, TCLP SVOCs, and TCLP metals. Table A.8-16 presents the thickness and corresponding volumes for all phases of tank contents for System #3.

Tables A.8-17 through A.8-20 present the analytical results detected above MDCs for CAS 12-04-03. No samples exceeded TCLP limits or other NTS waste acceptance criteria. The sludge within the inlet chamber of Tank #1 had a mercury concentration, based upon the total metals analysis, that would exceed the RCRA limit based on a theoretical maximum obtained if the result was divided by twenty. However, the TCLP mercury analysis for this sample had a result less than the TCLP limit, but was non-detect and therefore not presented in the data table. In conclusion, mercury is not a hazardous waste constituent in this chamber.

Table A.8-10
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #1 at CAS 12-04-02, System #5
(Page 1 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #1 Inlet	D01	151D501	Liquid	Lead	0.057	mg/L
		151D501		Mercury	0.0017 (J+)	mg/L
		151D501		Silver	0.0028 (B)	mg/L
		151D501		Arsenic	0.011	mg/L
		151D501		Barium	0.19	mg/L
		151D501		Chromium	0.017	mg/L
		151D501		Selenium	0.0047 (J+)	mg/L
		151D501		1,4-Dichlorobenzene	1.4 (J)	µg/L
		151D501		Chlorobenzene	19	µg/L
		151D501		Benzene	1.4 (J)	µg/L
		151D507	Sludge	Diesel-Range Organics	610 (H, M, Z)	mg/kg
		151D507		Lead-212	1.16 (J)	pCi/g
		151D507		Gasoline-Range Organics	6.7 (Z)	mg/kg
		151D507		Lead	20	mg/kg
		151D507		Mercury	0.29	mg/kg
		151D507		Silver	0.78 (B)	mg/kg
		151D507		Arsenic	4.8	mg/kg
		151D507		Barium	59	mg/kg
		151D507		Cadmium	0.84 (B)	mg/kg
		151D507		Chromium	7.1	mg/kg
		151D507		Plutonium-238	0.039 (LT)	pCi/g
		151D507		Plutonium-239	0.117 (J)	pCi/g
		151D507		4-Chloroaniline	130 (J)	µg/kg
		151D507		Bis(2-Ethylhexyl)Phthalate	300 (J)	µg/kg
		151D507		Pyrene	110 (J)	µg/kg
		151D507		Fluoranthene	120 (J)	µg/kg
		151D507		Fluorene	100 (J)	µg/kg
		151D507		Phenanthrene	230 (J)	µg/kg
		151D507		2-Methylnaphthalene	290 (J)	µg/kg
		151D507		TCLP Arsenic	0.034 (B)	mg/L
		151D507		TCLP Chlorobenzene	0.28	mg/L
		151D507		Uranium-238	0.86	pCi/g

Table A.8-10
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #1 at CAS 12-04-02, System #5
(Page 2 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #1 Inlet (continued)	D01 (continued)	151D507	Sludge	Uranium-235	0.053	pCi/g
		151D507		Uranium-234	1.02	pCi/g
		151D507		Chlorobenzene	7,700	µg/kg
		151D507A		TCLP Lead	0.03	mg/L
		151D507A		TCLP Arsenic	0.034 (B)	mg/L
		151D507A		TCLP Selenium	0.038 (J+)	mg/L
		151D507A		TCLP Chlorobenzene	0.051	mg/L
		151D507RR1		N-Butylbenzene	14 (J)	µg/kg
		151D507RR1		1,4-Dichlorobenzene	400	µg/kg
		151D507RR1		1,3,5-Trimethylbenzene	22 (J)	µg/kg
		151D507RR1		1,3-Dichlorobenzene	13 (J)	µg/kg
		151D507RR1		Acetone	100 (J)	µg/kg
		151D507RR1		Benzene	250	µg/kg
		151D507RR1		Carbon Disulfide	14 (J)	µg/kg
		151D507RR1		1,2-Dichlorobenzene	14 (J)	µg/kg
		151D507RR1		1,2,4-Trimethylbenzene	53 (J)	µg/kg
Tank #1 Outlet	D02	151D519	Liquid	Mercury	0.0000074 (J+)	mg/L
		151D519		Barium	0.0005 (J-)	mg/L
		151D519		Chlorobenzene	0.98 (J)	µg/L

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
J- = The result is an estimated quantity, but the result may be biased low.
LT = Result is less than the requested minimum detectable concentration, greater than the sample specific minimum detectable concentration.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

Table A.8-11
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #2 at CAS 12-04-02, System #5
(Page 1 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #2 Inlet	D03	151D502	Liquid	Gasoline-Range Organics	0.019 (J)	mg/L
		151D502		Mercury	0.000007 (J+)	mg/L
		151D502		Uranium-234	0.107	pCi/L
		151D502		1,4-Dichlorobenzene	54	µg/L
		151D502		Chlorobenzene	5.2	µg/L
		151D508	Sludge	Diesel-Range Organics	1,700 (H, M,Z)	mg/kg
		151D508		Thallium-208	1.1 (G)	pCi/g
		151D508		Lead-212	1.5 (J)	pCi/g
		151D508		Gasoline-Range Organics	44 (Z)	mg/kg
		151D508		Lead	56	mg/kg
		151D508		Mercury	1	mg/kg
		151D508		Silver	3.6 (B)	mg/kg
		151D508		Arsenic	7.7	mg/kg
		151D508		Barium	100	mg/kg
		151D508		Cadmium	1.7 (B)	mg/kg
		151D508		Chromium	19	mg/kg
		151D508		Aroclor 1260	200 (J)	µg/kg
		151D508		Plutonium-239	0.103 (J)	pCi/g
		151D508		4-Chloroaniline	110 (J)	µg/kg
		151D508		Bis(2-Ethylhexyl)Phthalate	1,600 (J)	µg/kg
		151D508		Di-N-Octyl Phthalate	100 (J)	µg/kg
		151D508		Pyrene	170 (J)	µg/kg
		151D508		Fluoranthene	220 (J)	µg/kg
		151D508		Fluorene	150 (J)	µg/kg
		151D508		Phenanthrene	300 (J)	µg/kg
		151D508		2-Methylnaphthalene	280 (J)	µg/kg
		151D508		TCLP Arsenic	0.04 (B)	mg/L
		151D508		TCLP 1,4-Dichlorobenzene	0.72	mg/L
		151D508		TCLP Chlorobenzene	0.11	mg/L
		151D508		Uranium-238	1.18	pCi/g
		151D508		Uranium-235	0.072	pCi/g

Table A.8-11
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #2 at CAS 12-04-02, System #5
(Page 2 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #2 Inlet (continued)	D03 (continued)	151D508	Sludge	Uranium-234	1.87	pCi/g
		151D508		Chlorobenzene	3,000	µg/kg
		151D508		Methylene Chloride	3,000	µg/kg
		151D508		1,2-Dichlorobenzene	270 (J)	µg/kg
		151D508A		TCLP Lead	0.028 (B)	mg/L
		151D508A		TCLP Arsenic	0.049 (B)	mg/L
		151D508A		TCLP Chlorobenzene	0.058	mg/L
		1510508ARR1		TCLP 1,4-Dichlorobenzene	1.5	mg/L
		151D508RR1		1,4-Dichlorobenzene	71,000	µg/kg
Tank #2 Outlet	D04	151D503	Liquid	TCLP Mercury	0.0000059 (J+)	mg/L
		151D503		TCLP Arsenic	0.0041 (B)	mg/L
		151D503		1,4-Dichlorobenzene	12	µg/L
		151D503		Chlorobenzene	23	µg/L
		151D503		Benzene	0.89 (J)	µg/L
		151D515		Barium	0.0038 (J-)	mg/L
		151D515		1,4-Dichlorobenzene	9	µg/L

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
G = Sample density differs by more than 15% of laboratory control sample density.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
J- = The result is an estimated quantity, but the result may be biased low.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

Table A.8-12
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-02, System #5
(Page 1 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #3 Inlet	D05	151D509	Sludge	Diesel-Range Organics	390 (H, M, Z)	mg/kg
		151D509		Lead-212	1.6 (J)	pCi/g
		151D509		Gasoline-Range Organics	52 (Z)	mg/kg
		151D509		Lead	4.9	mg/kg
		151D509		Mercury	0.14 (J+)	mg/kg
		151D509		Silver	0.21 (B)	mg/kg
		151D509		Arsenic	4.4	mg/kg
		151D509		Barium	17	mg/kg
		151D509		Chromium	3.9	mg/kg
		151D509		Bis(2-Ethylhexyl)Phthalate	180 (J)	µg/kg
		151D509		Fluoranthene	37 (J)	µg/kg
		151D509		2-Chlorophenol	38 (J)	µg/kg
		151D509		TCLP Lead	0.023 (B)	mg/L
		151D509		TCLP Arsenic	0.029 (B)	mg/L
		151D509		TCLP 1,4-Dichlorobenzene	0.097 (J)	mg/L
		151D509		TCLP Chlorobenzene	0.41	mg/L
		151D509		Uranium-238	1.05	pCi/g
		151D509		Uranium-235	0.06	pCi/g
		151D509		Uranium-234	1.11	pCi/g
		151D509		Benzene	110 (J)	µg/kg
		151D509		Methylene Chloride	820	µg/kg
		151D509		1,2-Dichlorobenzene	89 (J)	µg/kg
		151D509RR1		1,4-Dichlorobenzene	38,000	µg/kg
		151D509RR1		Chlorobenzene	9,400	µg/kg
Tank #3 Outlet	D06	151D511	Liquid	Arsenic	0.0042 (B)	mg/L
		151D511		Uranium-234	0.124	pCi/L
		151D511		1,4-Dichlorobenzene	0.96 (J)	µg/L
		151D511		Chlorobenzene	11	µg/L

Table A.8-12
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-02, System #5
(Page 2 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #3 Outlet (continued)	D06 (continued)	151D512	Liquid	1,4-Dichlorobenzene	1.6 (J)	µg/L
		151D512		Chlorobenzene	9.6	µg/L
		151D513	Sludge	Diesel-Range Organics	390 (H, M, Z)	mg/kg
		151D513		Lead-212	1.48 (J)	pCi/g
		151D513		Lead	57	mg/kg
		151D513		Mercury	0.33 (J+)	mg/kg
		151D513		Silver	0.39 (B)	mg/kg
		151D513		Barium	140	mg/kg
		151D513		Chromium	7.5	mg/kg
		151D513		Aroclor 1254	160 (J)	µg/kg
		151D513		Plutonium-239	0.062	pCi/g
		151D513		Bis(2-Ethylhexyl)Phthalate	2,300	µg/kg
		151D513		Pyrene	95 (J)	µg/kg
		151D513		Benzo(b)Fluoranthene	190 (J)	µg/kg
		151D513		Fluoranthene	130 (J)	µg/kg
		151D513		Benzo(k)Fluoranthene	74 (J)	µg/kg
		151D513		Chrysene	84 (J)	µg/kg
		151D513		Benzo(a)Pyrene	77 (J)	µg/kg
		151D513		Benzo(a)Anthracene	100 (J)	µg/kg
		151D513		Butyl Benzyl Phthalate	190 (J)	µg/kg
		151D513		Uranium-238	0.82	pCi/g
		151D513		Uranium-234	1.41	pCi/g
		151D513		Ethylbenzene	3.6 (J)	µg/kg
		151D513		1,4-Dichlorobenzene	88	µg/kg
		151D513		Chlorobenzene	29	µg/kg
		151D513		Acetone	120	µg/kg
		151D513		Methylene Chloride	35	µg/kg
		151D513		Carbon Disulfide	4.5 (J)	µg/kg
		151D514		Diesel-Range Organics	260 (H, M, Z)	mg/kg
		151D514		Lead-212	1.13 (J)	pCi/g
		151D514		Lead	70	mg/kg

Table A.8-12
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-02, System #5
(Page 3 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #3 Outlet (continued)	D06 (continued)	151D514	Sludge	Mercury	0.39 (J+)	mg/kg
		151D514		Silver	0.65 (B)	mg/kg
		151D514		Arsenic	6.3	mg/kg
		151D514		Barium	170	mg/kg
		151D514		Chromium	9.9	mg/kg
		151D514		Aroclor 1254	400	µg/kg
		151D514		Plutonium-238	0.028 (LT)	pCi/g
		151D514		Plutonium-239	0.196	pCi/g
		151D514		3+4-Methylphenol	110 (J)	µg/kg
		151D514		Bis(2-Ethylhexyl)Phthalate	1,900	µg/kg
		151D514		Di-N-Octyl Phthalate	97 (J)	µg/kg
		151D514		Pyrene	130 (J)	µg/kg
		151D514		Benzo(b)Fluoranthene	240 (J)	µg/kg
		151D514		Fluoranthene	210 (J)	µg/kg
		151D514		Benzo(k)Fluoranthene	140 (J)	µg/kg
		151D514		Chrysene	140 (J)	µg/kg
		151D514		Benzo(a)Pyrene	130 (J)	µg/kg
		151D514		Benzo(a)Anthracene	140 (J)	µg/kg
		151D514		Butyl Benzyl Phthalate	250 (J)	µg/kg
		151D514		TCLP Selenium	0.061 (J+)	mg/L
		151D514		Uranium-238	0.87	pCi/g
		151D514		Uranium-235	0.053	pCi/g
		151D514		Uranium-234	1.38	pCi/g
		151D514		Ethylbenzene	2.6 (J)	µg/kg
		151D514		1,4-Dichlorobenzene	73	µg/kg
		151D514		Chlorobenzene	22	µg/kg
		151D514		Acetone	26 (J)	µg/kg
		151D514		Methylene Chloride	11 (J)	µg/kg
		151D514		Carbon Disulfide	2.3 (J)	µg/kg

Table A.8-12
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-02, System #5
(Page 4 of 4)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
μg/kg = Micrograms per kilogram
μg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
LT = Result is less than the requested minimum detectable concentration, but greater than the sample specific minimum detectable concentration.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

Table A.8-13
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #4 at CAS 12-04-02, System #5
(Page 1 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #4 Inlet	D07	151D504	Liquid	Mercury	0.000007 (J+)	mg/L
		151D504		Uranium-234	0.14	pCi/L
		151D504		1,4-Dichlorobenzene	49	μg/L
		151D504		Chlorobenzene	4.9 (J)	μg/L
		151D510	Sludge	Diesel-Range Organics	1,200 (M, Z)	mg/kg
		151D510		Gasoline-Range Organics	720 (Z)	mg/kg
		151D510		Lead	22	mg/kg
		151D510		Mercury	1 (J+)	mg/kg
		151D510		Silver	1.3 (B)	mg/kg
		151D510		Barium	73	mg/kg
		151D510		Cadmium	0.81 (B)	mg/kg
		151D510		Chromium	3.7	mg/kg
		151D510		Aroclor 1260	72 (J)	μg/kg
		151D510		Aroclor 1254	260 (J)	μg/kg

Table A.8-13
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #4 at CAS 12-04-02, System #5
(Page 2 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #4 Inlet (continued)	D07 (continued)	151D510	Sludge	Plutonium-239	0.247	pCi/g
		151D510		Bis(2-Ethylhexyl)Phthalate	210 (J)	µg/kg
		151D510		Pyrene	72 (J)	µg/kg
		151D510		Fluoranthene	170 (J)	µg/kg
		151D510		Fluorene	40 (J)	µg/kg
		151D510		Phenanthrene	130 (J)	µg/kg
		151D510		2-Methylnaphthalene	57 (J)	µg/kg
		151D510		TCLP Chlorobenzene	0.17	mg/L
		151D510		Uranium-238	2.08	pCi/g
		151D510		Uranium-235	0.092	pCi/g
		151D510		Uranium-234	4.88	pCi/g
		151D510		Ethylbenzene	190 (J)	µg/kg
		151D510		Chlorobenzene	3,800 (J)	µg/kg
		151D510		1,3-Dichlorobenzene	1,700 (J)	µg/kg
		151D510		Methylene Chloride	1,500 (J)	µg/kg
		151D510		1,2-Dichlorobenzene	3,100 (J)	µg/kg
		151D510		1,2,4-Trimethylbenzene	180 (J)	µg/kg
		151D510RR1		TCLP 1,4-DiChloroBenzene	4.4	mg/L
		151D510RR1		1,4-Dichlorobenzene	1,100,000	µg/kg
Tank #4 Outlet	D08	151D505	Liquid	Mercury	0.0000075 (J+)	mg/L
		151D505		Uranium-234	0.134	pCi/L
		151D505		1,4-Dichlorobenzene	19	µg/L
		151D505		Chlorobenzene	2.9 (J)	µg/L

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

Table A.8-14
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #5 at CAS 12-04-02, System #5
(Page 1 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #5 Inlet	D09	151D517	Liquid	Mercury	0.0000081 (J+)	mg/L
		151D517		Barium	0.0024 (J-)	mg/L
		151D517		Uranium-234	0.143	pCi/L
		151D517		1,4-Dichlorobenzene	4.7 (J)	μg/L
		151D521	Sludge	Diesel-Range Organics	2,000 (H, M, Z)	mg/kg
		151D521		Gasoline-Range Organics	150 (Z)	mg/kg
		151D521		Lead	110	mg/kg
		151D521		Mercury	0.88	mg/kg
		151D521		Silver	2.4 (B)	mg/kg
		151D521		Barium	210	mg/kg
		151D521		Chromium	17	mg/kg
		151D521		Aroclor 1254	620 (J)	μg/kg
		151D521		Plutonium-239	0.084	pCi/g
		151D521		Bis(2-Ethylhexyl)Phthalate	2,000 (J)	μg/kg
		151D521		Pyrene	300 (J)	μg/kg
		151D521		Benzo(a)Anthracene	240 (J)	μg/kg
		151D521		TCLP Chlorobenzene	0.22	mg/L
		151D521		Uranium-238	1.08	pCi/g
		151D521		Uranium-235	0.05 (J)	pCi/g
		151D521		Uranium-234	2.48	pCi/g
		151D521		Chlorobenzene	18,000	μg/kg
		151D521		1,3-Dichlorobenzene	540 (J)	μg/kg
		151D521		1,2-Dichlorobenzene	1,500 (J)	μg/kg
		151D521RR1		TCLP 1,4-Dichlorobenzene	1.7	mg/L
		151D521RR1		1,4-Dichlorobenzene	500,000	μg/kg
		151D521RR1		Methylene Chloride	100,000	μg/kg
Tank #5 Outlet	D10	151D518	Liquid	Mercury	0.0000073 (J+)	mg/L
		151D518		Silver	0.00078 (B)	mg/L
		151D518		Barium	0.005 (J-)	mg/L
		151D518		1,4-Dichlorobenzene	56	μg/L
		151D518		Chlorobenzene	0.86 (J)	μg/L
		151D522	Sludge	Diesel-Range Organics	230 (H, M, Z)	mg/kg

Table A.8-14
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #5 at CAS 12-04-02, System #5
(Page 2 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #5 Outlet (continued)	D10 (continued)	151D522	Sludge	Lead-212	1.83 (J)	pCi/g
		151D522		Gasoline-Range Organics	0.85 (H)	mg/kg
		151D522		Lead	11	mg/kg
		151D522		Mercury	0.079	mg/kg
		151D522		Silver	0.26 (B)	mg/kg
		151D522		Arsenic	4	mg/kg
		151D522		Barium	80	mg/kg
		151D522		Chromium	2.6	mg/kg
		151D522		Plutonium-239	0.151	pCi/g
		151D522		Bis(2-Ethylhexyl)Phthalate	500 (J)	µg/kg
		151D522		Diethyl Phthalate	30 (J)	µg/kg
		151D522		Butyl Benzyl Phthalate	110 (J)	µg/kg
		151D522		TCLP Lead	0.1	mg/L
		151D522		Uranium-238	0.97	pCi/g
		151D522		Uranium-235	0.065	pCi/g
		151D522		Uranium-234	1.09	pCi/g
		151D522		Ethylbenzene	2.6 (J)	µg/kg
		151D522		N-Propylbenzene	5.2 (J)	µg/kg
		151D522		N-Butylbenzene	2.9 (J)	µg/kg
		151D522		1,4-Dichlorobenzene	120	µg/kg
		151D522		1,3,5-Trimethylbenzene	20	µg/kg
		151D522		Toluene	1.6 (J)	µg/kg
		151D522		Chlorobenzene	1.6 (J)	µg/kg
		151D522		Acetone	43	µg/kg
		151D522		Methylene Chloride	23	µg/kg
		151D522		Carbon Disulfide	1.7 (J)	µg/kg
		151D522		1,2-Dichlorobenzene	2.9 (J)	µg/kg
		151D522		1,2,4-Trimethylbenzene	74	µg/kg

Table A.8-14
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #5 at CAS 12-04-02, System #5
(Page 3 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
J- = The result is an estimated quantity, but the result may be biased low.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

Table A.8-15
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #6 at CAS 12-04-02, System #5
(Page 1 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #6 Inlet	D11	151D506	Liquid	Mercury	0.000007 (J+)	mg/L
		151D506		Barium	0.00047 (J-)	mg/L
		151D506		1,4-Dichlorobenzene	0.86 (J)	µg/L
		151D520	Sludge	Diesel-Range Organics	1,500 (H, M, Z)	mg/kg
		151D520		Lead-212	1.42 (J)	pCi/g
		151D520		Gasoline-Range Organics	160 (Z)	mg/kg
		151D520		Lead	41	mg/kg
		151D520		Mercury	0.65	mg/kg
		151D520		Silver	2.5 (J-)	mg/kg
		151D520		Barium	91	mg/kg
		151D520		Chromium	8.1	mg/kg
		151D520		Aroclor 1254	660 (J)	µg/kg
		151D520		Plutonium-239	0.208	pCi/g
		151D520		4-Chloroaniline	730 (J)	µg/kg
		151D520		Bis(2-Ethylhexyl)Phthalate	530 (J)	µg/kg

Table A.8-15
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #6 at CAS 12-04-02, System #5
(Page 2 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Location	Sample Number	Matrix	Parameter	Result	Units
Tank #6 Inlet (continued)	D11 (continued)	151D520	Sludge	Pyrene	80 (J)	µg/kg
		151D520		Fluoranthene	170 (J)	µg/kg
		151D520		Fluorene	80 (J)	µg/kg
		151D520		Phenanthrene	180 (J)	µg/kg
		151D520		2-Methylnaphthalene	370 (J)	µg/kg
		151D520		Lead	0.052	mg/L
		151D520		Arsenic	0.029 (B)	mg/L
		151D520		1,4-Dichlorobenzene	1.1	mg/L
		151D520		Chlorobenzene	0.014 (J)	mg/L
		151D520		Uranium-238	1.07	pCi/g
		151D520		Uranium-235	0.066	pCi/g
		151D520		Uranium-234	1.48	pCi/g
		151D520		Chlorobenzene	490 (J)	µg/kg
		151D520		Methylene Chloride	1,800	µg/kg
		151D520		1,2-Dichlorobenzene	280 (J)	µg/kg
		151D520		1,2,4-Trimethylbenzene	250 (J)	µg/kg
		151D520RR1		1,4-Dichlorobenzene	140,000	µg/kg
Tank #6 Outlet	D12	151D516	Liquid	Mercury	0.0000089 (J+)	mg/L
		151D516		Barium	0.0013 (J-)	mg/L
		151D516		1,4-Dichlorobenzene	27	µg/L
		151D516		Chlorobenzene	0.56 (J)	µg/L

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
J- = The result is an estimated quantity, but the result may be biased low.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

Disposable plastic samplers used during the tank sampling were placed inside the tanks after sampling and will be dispositioned with final tank disposal.

Table A.8-16
Waste Characterization Samples Collected at CAS 12-04-03, Septic Tank

Sample Location	Sample Number	Thickness (ft)	Volume (gallons)	Sample Matrix	Purpose	Analyses
E01 (Tank 4 W)	151E511	4.5	3,106	Liquid	Waste Management	Set 1
	151E512	1.0	340	Sludge	Waste Management	Set 2
E02 (Tank 4 E)	151E513	5.0	3,442	Liquid	Waste Management	Set 1
	151E514	< 1.0	340	Sludge	Waste Management	Set 2
E03 (Tank 3 E)	151E507	5.5	3,659	Liquid	Waste Management	Set 1
	151E508	< 0.5	122	Sludge	Waste Management	Set 2
E04 (Tank 3 W)	151E509	5.5	3,659	Liquid	Waste Management	Set 1
	151E510	< 0.5	122	Sludge	Waste Management	Set 2
E05 (Tank 2 W	151E515	8.0	4,700	Sediment	Waste Management	Set 2
E06 (Tank 2 E)	151E516	8.0	4,700	Sediment	Waste Management	Set 2
E07 (Tank 1 W)	151E503	2.5	1,835	Liquid	Waste Management MS/MSD	Set 1
	151E504	2.5	1,835	Liquid	Field Duplicate of #151E505	Set 1
	151E505	2.5	1,255	Sludge	Waste Management MS/MSD	Set 2
	151E506	2.5	1,255	Sludge	Field Duplicate of #151E505	Set 2
E08 (Tank 1 E)	151E501	3.0	2,171	Liquid	Waste Management	Set 1
	151E502	2.0	919	Sludge	Waste Management	Set 2

Set 1 = Total VOCs, Total SVOCs, TPH (DRO-GRO), PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90
Set 2 = Total VOCs, Total SVOCs, TPH (DRO-GRO), PCBs, Total RCRA Metals, Beryllium, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90, TCLP VOCs, TCLP SVOCs, TCLP RCRA Metals

Ft = Feet
MS/MSD = Matrix spike/Matrix spike duplicate

Table A.8-17
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #1 at CAS 12-04-03, System #3
(Page 1 of 5)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #1 Inlet	E07	151E503	Liquid	N-Butylbenzene	1.2 (J)	μg/L
		151E503		Sec-Butylbenzene	0.75 (J)	μg/L
		151E503		Tert-Butylbenzene	0.7 (J)	μg/L
		151E504		Uranium-234	0.225	pCi/L
		151E505	Sludge	Diesel-Range Organics	1,200 (H, M, Z)	mg/kg
		151E505		Lead-212	1.72 (J)	pCi/g
		151E505		Gasoline-Range Organics	240 (Z)	mg/kg
		151E505		Lead	39 (J)	mg/kg
		151E505		Mercury	0.5	mg/kg
		151E505		Silver	3.9	mg/kg
		151E505		Arsenic	5.1	mg/kg
		151E505		Barium	170	mg/kg
		151E505		Cadmium	2.2	mg/kg
		151E505		Chromium	13	mg/kg
		151E505		Selenium	2.7	mg/kg
		151E505		Aroclor 1260	630	μg/kg
		151E505		Plutonium-238	0.043 (LT)	pCi/g
		151E505		Plutonium-239	0.202	pCi/g
		151E505		Anthracene	64 (J)	μg/kg
		151E505		Pyrene	260 (J)	μg/kg
		151E505		Fluoranthene	140 (J)	μg/kg
		151E505		Benzo(a)Pyrene	49 (J)	μg/kg
		151E505		Benzo(a)Anthracene	67 (J)	μg/kg
		151E505		Di-N-Butyl Phthalate	60 (J)	μg/kg
		151E505		Fluorene	55 (J)	μg/kg
		151E505		Phenanthrene	350 (J)	μg/kg
		151E505		2-Methylnaphthalene	210 (J)	μg/kg
		151E505		TCLP Arsenic	0.028 (B)	mg/L
		151E505		TCLP Chromium	0.016 (B)	mg/L

Table A.8-17
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #1 at CAS 12-04-03, System #3
(Page 2 of 5)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #1 Inlet (continued)	E07 (continued)	151E505	Sludge	1,4-Dichlorobenzene	0.14	mg/L
		151E505		Uranium-238	1.62	pCi/g
		151E505		Uranium-235	0.142 (J)	pCi/g
		151E505		Uranium-234	2.56	pCi/g
		151E505		1,4-Dichlorobenzene	6,700 (B)	µg/kg
		151E505RR1		Bis(2-Ethylhexyl)Phthalate	860 (J)	µg/kg
		151E505RR1		Ethylbenzene	14 (J)	µg/kg
		151E505RR1		N-Propylbenzene	13 (J)	µg/kg
		151E505RR1		N-Butylbenzene	16 (J)	µg/kg
		151E505RR1		1,3,5-Trimethylbenzene	63 (J)	µg/kg
		151E505RR1		Chlorobenzene	61 (J)	µg/kg
		151E505RR1		Total Xylenes	57 (J)	µg/kg
		151E505RR1		1,3-Dichlorobenzene	80	µg/kg
		151E505RR1		Acetone	400	µg/kg
		151E505RR1		Carbon Disulfide	55 (J)	µg/kg
		151E505RR1		1,2-Dichlorobenzene	1,200	µg/kg
		151E505RR1		1,2,4-Trimethylbenzene	140	µg/kg
		151E506		Diesel-Range Organics	2,800 (H, M, Z)	mg/kg
		151E506		Cesium-137	0.93 (J)	pCi/g
		151E506		Gasoline-Range Organics	180 (Z)	mg/kg
		151E506		Lead	34 (J)	mg/kg
		151E506		Mercury	1.4	mg/kg
		151E506		Silver	3.8	mg/kg
		151E506		Arsenic	4.7	mg/kg
		151E506		Barium	120	mg/kg
		151E506		Cadmium	1.6	mg/kg
		151E506		Chromium	9.3	mg/kg
		151E506		Selenium	2.2 (J+)	mg/kg
		151E506		Aroclor 1260	560	mg/kg

Table A.8-17
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #1 at CAS 12-04-03, System #3
(Page 3 of 5)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #1 Inlet (continued)	E07 (continued)	151E506	Sludge	Plutonium-238	0.242	pCi/g
		151E506		Plutonium-239	0.78	pCi/g
		151E506		4-Chloroaniline	220 (J)	μg/kg
		151E506		Bis(2-Ethylhexyl)Phthalate	950 (J)	μg/kg
		151E506		Anthracene	120 (J)	μg/kg
		151E506		Pyrene	550 (J)	μg/kg
		151E506		Fluoranthene	210 (J)	μg/kg
		151E506		Benzo(a)Anthracene	120 (J)	μg/kg
		151E506		Fluorene	98 (J)	μg/kg
		151E506		Naphthalene	77 (J)	μg/kg
		151E506		Phenanthrene	580 (J)	μg/kg
		151E506		2-Methylnaphthalene	540 (J)	μg/kg
		151E506		TCLP Chromium	0.0064 (B)	mg/L
		151E506		TCLP Selenium	0.036 (J-)	mg/L
		151E506		TCLP Chlorobenzene	0.018 (J)	mg/L
		151E506		TCLP Trichloroethene	0.022 (J)	mg/L
		151E506		Uranium-238	1.65	pCi/g
		151E506		Uranium-235	0.094 (J)	pCi/g
		151E506		Uranium-234	3.13	pCi/g
		151E506		1,4-Dichlorobenzene	300,000 (B)	μg/kg
		151E506RR1		TCLP 1,4-Dichlorobenzene	5.3	mg/L
Tank #1 Outlet	E08	151E501	Liquid	Uranium-238	0.077 (LT)	pCi/L
		151E501		Uranium-234	0.135	pCi/L
		151E502	Sludge	Diesel-Range Organics	970 (H, M, Z)	mg/kg
		151E502		Thallium-208	0.77 (G)	pCi/g
		151E502		Cesium-137	2.34 (J)	pCi/g

Table A.8-17
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #1 at CAS 12-04-03, System #3
(Page 4 of 5)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #1 Outlet (continued)	E08 (continued)	151E502	Sludge	Lead-212	1.92 (J)	pCi/g
		151E502		Gasoline-Range Organics	5.7 (Z)	mg/kg
		151E502		Lead	63 (J)	mg/kg
		151E502		Mercury	0.71	mg/kg
		151E502		Silver	3	mg/kg
		151E502		Arsenic	6.6	mg/kg
		151E502		Barium	160	mg/kg
		151E502		Cadmium	2.1	mg/kg
		151E502		Chromium	12	mg/kg
		151E502		Selenium	2.9	mg/kg
		151E502		Aroclor 1260	390	µg/kg
		151E502		Plutonium-239	0.306	pCi/g
		151E502		Bis(2-Ethylhexyl)Phthalate	370 (J)	µg/kg
		151E502		Pyrene	470 (J)	µg/kg
		151E502		Benzo(b)Fluoranthene	76 (J)	µg/kg
		151E502		Fluoranthene	240 (J)	µg/kg
		151E502		Chrysene	88 (J)	µg/kg
		151E502		Benzo(a)Pyrene	73 (J)	µg/kg
		151E502		Benzo(a)Anthracene	95 (J)	µg/kg
		151E502		Di-N-Butyl Phthalate	140 (J)	µg/kg
		151E502		Fluorene	64 (J)	µg/kg
		151E502		Naphthalene	62 (J)	µg/kg
		151E502		Phenanthrene	470 (J)	µg/kg
		151E502		2-Methylnaphthalene	320 (J)	µg/kg
		151E502		TCLP Arsenic	0.052 (B)	mg/L
		151E502		TCLP Chlorobenzene	0.0083 (J)	mg/L
		151E502		Uranium-238	6.02	pCi/g
		151E502		Uranium-235	0.51 (J)	pCi/g
		151E502		Uranium-234	10.5	pCi/g

Table A.8-17
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #1 at CAS 12-04-03, System #3
(Page 5 of 5)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #1 Outlet (continued)	E08 (continued)	151E502	Sludge	Chlorobenzene	260 (J)	μg/kg
		151E502		1,3-DIChlorobenzene	320 (J)	μg/kg
		151E502		1,2-Dichlorobenzene	700 (J)	μg/kg
		151E502RR1		TCLP 1,4-Dichlorobenzene	4.5	mg/L
		151E502RR1		1,4-Dichlorobenzene	350,000 (B)	μg/kg

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
μg/kg = Micrograms per kilogram
μg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
G = Sample density differs by more than 15% of laboratory control sample density.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
J- = The result is an estimated quantity, but the result may be biased low.
LT = Result is less than the requested minimum detectable concentration, but greater than the sample specific minimum detectable concentration.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

Table A.8-18
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #2 at CAS 12-04-03, System #3
(Page 1 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #2 Inlet	E05	151E515	Soil	Diesel-Range Organics	62 (H)	mg/kg
		151E515		Thallium-208	0.61 (G)	pCi/g
		151E515		Actinium-228	1.85 (G)	pCi/g
		151E515		Cesium-137	0.34 (G, LT)	pCi/g
		151E515		Lead-212	1.66 (J)	pCi/g
		151E515		Bismuth-214	0.76 (G, J)	pCi/g
		151E515		Lead-214	0.94 (G, J)	pCi/g
		151E515		Lead	11	mg/kg
		151E515		Arsenic	2.1	mg/kg
		151E515		Barium	110	mg/kg
		151E515		Chromium	2	mg/kg
		151E515		Plutonium-238	0.306	pCi/g
		151E515		Plutonium-239	1.32	pCi/g
		151E515		TCLP Arsenic	0.029 (B)	mg/L
		151E515		TCLP Trichloroethene	0.0033 (J)	mg/L
		151E515		Uranium-238	0.89	pCi/g
		151E515		Uranium-235	0.085	pCi/g
		151E515		Uranium-234	0.83	pCi/g
		151E515		1,4-Dichlorobenzene	2.1 (J)	µg/kg
Tank #2 Outlet	E06	151E516	Soil	Diesel-Range Organics	22 (H)	mg/kg
		151E516		Thallium-208	0.85 (G)	pCi/g
		151E516		Actinium-228	2.31 (G)	pCi/g
		151E516		Cesium-137	0.31 (G, LT)	pCi/g
		151E516		Lead-212	2.43 (J)	pCi/g
		151E516		Bismuth-214	1.13 (G, J)	pCi/g
		151E516		Lead-214	1.25 (G, J)	pCi/g
		151E516		Lead	6.4	mg/kg
		151E516		Arsenic	1.8	mg/kg
		151E516		Barium	150	mg/kg

Table A.8-18
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #2 at CAS 12-04-03, System #3
(Page 2 of 2)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #2 Outlet (continued)	E06	151E516	Soil	Beryllium	0.98	mg/kg
		151E516		TCLP Trichloroethene	0.013 (J)	mg/L
		151E516		Uranium-238	0.96	pCi/g
		151E516		Uranium-235	0.058	pCi/g
		151E516		Uranium-234	1.03	pCi/g
		151E516		1,4-Dichlorobenzene	2.1 (J)	µg/kg

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
µg/kg = Micrograms per kilogram

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
G = Sample density differs by more than 15% of laboratory control sample density.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
LT = Result is less than the requested minimum detectable concentration, but greater than the sample specific minimum detectable concentration.

Table A.8-19
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-03, System #3
(Page 1 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #3 Inlet	E03	151E507	Liquid	Uranium-234	0.197	pCi/L
		151E508	Sludge	Diesel-Range Organics	3,100 (D, M, Z)	mg/kg
		151E508		Gasoline-Range Organics	52 (H)	mg/kg
		151E508		Lead	69 (J)	mg/kg
		151E508		Mercury	2.3	mg/kg
		151E508		Silver	7.9 (B)	mg/kg
		151E508		Arsenic	11	mg/kg
		151E508		Barium	110	mg/kg
		151E508		Cadmium	4.2 (B)	mg/kg
		151E508		Chromium	15	mg/kg
		151E508		Selenium	5.3 (J+)	mg/kg
		151E508		Aroclor 1260	5,300 (J)	µg/kg
		151E508		Bis(2-Ethylhexyl)Phthalate	1,300 (J)	µg/kg
		151E508		Pyrene	1,300 (J)	µg/kg
		151E508		Benzo(b)Fluoranthene	310 (J)	µg/kg
		151E508		Fluoranthene	510 (J)	µg/kg
		151E508		Chrysene	400 (J)	µg/kg
		151E508		Benzo(a)Pyrene	250 (J)	µg/kg
		151E508		Benzo(a)Anthracene	380 (J)	µg/kg
		151E508		Phenanthrene	320 (J)	µg/kg
		151E508		TCLP 1,4-Dichlorobenzene	0.03	mg/L
		151E508		TCLP Trichloroethene	0.038	mg/L
		151E508		Ethylbenzene	8.6 (J)	µg/kg
		151E508		1,4-Dichlorobenzene	720 (J)	µg/kg
		151E508		1,3,5-Trimethylbenzene	9 (J)	µg/kg
		151E508		1,3-DiChlorobenzene	59 (J)	µg/kg
		151E508		Acetone	160 (J)	µg/kg
		151E508		Carbon Disulfide	14 (J)	µg/kg
		151E508		1,2-Dichlorobenzene	860 (J)	µg/kg
		151E508		1,2,4-Trimethylbenzene	24 (J)	µg/kg

Table A.8-19
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-03, System #3
(Page 2 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #3 Outlet	E04	151E509	Liquid	Bis(2-Ethylhexyl)Phthalate	19	μg/L
		151E509		Uranium-238	0.109	pCi/L
		151E509		Uranium-234	0.29	pCi/L
		151E509		N-Butylbenzene	1.1 (J)	μg/L
		151E510	Sludge	Diesel-Range Organics	1,600 (D, M, Z)	mg/kg
		151E510		Cesium-137	1.38 (J)	pCi/g
		151E510		Lead-212	1.6 (J)	pCi/g
		151E510		Gasoline-Range Organics	41 (Z)	mg/kg
		151E510		Lead	63 (J)	mg/kg
		151E510		Mercury	0.79	mg/kg
		151E510		Silver	1.4 (B)	mg/kg
		151E510		Barium	100	mg/kg
		151E510		Cadmium	1.1 (B)	mg/kg
		151E510		Chromium	5.2	mg/kg
		151E510		Selenium	3.6 (J+)	mg/kg
		151E510		Aroclor 1260	930	μg/kg
		151E510		Bis(2-Ethylhexyl)Phthalate	12,000 (J)	μg/kg
		151E510		Anthracene	540 (J)	μg/kg
		151E510		Pyrene	3,700 (J)	μg/kg
		151E510		Benzo(b)Fluoranthene	520 (J)	μg/kg
		151E510		Benzo(k)Fluoranthene	160 (J)	μg/kg
		151E510		Chrysene	860 (J)	μg/kg
		151E510		Benzo(a)Pyrene	470 (J)	μg/kg
		151E510		Benzo(a)Anthracene	880 (J)	μg/kg
		151E510		Acenaphthene	330 (J)	μg/kg
		151E510		Fluorene	280 (J)	μg/kg
		151E510		Carbazole	520 (J)	μg/kg
		151E510		Naphthalene	960 (J)	μg/kg
		151E510		Phenanthrene	2,200	μg/kg
		151E510		2-Methylnaphthalene	220 (J)	μg/kg
		151E510		TCLP 1,4-Dichlorobenzene	0.36	mg/L
		151E510		TCLP Chlorobenzene	0.0026 (J)	mg/L
		151E510		Uranium-238	1.03	pCi/g

Table A.8-19
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #3 at CAS 12-04-03, System #3
(Page 3 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #3 Outlet (continued)	E04 (continued)	151E510	Sludge	Uranium-235	0.055 (J)	pCi/g
		151E510		Uranium-234	1.05	pCi/g
		151E510		1,4-Dichlorobenzene	27,000 (B)	µg/kg
		151E510		1,2-Dichlorobenzene	7,400	µg/kg
		151E510RR1		Fluoranthene	2,000 (J)	µg/kg
		151E510RR1		Benzo(a)Anthracene	900 (J)	µg/kg

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
D = A pattern resembling diesel was detected.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

Table A.8-20
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #4 at CAS 12-04-03, System #3
(Page 1 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #4 Inlet	E01	151E511	Liquid	Uranium-234	0.142	pCi/L
		151E512	Sludge	Diesel-Range Organics	2,900 (H, M, Z)	mg/kg
		151E512		Cesium-137	1.53 (G)	pCi/g
		151E512		Gasoline-Range Organics	20 (H)	mg/kg
		151E512		Lead	39	mg/kg
		151E512		Mercury	0.73	mg/kg
		151E512		Silver	2.9 (B)	mg/kg
		151E512		Arsenic	11 (B)	mg/kg
		151E512		Selenium	9.6 (J+)	mg/kg
		151E512		Aroclor 1268	5,700 (J)	µg/kg
		151E512		Plutonium-239	0.135	pCi/g
		151E512		4-Chloroaniline	3,700 (J)	µg/kg
		151E512		Bis(2-Ethylhexyl)Phthalate	6,200 (J)	µg/kg
		151E512		Anthracene	2,000 (J)	µg/kg
		151E512		Pyrene	3,700 (J)	µg/kg
		151E512		Acenaphthene	1,200 (J)	µg/kg
		151E512		Fluorene	1,600 (J)	µg/kg
		151E512		Carbazole	9,100 (J)	µg/kg
		151E512		Phenanthrene	13,000 (J)	µg/kg
		151E512		Uranium-238	1.33	pCi/g
		151E512		Uranium-235	0.074	pCi/g
		151E512		Uranium-234	2.76	pCi/g
		151E512		Ethylbenzene	60 (J)	µg/kg
		151E512		1,4-Dichlorobenzene	950 (J)	µg/kg
		151E512		1,3-Dichlorobenzene	24 (J)	µg/kg
		151E512		Acetone	200 (J)	µg/kg
		151E512		Carbon Disulfide	14 (J)	µg/kg
		151E512		1,2-Dichlorobenzene	450 (J)	µg/kg
		151E512		1,2,4-Trimethylbenzene	22 (J)	µg/kg

Table A.8-20
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #4 at CAS 12-04-03, System #3
(Page 2 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units
Tank #4 Outlet	E02	151E514	Sludge	Diesel-Range Organics	1,900 (H, M, Z)	mg/kg
		151E514		Cesium-137	1.7 (G)	pCi/g
		151E514		Lead-212	1.18 (J)	pCi/g
		151E514		Gasoline-Range Organics	6 (H)	mg/kg
		151E514		Lead	50	mg/kg
		151E514		Mercury	0.66	mg/kg
		151E514		Silver	6.2 (B)	mg/kg
		151E514		Arsenic	12	mg/kg
		151E514		Barium	130	mg/kg
		151E514		Chromium	15	mg/kg
		151E514		Selenium	5.5 (J+)	mg/kg
		151E514		Aroclor 1268	2,500 (J)	µg/kg
		151E514		Plutonium-239	0.203	pCi/g
		151E514		4-Chloroaniline	2,000 (J)	µg/kg
		151E514		Bis(2-Ethylhexyl)Phthalate	4,500 (J)	µg/kg
		151E514		Pyrene	2,900 (J)	µg/kg
		151E514		Benzo(a)Anthracene	1,400 (J)	µg/kg
		151E514		TCLP Arsenic	0.029 (B)	mg/L
		151E514		TCLP Chromium	0.0062 (B)	mg/L
		151E514		Uranium-238	1.84	pCi/g
		151E514		Uranium-235	0.107	pCi/g
		151E514		Uranium-234	3.63	pCi/g
		151E514		1,4-Dichlorobenzene	200 (J)	µg/kg
		151E514		1,3-Dichlorobenzene	24 (J)	µg/kg
		151E514		1,2-Dichlorobenzene	310 (J)	µg/kg
		151E514		1,2,4-Trimethylbenzene	14 (J)	µg/kg

Table A.8-20
Waste Management Sample Results Detected Above Minimum Detectable Concentrations in Septic Tank #4 at CAS 12-04-03, System #3
(Page 3 of 3)

Tank Number and Chamber (inlet or outlet)	Sample Locations	Sample Number	Matrix	Parameter	Result	Units

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
μg/kg = Micrograms per kilogram

B = Value less than the contract required detection limit, but greater than or equal to the instrument detection limit.
G = Sample density differs by more than 15% of laboratory control sample density.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

A.9.0 Quality Assurance

This section contains a summary of QA/QC measures implemented during the sampling and analysis activities conducted in support of the CAU 151 corrective action investigation. The following sections discuss the data validation process, QC samples, and nonconformances. A detailed evaluation of the DQIs is presented in Appendix B.

Laboratory analyses were conducted for samples used in the decision-making process to provide a quantitative measurement of any COPCs present. Rigorous QA/QC was implemented for the laboratory samples including documentation, verification, and validation of analytical results, and affirmation of DQI requirements related to laboratory analysis. Detailed information regarding the QA program is contained in the Industrial Sites QAPP (NNSA/NV, 2002a).

A.9.1 Data Validation

Data validation was performed in accordance with the Industrial Sites QAPP (NNSA/NV, 2002a) and approved protocols and SNJV procedures. All laboratory data from samples collected and analyzed for CAU 151 were evaluated for data quality according to the EPA Functional Guidelines (EPA, 1999 and 2004a). These guidelines are implemented in a tiered process and are presented in the following sections. Data were reviewed to ensure that samples were appropriately processed and analyzed, and the results were evaluated using validation criteria. Documentation of data qualifications resulting from these reviews is retained in project files as a hard copy and electronic media.

One hundred percent of the data analyzed as part of this investigation were subjected to Tier I and Tier II evaluations. A Tier III evaluation was performed on approximately 5 percent of the data analyzed.

A.9.1.1 Tier I Evaluation

Tier I evaluation for chemical and radiochemical analysis examines, but is not limited to:

- Sample count/type consistent with chain of custody
- Analysis count/type consistent with chain of custody
- Correct sample matrix
- Significant problems stated in cover letter or case narrative

- Completeness of certificates of analysis
- Completeness of Contract Laboratory Program (CLP) or CLP-like packages
- Completeness of signatures, dates, and times on chain of custody
- Condition-upon-receipt variance form included
- Requested analyses performed on all samples
- Date received/analyzed given for each sample
- Correct concentration units indicated
- Electronic data transfer supplied
- Results reported for field and laboratory QC samples
- Whether or not the deliverable met the overall objectives of the project

A.9.1.2 Tier II Evaluation

Tier II evaluation for chemical analysis examines, but is not limited to:

- Correct detection limits achieved
- Sample date, preparation date, and analysis date for each sample
- Holding time criteria met
- Quality control batch association for each sample
- Cooler temperature upon receipt
- Sample pH for aqueous samples, as required
- Detection limits properly adjusted for dilution, as required
- Blank contamination evaluated and applied to sample results/qualifiers
- MS/MSD percent recoveries and relative percent differences (RPDs) evaluated, and qualifiers applied to laboratory results, as necessary
- Field duplicate RPDs evaluated using professional judgment and qualifiers applied to laboratory results, as necessary
- Laboratory duplicate RPDs evaluated and qualifiers applied to laboratory results, as necessary
- Surrogate percent recovery evaluated and qualifiers applied to laboratory results, as necessary
- Laboratory control sample (LCS) percent recovery evaluated and qualifiers applied to laboratory results, as necessary

- Initial and continuing calibration evaluated and qualifiers applied to laboratory results, as necessary
- Internal standard evaluation
- Mass spectrometer tuning criteria
- Organic compound quantitation
- Inductively coupled plasma interference check sample evaluation
- Graphite furnace atomic absorption quality control
- Inductively coupled plasma serial dilution effects
- Recalculation of 10 percent of laboratory results from raw data.

Tier II evaluation for radiochemical analysis examines, but is not limited to:

- Correct detection limits achieved
- Blank contamination evaluated and, if significant, qualifiers applied to sample results
- Certificate of Analysis consistent with data package documentation
- QC sample results (duplicates, LCSs, laboratory blanks) evaluated and used to determine laboratory result qualifiers
- Sample results, uncertainty, and minimum detectable concentration evaluated
- Detector system calibrated with National Institute for Standards and Technology (NIST)-traceable sources
- Calibration sources preparation was documented, demonstrating proper preparation and appropriateness for sample matrix, emission energies, and concentrations
- Detector system response to daily or weekly background and calibration checks for peak energy, peak centroid, peak full-width half-maximum, and peak efficiency, depending on the detection system
- Tracers NIST-traceable, appropriate for the analysis performed, and recoveries that met QC requirements,
- Documentation of all QC sample preparation complete and properly performed

- Spectra lines, photon emissions, particle energies, peak areas, and background peak areas support the identified radionuclide and its concentration

A.9.1.3 Tier III Evaluation

The Tier III review is an independent examination of the Tier II evaluation. The Tier III review duplicates the Tier II review for a limited number of samples (typically 5 percent) by an independent agency and includes the following additional evaluations:

Chemical:

- Recalculation of all laboratory results from raw data
- QC sample results (e.g., calibration source concentration, percent recovery, and RPD) verified

Radioanalytical:

- QC sample results (e.g., calibration source concentration, percent recovery, and RPD) verified
- Radionuclides and their concentration validated as appropriate considering their decay schemes, half-lives, and process knowledge and history of the facility and site
- Each identified line in spectra verified against emission libraries and calibration results
- Independent identification of spectra lines, area under the peaks, and quantification of radionuclide concentration in a random number of sample results

A Tier III review of 5.5 percent of the sample analytical data was performed by TechLaw, Inc., of Lakewood, Colorado. Tier II and Tier III results were compared and where differences were noted, data were reviewed. No changes were made to data qualification.

A.9.2 Field Quality Control Samples

Field QC samples consisted of 32 trip blanks, 6 equipment rinsate blanks, 6 field blanks, 16 MS/MSDs, and 17 FDs collected and submitted for analysis by the laboratory analytical methods shown in Table A.2-2. The QC samples were assigned individual sample numbers and sent to the laboratory "blind." The MS/MSDs were sent as double volume samples. Additional samples were selected by the laboratory to be analyzed as laboratory duplicates.

A.9.2.1 Field Quality Control Sample Results

Review of the field blank analytical data for waste management and environmental characterization sampling indicates that there was no cross-contamination due to transportation practices or the ambient conditions. Field, equipment rinsate, and source blanks were analyzed for the applicable parameters listed in Table A.2-2, and trip blanks were analyzed for total VOCs only.

During the sampling events, 17 FDs were sent as blind samples to the laboratory to be analyzed for the investigation parameters listed in Table A.2-2. For these samples, the precision of the duplicate results (i.e., RPD between the environmental sample results and their corresponding FD sample results) was evaluated to the guidance set forth in the EPA Functional Guidelines (EPA, 1999 and 2004a).

A.9.2.2 Field Nonconformances

There was one field nonconformance identified during the collection of additional Decision I samples during the CAI. The proper sequence of field decontamination rinsing was not followed. The Standards-Based Management System (SBMS) procedure "Decontamination" states that field decontamination will be a soap wash followed by a tap water rinse and final deionized water rinse. A technician in the field was observed performing field decontamination as a soap wash, deionized water rinse and final tap water rinse.

Corrective actions to avoid recurrence included:

- A briefing with field personnel to heighten awareness of the importance and intent of performing decontamination.
- The SBMS procedure "Decontamination" will be changed to better describe the rinse process, to specifically state that the final rinse will be conducted using a hand sprayer.
- An effectiveness review will be performed by Industrial Sites management on future field projects, focusing on assessment of procedural change implementation and observations that the decontamination line is proper organized and labeled.

A.9.3 Laboratory Quality Control Samples

Analysis of method QC blanks was performed on each sample delivery group (SDG) for inorganics. Analysis for surrogate spikes and preparation blanks (PBs) were performed on each SDG for organics only. Paragon Analytics, Inc. performed initial and continuing calibration and LCSs for each chemical and radiological SDG. The results of these analyses were used to qualify associated environmental sample results according to the EPA Functional Guidelines (EPA, 1999 and 2004a). Documentation of data qualifications resulting from the application of these guidelines is retained in project files as both hard copy and electronic media.

The laboratory included a PB, LCS, and a laboratory duplicate sample with each batch of field samples analyzed for radionuclides.

A.9.4 Laboratory Nonconformances

Laboratory nonconformances are generally due to inconsistencies in the analytical instrumentation operation, sample preparations, extractions, missed holding times, and fluctuations in internal standard and calibration results. Thirty-five nonconformances were issued by the laboratory that may or may not have resulted in qualifying data. These laboratory nonconformances have been accounted for during the data qualification process.

A.10.0 Summary

Analytes detected in samples during the CAI were evaluated against the FALs to determine the nature and extent of COCs for CAU 151. Assessment of the data generated from investigation activities indicates the presence of COCs or potential source material (in the case of septic tank contents) at two CAU 151 CASs. The following summarizes the results for each CAS in CAU-151.

No COCs were identified in soils at CASs 02-05-01, 12-04-01, 12-04-02, 12-04-03, 12-47-01, 18-03-01 and 18-99-09.

Arsenic was identified as a COC at two locations in Lagoon A (B09 and B10) at CAS 12-03-01. No COCs were identified in Lagoons B through G of this CAS.

Additionally, results from septic tank sampling revealed potential source material in the two of 16 tanks at CASs 12-04-01, 12-04-02, and 12-04-03. No liquids contained in the septic tanks was determined to be potential source material. Only the septic tank sludges from CASs 12-04-01, System #1, (Tanks #5 and #6) contained 1,4-dichlorobenzene, aroclor-1254, trichloroethene, and Cs-137 above FALs or toxicity characteristic limits, making the sludge potential source material. The contaminants 1,4-dichlorobenzene and trichloroethene in the inlet chambers of Tank #5 and Tank #6 in System #1 exceeded the applicable toxicity characteristic limit. Therefore, this sludge will likely require handling and disposal as a hazardous waste when removed.

Septic tank sludges from CAS 12-04-02, System #5, contained 1,4-dichlorobenzene, and methylene chloride above PALs. Of these contaminants, none exceeded the applicable toxicity characteristic limit or FAL, and are not considered potential source material.

Septic tank sludges from CAS 12-04-03, System #3, contained 1,4-dichlorobenzene, aroclor-1260, aroclor-1268, and benzo(a)pyrene above PALs. Of these contaminants, none exceeded the applicable toxicity characteristic limit or FALs, and are not considered potential source material.

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Appendix B

Data Assessment for CAU 151

B.1.0 Data Quality Assessment

The DQA process is the scientific evaluation of the actual investigation results to determine whether the DQO criteria established in the CAU 151 CAIP (NNSA/NSO, 2004) were met, and whether DQO decisions can be resolved at the desired level of confidence. The DQO process details the field requirements to ensure that the right type, quality, and quantity of data will be available to support the resolution of those decisions at an appropriate level of confidence. Using both the DQO and DQA processes helps to ensure that DQO decisions are sound and defensible.

The DQA involves five steps that begin with a review of the DQOs and end with an answer to the DQO decision statements. The five steps are briefly summarized as follows:

Step 1: Review DQOs and Sampling Design – Review the DQO process to provide context for analyzing the data. State the primary statistical hypotheses; confirm the limits on decision errors for committing false negative (Type I) or false positive (Type II) decision errors; and review any special features, potential problems, or any deviations to the sampling design.

Step 2: Conduct a Preliminary Data Review – A preliminary data review should be performed by reviewing QA reports and inspecting the data both numerically and graphically, validating and verifying the data to ensure that the measurement systems performed in accordance with the criteria specified, and using the validated dataset to determine whether the quality of the data is satisfactory.

Step 3: Select the Test – Select the test based on the population of interest, population parameter, and the hypotheses. Identify the key underlying assumptions that could cause a change in one of the DQO decisions.

Step 4: Verify the Assumptions – Perform tests of assumptions. If data are missing or are censored, determine the impact on the DQO decision error.

Step 5: Draw Conclusions from the Data – Perform the calculations required for the test.

B.1.1 Review DQOs and Sampling Design

This section contains a review of the DQO process presented in Appendix A of the CAU 151 CAIP. The DQO decisions are presented with the DQO provisions to limit false negative or false positive decision errors. Special features, potential problems, or any deviations to the sampling design are also presented.

B.1.1.1 Decision I

The Decision I statement as presented in the CAU 151 CAIP: "Is a contaminant present within a CAS at a concentration that could pose an unacceptable risk to human health and the environment?"

Decision I Rules:

- If the population parameter of any COPC in a target population exceeds the risk-based FAL for that COPC, then that COPC is identified as a COC.
- If a COC is identified, then the Decision II statement must be resolved.
- If COCs are not identified, then the investigation is complete.

Population parameter: The maximum observed sample result.

B.1.1.1.1 DQO Provisions To Limit False Negative Decision Error

A false negative decision error (determining a COC is not present when, in fact, it is) is where consequences are more severe, and was controlled by meeting the following criteria:

1. Having a high degree of confidence that locations selected will identify COCs if present anywhere within the CAS.
2. Having a high degree of confidence that analyses conducted will be sufficient to detect any COC present in the samples.
3. Having a high degree of confidence that the dataset is of sufficient quality and completeness.

Criterion 1:

The following methods (stipulated in the CAU 151 CAIP, Appendix A DQOs [NNSA/NV, 2004]) were used in selecting sample locations.

1. Selection of sampling locations associated with process knowledge and similar investigations was accomplished through the creation of a conceptual site model (CSM) that highlighted the potential release locations associated with sanitary sewage systems. Field activities did not contradict the CSM as established in the CAIP; therefore, it can be assumed that sample locations based on the CSM would include any potential release site.
2. Selection of sampling locations associated with site visit/field observations were related to observations of soil around septic tanks and within lagoons, ponds, or sumps for staining, odors, presence of debris, signs of overflow, etc. In addition, visual inspection of the septic tanks was made for corrosion or wear.
3. Selection of sampling locations associated with breaches in buried piping was accomplished by performing a video survey of all accessible piping. Engineering drawings were used to supplement video surveys, at a minimum ensuring that features shown on such drawings were investigated. Distances of pipe runs were also compared/verified with engineering drawings.
4. Selection of sampling locations associated with professional judgment based on acceptable knowledge was accomplished by:

   A: Identification of source and release locations associated with the features of each CAS,
   B: Understanding of the chemical nature and fate properties of the COPCs,
   C: Field observations of the physical properties of the media being sampled and potential effects on migration/transport pathways, and
   D: Understanding of the hydrologic drivers, both past and present.

5. Selection of sampling locations associated with FSRs was accomplished by analyzing samples in the field for VOCs in headspace using an FID, alpha and beta/gamma-emitting radionuclides using a handheld instrument, and gamma-emitting radionuclides using gamma spectroscopy.

Reviews of aerial photographs as well as radiological and geophysical surveys were also performed before moving into the field, but did not yield any information to support sampling location decisions.

In general, soil sample results demonstrated that the vertical and lateral extent of COPCs were defined. The extent sample locations are shown in Figure B.1-1 for additional Decision I sampling at Lagoon E of CAS 12-03-01, and Figure B.1-2 for additional Decision I sampling at the old sump of CAS 12-47-01. Concentrations of the contaminants driving the extent of contamination are listed in Table B.1-1.

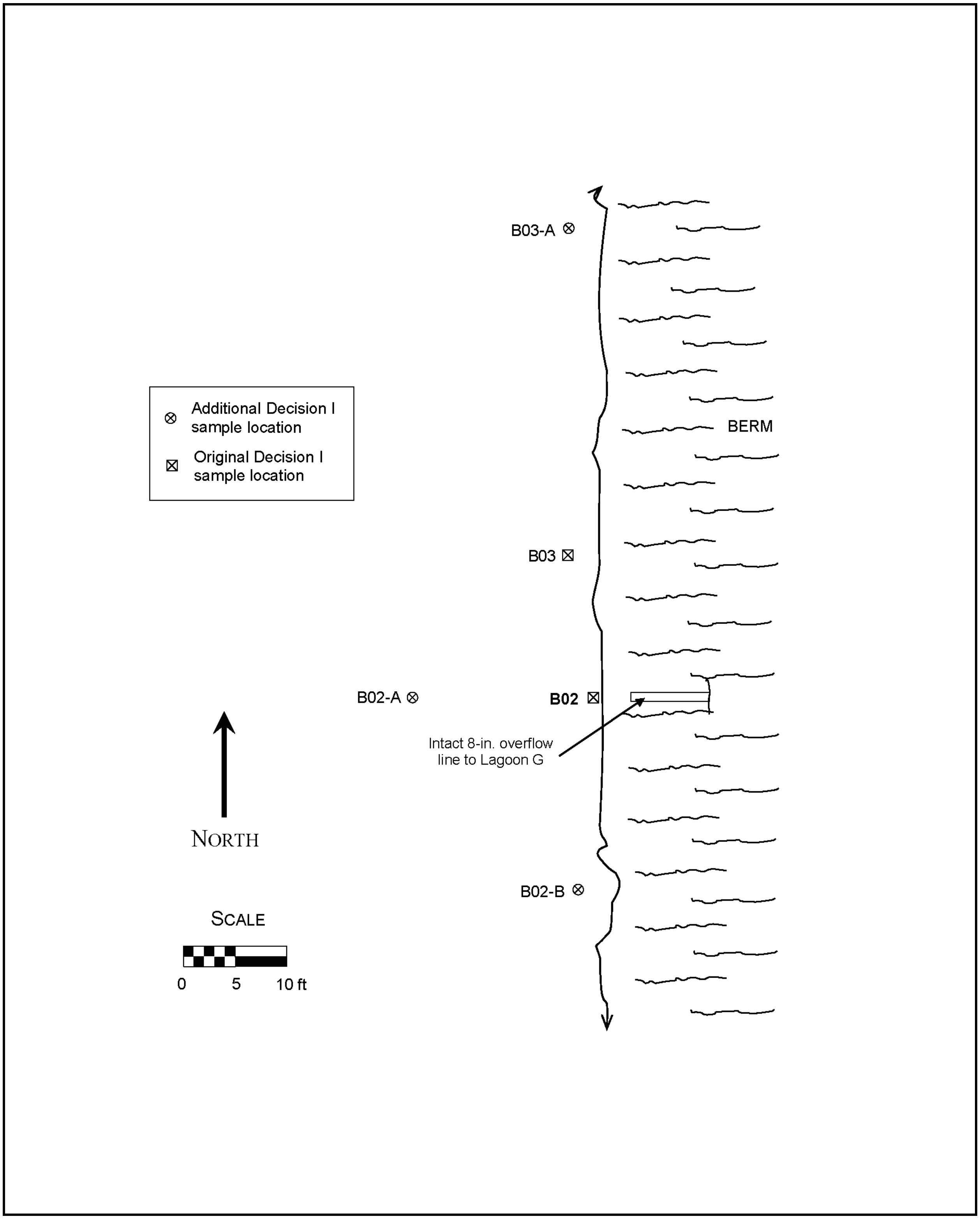

Figure B.1-1
Additional Decision I Sampling Locations at CAS 12-03-01, Lagoon E

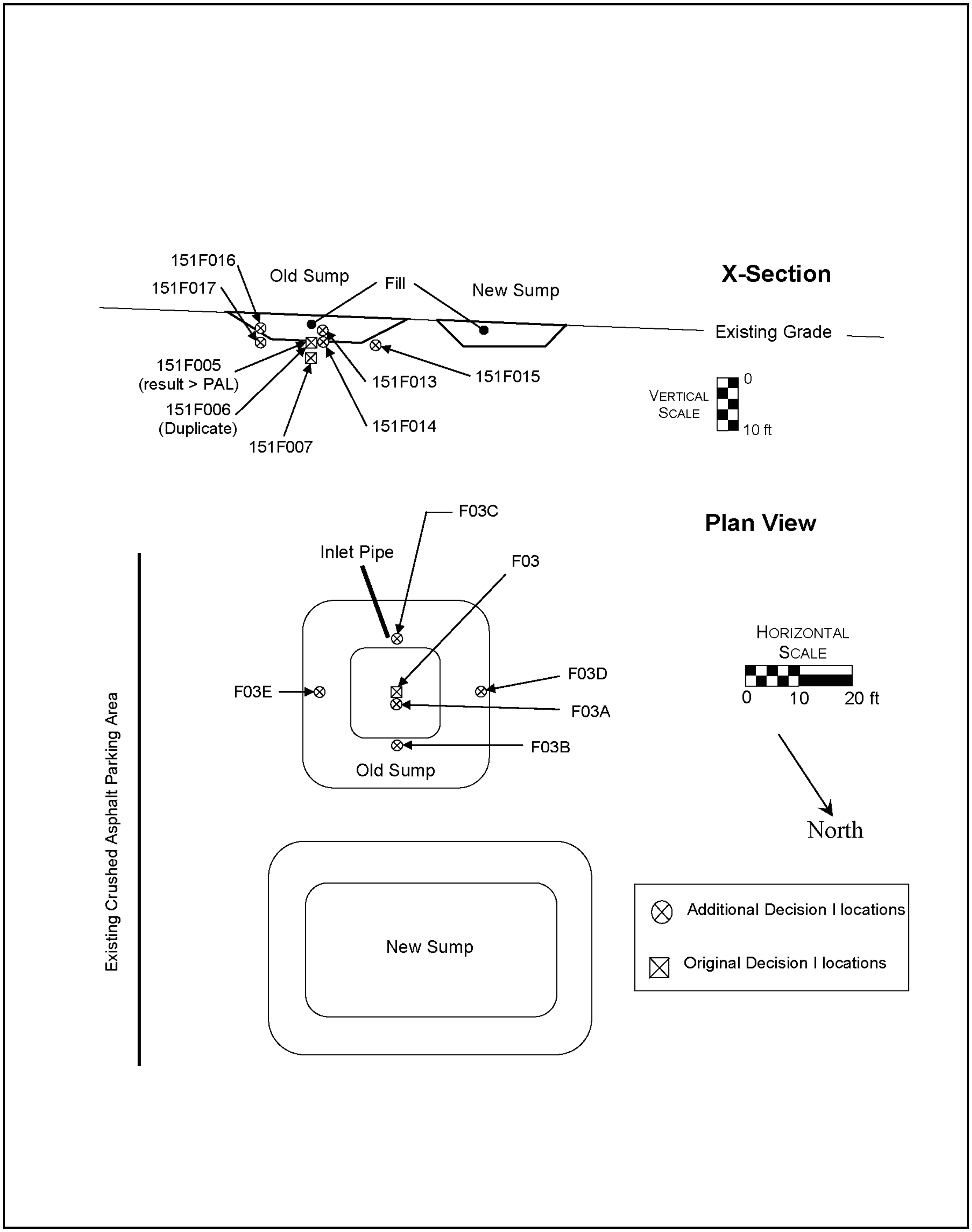

Figure B.1-2
Additional Decision I Sampling Locations at CAS 12-47-01

Table B.1-1
Contaminants of Potential Concern Driving Additional Decision 1 Sampling
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Parameter[a]						
			Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(a)pyrene	Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	TPH-DRO	Aroclor-1254
PAL[b]			2,100	2,100	210	210	210,000	100[c]	740
B02	151B003	0.0 - 0.5	4,000	6,700 (J)	3,700 (J)	740 (J)	1,800 (J)	--	--
	151B004	2.0 - 2.5	27 (J)	32 (J)	22 (J)	250 (U)	420 (U)	--	--
B02A	151B051	0.0 -1.0	380 (U)	380 (U)	230 (U)	230 (U)	380 (U)	--	--
B02B	151B052	0.0 - 1.0	770 (U)	770 (U)	42 (J)	460 (U)	770 (U)	--	--
B03	151B005	0.0 - 0.5	540 (U)	540 (UJ)	320 (UJ)	320 (UJ)	540 (UJ)	--	--
	151B006	2.0 - 2.5	520 (U)	520 (U)	310 (U)	310 (U)	520 (U)	--	--
B03A	151B053	0.0 - 1.0	470 (U)	470 (U)	280 (U)	280 (U)	470 (U)	--	--
F03	151F005	5.0 - 5.75	440	380 (J)	240 (J)	210 (UJ)	120 (J)	190 (M,Z)	2,000 (J)
	151F006	5.0 - 5.75	20,000 (J)	13,000 (J)	11,000 (J)	4,200 (UJ)	3,500 (J)	190 (M,Z)	2,200 (J)
	151F007	7.0 - 7.5	360 (U)	360 (U)	210 (U)	210 (U)	360 (U)	3.6 (J)	18 (U)
F03A	151F013	2.0 - 3.0	350 (U)	350 (UJ)	210 (UJ)	210 (UJ)	350 (UJ)	--	--
	151F014	4.0 - 5.0	350 (U)	350 (UJ)	210 (UJ)	210 (UJ)	350 (UJ)	--	--
F03B	151F015	4.0 -5.0	360 (U)	360 (U)	210 (U)	210 (U)	360 (U)	--	--

Table B.1-1
Contaminants of Potential Concern Driving Additional Decision 1 Sampling
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Parameter[a]						
			Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(a)pyrene	Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	TPH-DRO	Aroclor-1254
PAL[b]			**2,100**	**2,100**	**210**	**210**	**210,000**	**100[c]**	**740**
F03C	151F016	2.0 - 3.0	220 (J)	170 (J)	140 (J)	220 (U)	41 (J)	--	--
	151F017	5.0 - 6.0	350 (U)	350 (U)	210 (U)	210 (U)	350 (U)	--	--
F03D	151F018	4.0 - 5.0	360 (U)	360 (U)	210 (U)	210 (U)	360 (U)	--	--
F03E	151F019	4.0 - 5.0	350 (U)	350 (U)	210 (U)	210 (U)	350 (U)	--	--

[a] All values are in micrograms per kilogram (μg/kg).
[b] Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Action Goals (PRGs)* (EPA, 2004).
[c] TPH-DRO values are in milligrams per kilogram (mg/kg).

ft bgs = Feet below ground surface
PAL = Preliminary action level
-- Not applicable to this site.
J = Estimated value.
M = A pattern resembling motor oil was detected.
U = Compound was analyzed for, but was not detected (“Non-detect”). Results shown for comparison only.
Z = Result did not resemble any common TPH products.

Two areas were identified as requiring further delineation of COPCs. The surface soils at one location in CAS 12-03-01 Lagoon E, showed benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene at concentrations exceeding the PALs. Additional Decision I samples were collected to define the extent of contamination within the lagoon. Vertical extent was defined by results below PALs for the sample below the surface sample; therefore, additional vertical sampling was not required.

For the COPCs identified at CAS 12-47-01, additional Decision I sampling consisted of samples collected approximately 15 ft laterally from Location F03. One additional location adjacent to F03 was also sampled vertically to a depth of 5 ft bgs, approximately the same depth as original samples from F03.

Soil sample results demonstrated that the vertical and lateral extent of benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, TPH-DRO, and aroclor-1254 above the PALs was defined. The vertical extent of the COPCs is defined by the soil samples collected in the shallow subsurface at F03 and F03A that are below PALs. The results of the additional Decision I soil samples at CAS 12-47-01 show that COPCs are limited to approximately 15 ft laterally from Location F03 and are limited to the sump bottom.

Criterion 2:

All samples were analyzed using the analytical methods listed in Table A.1-13 of the CAIP and for the chemical and radiological parameters listed in Table 3-3 of the CAIP. Table B.1-2 provides a reconciliation of samples analyzed to the planned analytical program.

Samples were submitted for all of the analytical methods specified in the analytical program outlined in Section A.1.4.3 of the CAIP.

Sensitivity

Sample results were assessed against the acceptance criterion for the DQI of sensitivity as defined in the Industrial Sites QAPP (NNSA/NV, 2002). The sensitivity acceptance criterion defined in the CAIP is that analytical detection limits will be less than or equal to the corresponding action level (PALs). This criterion was not achieved for the analytical results listed in Table B.1-3. Results not

Table B.1-2
CAU 151 Analyses Performed

Analytes	CAS Number					
	02-05-01	12-03-01	12-04-01, 12-04-02, 12-04-03	12-04-01, 12-04-02, 12-04-03 Tank Contents	12-47-01	18-03-01, 18-99-09
Total VOCs	RS	RS	RS	RS	RS	RS
Total SVOCs	RS	RS	RS	RS	RS	RS
PCBs	RS	RS	RS	RS	RS	RS
Pesticides	SNR	SNR	SNR	SNR	RS	RS
TPH-DRO	NR	RS	RS	RS	SNR	SNR
TPH-GRO	NR	RS	RS	RS	NR	NR
RCRA Metals	RS	RS	RS	RS	RS	RS
Beryllium	RS	RS	RS	RS	RS	RS
Gamma Spectrometry	RS	RS	RS	RS	RS	RS
Isotopic Uranium	RS	RS	RS	RS	RS	RS
Isotopic Plutonium	RS	RS	RS	RS	RS	RS
Strontium-90	RS	RS	RS	RS	RS	RS
Tritium	RS	NR	NR	NR	NR	NR
TCLP VOCs	NR	NR	NR	RS	NR	NR
TCLP SVOCs	NR	NR	NR	RS	NR	NR
TCLP Metals	NR	NR	NR	RS	NR	NR

DRO = Diesel-range organics
GRO = Gasoline-range organics
PCB = Polychlorinated biphenyl
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TCLP = Toxicity characteristic leaching procedure
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

NR = Not required, not submitted
R = Required but not submitted
RS = Required and submitted
SNR = Submitted but not required in CAIP

meeting the sensitivity acceptance criterion will not be used in making DQO decisions and will therefore be considered as rejected data. The impact on DQO decisions is addressed in the assessment of completeness.

Table B.1-3
Analytes Failing Sensitivity Criteria

Sample Number	Parameter	Result[a]	Method Detection Limit[a]	Preliminary Action Level[a]
151B052	Dibenzo(a,h)anthracene	460 (U)	250	210
151F006	Benzo(a)pyrene	11,000 (J)	330	210
	Dibenzo(a,h)anthracene	4,200 (UJ)	2,200	210
	N-Nitroso-di-N-propylamine	4,900 (UJ)	560	250
151G009	Toxaphene	8,400 (UJ)	1,700	1,600

[a]All values are in micrograms per kilogram (μg/kg) unless noted.

U = Not detected.
UJ = Estimated, surrogate recovery exceeded the lower limits. Matrix effects may exist.

Criterion 3:

To satisfy the third criterion, the entire dataset, as well as individual sample results, were assessed against the acceptance criteria for the DQIs of precision, accuracy, comparability, completeness, and representativeness, as defined in the Industrial Sites QAPP (NNSA/NV, 2002). The DQI acceptance criteria are presented in Table 6-1 of the CAIP. As presented in Tables B.1-4 through B.1-7, these criteria were met for each the DQIs except as noted in the following subsections.

Precision

The duplicate precision is evaluated using the relative percent difference (RPD) or the normalized difference. For the purpose of determining the data precision of chemical analyses, the RPD between duplicate analyses was calculated. For radionuclides, the RPD was not calculated unless both the sample and its duplicate had concentrations of the target radionuclide exceeding five times their MDC. Otherwise radionuclide duplicate results were evaluated using the normalized difference. Table B.1-4 provides the chemical and radiological precision analysis results for all constituents that were qualified for precision. The chemical analytes qualified for precision were barium, mercury, and lead. Radionuclides qualified for precision were cesium (Cs)-137, plutonium (Pu)-238, Pu-239, thallium (Tl)-208, and uranium (U)-235.

Table B.1-4
Precision Measurements

Parameter	CAS Number	User Test Panel	Number of Analyses Qualified	Number of Measurements Performed	Percent Within Criteria
Barium	7440-39-3	Metals	15	203	92.6
Mercury	7439-97-6	Metals	9	203	95.6
Lead	7439-92-1	Metals	10	203	95.1
Cesium-137	10045-97-3	Gamma	6	202	97
Plutonium-238	13981-16-3	Plutonium	7	201	96.5
Plutonium-239	**15117-48-3**	**Plutonium**	**50**	**201**	**75.1**
Thallium-208	14913-50-9	Gamma	10	202	95
Uranium-235	15117-96-1	Gamma	7	202	96.5
Uranium-235	15117-96-1	Uranium	7	201	96.5

CAS = Chemical Abstract System

As shown by bold text in Table B.1-4, the precision rate for the radionuclide Pu-239 was below the CAIP acceptance criterion of 80 percent. The precision rate for all other constituents is better than 90 percent.

The precision rate for Pu-239 of 75.1 percent is due to the nature of particle distribution of Pu-239. A single particle of Pu-239 in one sample and not in the duplicate would result in a significant RPD between the samples. This spatial variability is considered normal for plutonium distribution at the NTS and is not indicative of a measurement error. As the precision rate for all other constituents meet the acceptance criteria for precision, the dataset is determined to be acceptable for the DQI of precision.

Accuracy

For the purpose of determining data accuracy of sample analyses, environmental soil samples were evaluated and incorporated into the accuracy calculation. The results qualified for accuracy were associated with MS recoveries that were outside control limits and could potentially be reported at concentrations lower or higher than actual concentrations. Table B.1-5 provides the chemical accuracy analysis results for all constituents qualified for accuracy. Accuracy rates are above the

Table B.1-5
Accuracy Measurements
(Page 1 of 2)

Parameter	CAS Number	User Test Panel	Number of Analyses Qualified	Number of Measurements Performed	Percent Within Criteria
1,2,4-Trichlorobenzene	120-82-1	VOCs	1	203	99.5
1,2,4-Trimethylbenzene	95-63-6	VOCs	2	203	99
1,2-Dichlorobenzene	95-50-1	VOCs	1	203	99.5
1,3,5-Trimethylbenzene	108-67-8	VOCs	1	203	99.5
1,3-Dichlorobenzene	541-73-1	VOCs	2	203	99
4,4'-DDT	50-29-3	Pesticides	1	149	99.3
Acetone	67-64-1	VOCs	1	203	99.5
Aroclor-1016	12674-11-2	PCBs	16	203	92.1
Aroclor-1221	11104-28-2	PCBs	16	203	92.1
Aroclor-1232	11141-16-5	PCBs	16	203	92.1
Aroclor-1242	53469-21-9	PCBs	16	203	92.1
Aroclor-1248	12672-29-6	PCBs	16	203	92.1
Aroclor-1254	11097-69-1	PCBs	16	203	92.1
Aroclor-1260	11096-82-5	PCBs	17	203	91.6
Aroclor-1268	11100-14-4	PCBs	18	203	91.1
Carbon Disulfide	75-15-0	VOCs	1	203	99.5
Chlorobenzene	108-90-7	VOCs	4	203	98
cis-1,2-Dichloroethene	156-59-2	VOCs	1	203	99.5
Diesel-Range Organics	68334-30-5	DRO	1	164	99.4
Ethylbenzene	100-41-4	VOCs	2	203	99
Gasoline-Range Organics	8006-61-9	GRO	3	152	98
Isopropylbenzene	98-82-8	VOCs	1	203	99.5
Lead	7439-92-1	Metals	7	203	96.6
Mercury	7439-97-6	Metals	3	203	98.5
Methylene Chloride	75-09-2	VOCs	1	203	99.5
N-Butylbenzene	104-51-8	VOCs	1	203	99.5
N-Nitroso-di-n-propylamine	621-64-7	SVOCs	13	213	93.9
N-Propylbenzene	103-65-1	VOCs	1	203	99.5

Table B.1-5
Accuracy Measurements
(Page 2 of 2)

Parameter	CAS Number	User Test Panel	Number of Analyses Qualified	Number of Measurements Performed	Percent Within Criteria
Pyrene	129-00-0	SVOCs	1	213	99.5
sec-Butylbenzene	135-98-8	VOCs	1	203	99.5
Toluene	108-88-3	VOCs	1	203	99.5
Total Xylenes	1330-20-7	VOCs	1	203	99.5
Trichloroethene	79-01-6	VOCs	4	203	98
Uranium-238	7440-61-1	Uranium	14	201	93

CAS = Chemical Abstract System.

CAIP criterion of 80 percent for all qualified constituents. No radiological data were qualified for accuracy.

Representativeness

The DQO process as identified in Appendix A of the CAU 151 CAIP (NNSA/NSO, 2004) was used to address sampling and analytical requirements for CAU 151. During this process, appropriate locations were selected that enabled the samples collected to be representative of the population parameters identified by the DQOs (the most likely locations to contain contamination and locations that bound COCs). The sampling locations identified in the Criterion 1 discussion meet all these criteria. Therefore, the analytical data acquired during the CAU 151 CAI are considered representative of the population parameters.

Comparability

Field sampling, as described in the CAU 151 CAIP (NNSA/NSO, 2004), was performed and documented in accordance with approved procedures that are comparable to standard industry practices. Approved analytical methods and procedures per DOE were used to analyze, report, and validate the data. These are comparable to other methods used not only in industry and government practices, but most importantly are comparable to other investigations conducted for the NTS.

Therefore, project datasets are considered comparable to other datasets generated using these same standardized DOE procedures, thereby meeting DQO requirements.

Also, standard, approved field and analytical methods ensured that data were appropriate for comparison to the investigation action levels specified in the CAIP.

Completeness

The CAU 151 CAIP (NNSA/NSO, 2004) defines acceptable criteria for completeness to be 80 percent of CAS-specific non-critical analytes identified in the CAIP having valid results and 100 percent of critical analytes (including Decision II samples) having valid results. Also, the dataset must be sufficiently complete to make DQO decision determinations. Critical analytes for CAU 151 are identified as TPH-DRO and TPH-GRO, arsenic, aroclor-1254, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

Rejected data (either qualified as rejected or data that failed the criterion of sensitivity) were not used in the resolution of DQO decisions and are not counted toward meeting the completeness acceptance criterion. Table B.1-6 provides the rejected data for the site. Benzo(a)pyrene and dibenzo(a,h)anthracene failed the criterion for sensitivity in specific samples while the other constituents were qualified as rejected during the Tier II validation. Although data for the critical analytes benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene did not meet the 100 percent completeness criteria, they are still considered acceptable as the CSM assumes uniform distribution of contaminants throughout a lagoon or sump.

B.1.1.1.2 DQO Provisions To Limit False Positive Decision Error

The false positive decision error was controlled by assessing the potential for false positive analytical results. Quality assurance/QC samples such as field blanks, trip blanks, LCSs, and method blanks were used to determine whether a false positive analytical result may have occurred. Stoller-Navarro Joint Venture performed Tier II validation for all of the 77 QA/QC samples submitted, and no false positives were detected.

Table B.1-6
Rejected Measurements

Parameter	CAS Number	User Test Panel	Number of Analyses Rejected	Number of Measurements Performed	Percent Within Criteria
Butyl-benzyl-phthalate	85-68-7	SVOCs	1	215	99.5
Di-N-octylphthalate	117-84-0	SVOCs	1	215	99.5
Benzo(b)fluoranthene	205-99-2	SVOCs	11	215	94.9
Benzo(a)pyrene	50-32-8	SVOCs	12	214	94.4
Benzo(g,hi)perylene	191-24-2	SVOCs	14	215	93.5
Benzo(k)fluoranthene	207-08-9	SVOCs	15	215	93
Dibenzo(a,h)anthracene	53-70-3	SVOCs	15	215	93
Indeno(1,2,3-c,d)pyrene	193-39-5	SVOCs	15	215	93

Proper decontamination of sampling equipment and the use of new or certified clean sampling equipment and containers also minimized the potential for cross contamination that could lead to a false positive analytical result.

B.1.1.2 Decision II

The Decision II statement as presented in the CAU 151 CAIP: "If a COC is present, is sufficient information available to evaluate appropriate corrective action alternatives?"

Decision II Rules:

- If the observed concentration of any COC in a Decision II sample exceeds the FALs, then additional samples will be collected to complete the determination of the extent.
- If observed COC concentrations in a sample from all bounding directions are less than the FALs, then the decision will be that the extent of contamination has been defined in the lateral and/or vertical direction.
- If wastes are to be generated as part of a corrective action, samples will be collected to sufficiently characterize the potential wastes.

Population parameters: The population parameters for Decision II data will be the observed concentration of each unbounded COC in any sample or the observed concentration of each sample used to characterize the potential waste streams.

B.1.1.2.1 DQO Provisions To Limit False Negative Decision Error

A false negative decision error (determining COC extent is defined when, in fact, it is not) is where consequences are more severe, and was controlled by meeting the following criteria:

1. Having a high degree of confidence that the sample locations selected will identify the extent of the COCs.
2. Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs present in the samples.
3. Having a high degree of confidence that the dataset is of sufficient quality and completeness.
4. Having a high degree of confidence that the potential waste streams are characterized.

Criterion 1:

In general, soil sample results demonstrated that the vertical and lateral extent of COCs were defined. Concentrations for the contaminants driving the extent of contamination are listed in Table B.1-7. For the COCs identified at CAS 12-03-01, Lagoon A (arsenic), Decision II sampling consisted of step-out samples collected to 9.0 ft vertically beneath Location B09. Lateral extent was assumed to be the edges of the lagoon. The extent sample locations are shown in Figure B.1-3.

Soil sample results demonstrated that the vertical and lateral extent of arsenic above the FAL was defined. The dimensions of the lagoon defines the lateral extent of the COC. The vertical extent of the COC is defined by the soil samples collected in the shallow subsurface. The results of additional soil samples at CAS 12-03-01 show that arsenic is vertically limited to a subsurface depth of 5.5 ft bgs, as defined by sample 151B054. This sample was collected from 5.5 to 6 ft bgs and the result for arsenic of is less than the PAL, thereby bounding the arsenic contamination.

Samples collected of septic tank contents for characterization as potential source material (material that could pose a threat of introducing a COC to the environment surrounding the tanks) identified potential source material in the sludge in two out of 16 tanks (Figure B.1-4). Sludge samples from the

Table B.1-7
Contaminants of Concern Driving Decision II Sampling

Sample Location	Sample Number	Depth	Parameter
			Arsenic
FAL			45.1
B09	151B017	1.25 - 1.5	51
	151B018	2.75 - 3.0	58
	151B054	5.5 - 6.0	14
	151B055	8.5 - 9.0	5.5
B10	151B019	0.75 - 1.0	47
	151B020	2.0 -2.5	42
B11	151B028	2.0 - 2.25	17
	151B029	3.5 - 4.0	3.4
B12	151B021	1.0 - 1.5	22
	151B022	4.0 - 4.5	29

FAL = Final action level

inlet chamber of Tank # 5, System #1, at CAS 12-04-01 contained trichloroethene (TCE) at concentrations above FALs. The outlet chamber of Tank # 5, System #1, at CAS 12-04-01 contained aroclor-1254, and Cs-137 at concentrations above FALs. Additionally, the inlet chamber of System #1, Tank #6, contains sludge exceeding the RCRA toxicity characteristic limit for 1,4-dichlorobenzene. For CAU 151, the evaluation of the septic tank contents; potential source materials required corrective action evaluation when they exceeded a FAL or displayed toxicity characteristic exceeding action levels (above TCLP waste limits). Therefore, the presence of 1,4-dichlorobenzene in Tank #6 above the toxicity characteristic results in the sludge being identified as containing potential source material.

Criterion 2:

All samples were analyzed for the COCs present at the corresponding CAS.

- CAS 12-03-01 - Lagoon A, arsenic
- CAS 12-04-01 - Septic Tanks, System #1, Tank 5 sludge, aroclor-1254, Cs-137, TCE
- CAS 12-04-01 - Septic Tanks, System #1, Tank 6 sludge, 1,4-dichlororbenzene

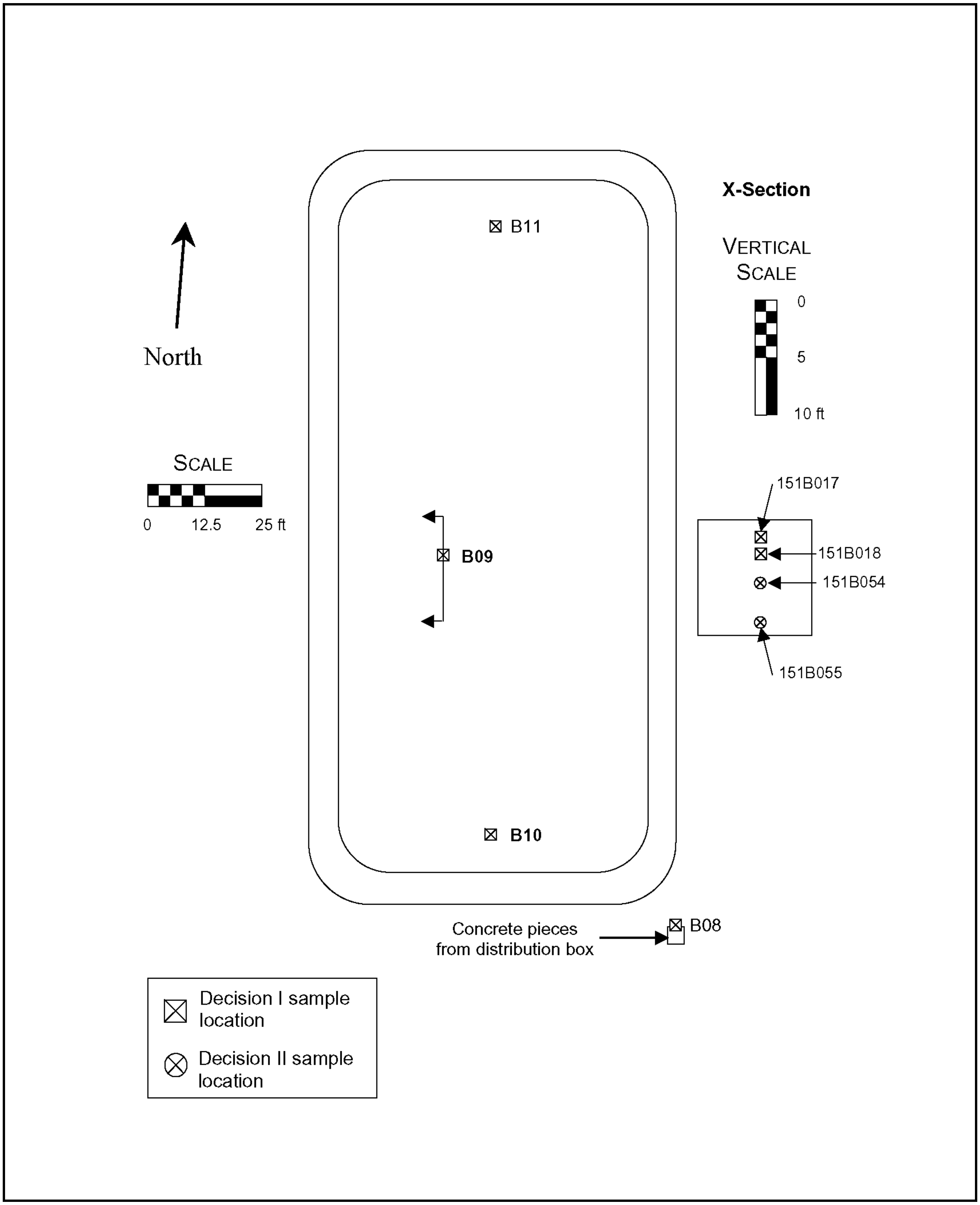

Figure B.1-3
Decision II Step-Out Sampling Locations at CAS 12-03-01, Lagoon A

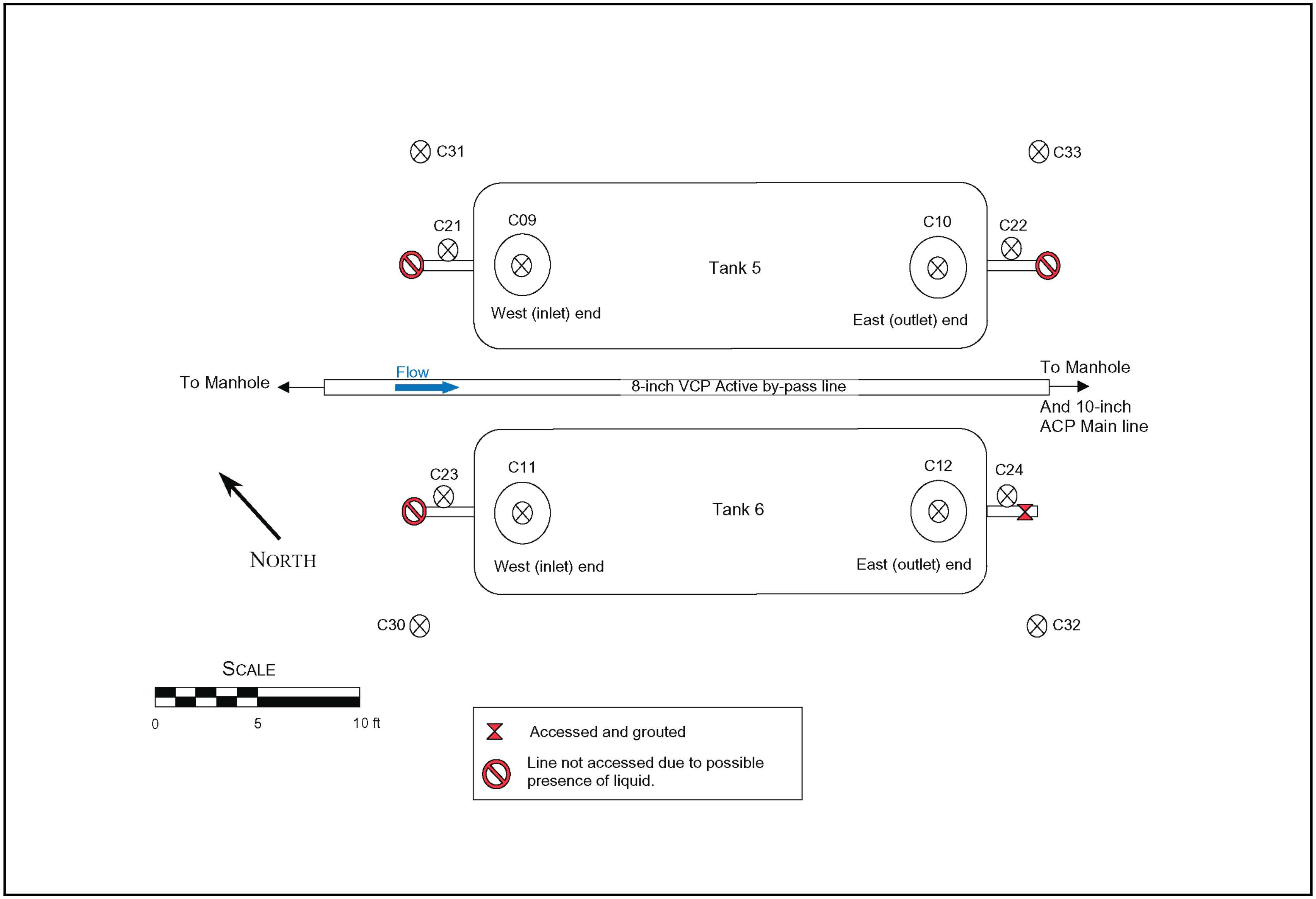

Figure B.1-4
Sample Locations CAS 12-04-01, System #1

Uncontrolled When Printed

The second criterion for extent (sensitivity) was accomplished for all analyses as demonstrated in Table B.1-3.

Criterion 3:

To satisfy the third criterion for extent, the entire dataset, as well as individual sample results, were assessed against the DQIs of precision, accuracy, comparability, completeness, and representativeness, as defined in the Industrial Sites QAPP (NNSA/NV, 2002b). The DQI discussion is presented under Criterion 3 for Decision I.

Criterion 4:

To satisfy the criterion that potential waste streams had been characterized, individual sample results of septic tank contents were compared to RCRA toxicity characteristic limits. As stated under Criterion 1, the inlet chamber of Tank #6 contains sludge exceeding the RCRA toxicity characteristic limit for 1,4-dichlorobenzene. Therefore, the presence of 1,4-dichlorobenzene in Tank #6 above the toxicity characteristic limit results in the sludge likely being identified as a hazardous waste if removed.

In addition, the sludge contained within the inlet chamber of Tank #5 also exceeded the disposal restriction levels (greater than RCRA toxicity characteristic limits) for 1,4-dichlorobenzene and TCE. The presence of 1,4-dichlorobenzene and TCE above the toxicity characteristic limit serves to define the sludge contents of this chamber as likely being a hazardous waste if removed.

B.1.1.2.2 DQO Provisions To Limit False Positive Decision Error

The false positive decision error was controlled by assessing the potential for false positive analytical results. Quality assurance/QC samples such as field blanks, trip blanks, LCSs, and method blanks were used to determine whether a false positive analytical result may have occurred. Stoller-Navarro Joint Venture performed Tier II validation for all of the 77 QA/QC samples submitted, and no false positives were detected.

Proper decontamination of sampling equipment and the use of new or certified clean sampling equipment and containers also minimized the potential for cross contamination that could lead to a false positive analytical result.

B.1.1.3 Sampling Design

The CAIP made the following commitments for sampling:

1. Judgmental biased sampling will be conducted at each CAS of CAU 151.

   Result: All sample locations were selected as the most likely to contain contaminants (e.g., low points, beneath inflow lines). Samples were collected and analyzed for the appropriate COPCs.

2. Sampling activities at CASs with piping will consist of video-mole survey of abandoned piping adjacent to a feature in the CAS to identify breaches or residual material.

   Result: The accessible piping at each CAS, except 02-05-01 and 12-03-01, were video surveyed. Corrective Action Sites 02-05-01 and 12-03-01 did not contain any piping. No residual material was detected in any lines surveyed. Breaches identified in lines at CAS 18-03-01 were excavated and sampled.

3. Manholes, cleanouts, and distribution boxes will be excavated, as appropriate, to verify component integrity and identify any breaches in inlet and outlet piping.

   Result: These components received visual inspection of the interior to verify integrity. None of these components contained residual material. One manhole at CAS 18-03-01 had been backfilled, and the integrity could not be verified. This manhole was excavated and a sample taken below the concrete manhole.

4. Activities at CASs 12-04-01, 12-04-02, and 12-04-03 include visual inspection of the inside of the septic tank and collecting Decision I samples for laboratory analysis from the tank residual material if present. Decision I soil samples will be collected beneath inlet and outlet end pipes, in the soil horizon underlying the base of the septic tanks, and in areas of potential overflow.

   Result: Visual inspections of tank interiors was made and is documented on the FADLs from each of the listed CASs. Samples were collected of each phase (when present) of residual tank contents. Soil samples were collected from beneath inlet and outlet end piping and from the horizon underlying the base of the tanks. No areas of overflow were noted; thus, no biased samples were collected for this purpose.

5. Decision I activities at CASs 02-05-01, 12-03-01, 12-47-01, and 18-03-01 will consist of locating the inflow and outflow lines or discharge area for each lagoon, sump, or pond and collecting Decision I samples of lagoon sediments and soil beneath the lagoon at the native soil interface at the proximal (inflow), low or midpoint, and distal (outflow) ends.

   Result: Biased samples were collected from the proximal (inflow), low or midpoint, and distal (outflow) locations of each pond. For lagoons/sumps at CASs 12-03-01 and 12-47-01 that had been backfilled, trenching was performed to identify the base of the former ponds. Samples were collected at the interface and a depth 2 to 2.5 ft below the interface.

B.1.2 Conduct a Preliminary Data Review

A preliminary data review was conducted by reviewing QA reports and inspecting the data. The contract analytical laboratory generates a QA nonconformance report when data quality does not meet contractual requirements. The analytical laboratory generated 35 nonconformance reports during this CAI. These laboratory nonconformances were accounted for during the data qualification. Data were validated and verified to ensure that the measurement systems performed in accordance with the criteria specified. The validated dataset quality was found to be satisfactory.

B.1.3 Select the Test and Identify Key Assumptions

The test for making DQO Decision I determinations was the comparison of the maximum analyte result from each CAS to the corresponding FAL. The test for making DQO Decision II determinations was the comparison of all COC analyte results from each bounding sample to the corresponding FALs.

The key assumptions that could impact a DQO decision are listed in Table B.1-8.

B.1.4 Verify the Assumptions

The results of the investigation support the key assumptions identified in the CAU 151 DQOs and Table B.1-8 except as listed below:

- Exception: One of the assumptions made for field activities assumed that all features (manholes, septic tanks, piping) would be accessible for inspection, either visually or via video survey. A small percentage of lines were not video surveyed either due to being filled with sediment/debris washed in through open tie-ins or to concerns over the possible release of residual liquid in the lines.

- Impact: No Decision I impact.

- Exception: It was noted during personnel interviews that the sump at CAS 12-47-01 had overflowed onto the soils adjacent to this feature. This could result in contamination existing in surrounding surface soils. Field observations at CAS 12-47-01, as well as other CASs suspected of overflowing, indicated that surfaces onto which the features may have

Table B.1-8
Key Assumptions

Exposure Scenario	Site workers are only exposed to COCs through oral ingestion, inhalation, external exposure to radiation, or dermal contact (by absorption) of COCs absorbed onto the soils. Exposure to contamination is limited to industrial site workers, construction/ remediation workers, and military personnel conducting training. The investigation results did not reveal any potential exposures other than those identified in the CSMs.
Affected Media	Surface soil and shallow subsurface soil. Shallow (perched) and deep groundwater contamination is not a concern. Contaminants migrating to regional aquifers are not a concern. The investigation results did not reveal any affected media other than those identified in the CSM.
Location of Contamination/ Release Points	The extent of COC concentration decreases away from the area of contamination. The investigation results did not reveal any locations of contamination or release points other than those identified in the CSM.
Transport Mechanisms	Surface transport may occur as a result of a spill or storm water runoff. Surface transport beyond shallow substrate is not a concern. The investigation results did not reveal any transport mechanisms other than those identified in the CSM.
Preferential Pathways	None identified. The investigation results did not reveal any preferential pathways other than those identified in the CSM.
Lateral and Vertical Extent of Contamination	Subsurface contamination is contiguous and decreases with distance and depth from the source. Surface contamination may occur laterally as a result of a spill or storm water runoff. The investigation results did not reveal any lateral and vertical extent of contamination other than those identified in the CSM.
Groundwater impacts	None identified. The investigation results did not reveal groundwater impacts other than those identified in the CSM.
Future Land Use	Nuclear and High Explosive Test Zone The investigation results did not reveal any future land uses other than those identified in the CSM.
Other Data Quality Objective Assumptions	All features (manholes, septic tanks, piping) will be accessible for inspection, either visually or via video survey. Contamination may be present in the soils adjacent to a feature due to overflow of septic tanks, manholes, or lagoons/sumps/ponds. The investigation results did not reveal any special features, potential problems, or deviations that would affect DQO decisions.

overflowed have been extensively reworked by high velocity overland flow associated with runoff events in area dry washes. No samples were collected from these areas as they were deemed to be unrepresentative of conditions at the time of overflow.

- Impact: No Decision I impact.

All data collected during the CAI supported the resolution of DQO decisions with the exceptions noted in this section. These exceptions did not invalidate the CSM presented in the CAIP, nor did they necessitate revisions to the CSM.

B.1.4.1 Other DQO Commitments

The CAIP did not make any additional commitments for sampling beyond those discussed above.

B.1.5 Draw Conclusions from the Data

This section resolves the two DQO decision statements for each of the CAU 151 CASs.

B.1.5.1 Decision Rules for Decision I

Decision Rule: If the concentration of any COPC in a target population exceeds the FAL for that COPC during the initial investigation, then that COPC is identified as a COC and Decision II sampling will be conducted.

Result: The following COCs were identified in the following CAS.

- CAS 12-03-01 - Arsenic

Result: The following potential source materials were identified in the following CAS.

- CAS 12-04-01 - System #1, Tank #5 - trichloroethene, 1,4-dichlorobenzene, aroclor-1254, Cs-137

  CAS 12-04-01- System #1, Tank #6 - 1,4-dichlorobenzene

Decision Rule: If all COPC concentrations are less than the corresponding FALs, then the decision will be no further action.

Result: No COCs were identified in soil samples collected from CAS 02-05-01; CAS 12-03-01, Lagoons C, D, F, G; CAS 12-04-01; CAS 12-04-02; CAS 12-04-03; CAS 18-03-01; and CAS 18-99-09. No further action is identified as the recommended corrective action alternative for each of these CASs. Likewise, septic tank contents from CAS 12-04-01, System #4; CAS 12-04-02, System #3; and CAS 12-04-03, System #5, did not contain any identified potential source material. No further action with implementation of a BMP is identified as the recommended CAA for each system at these CASs. Details of this action are discussed in Section 4.0 of the main document.

Although soils at Lagoons B and E at CAS 12-03-01 and CAS 12-47-01 did not contain COCs, they do contain contaminants above PALs. The FALs used to evaluate the presence of COCs for these CASs were based on restrictive exposure scenarios (Remote Work Area or Occasional Use Area). To ensure that a future site worker does not receive a greater exposure than was used to calculate the FALs, an administrative use restriction will be imposed on these sites as a BMP to the No Further Action recommendation.

B.1.5.2 Decision Rules for Decision II

Decision Rule: If a COC is detected, then the Decision II statement must be resolved.

Result: Decision II step-out sampling was conducted at CAS 12-03-01, Lagoon A, to determine vertical extent of the COC (arsenic) listed. The lateral extent of contamination is defined as the pond dimensions.

Decision Rule: If the observed concentration of any COC in a Decision II sample exceeds the FALs, then additional samples will be collected to complete the determination of the extent.

Result: Samples to define vertical extent were collected from CAS 12-03-01, Lagoon A. All Decision II samples were less than PALs.

Decision Rule: If all observed COC population parameters at step-out locations are less than the PALs, then the decision will be that the extent of contamination has been defined in the lateral and/or vertical direction.

Result: The vertical and lateral extent of contamination at CAS 12-03-01, Lagoon A, was defined. All Decision II sample results were less than PALs.

B.2.0 References

EPA, see U.S. Environmental Protection Agency.

NNSA/NSO, see U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office.

NNSA/NV, see U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002. *Industrial Sites Quality Assurance Project Plan, Nevada Test Site, Nevada*, Rev. 3, DOE/NV--372, Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2004. *Corrective Action Investigation Plan for Corrective Action Unit 151: Septic Systems and Discharge Area, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--981. Las Vegas, NV.

U.S. Environmental Protection Agency. 2004. *Region 9 Preliminary Remediation Goals (PRGs)*. As accessed at www.epa.gov/region09/waste/sfund/prg/index.htm on 18 July 2005.

Appendix C

Cost Estimates for CAU 151

C.1.0 Clarification

The cost estimate for the recommended BMP of sludge removal from septic tanks not containing potential source material at CASs 12-04-01, System #4; 12-04-02; and 12-04-03 are equivalent to those listed under the Clean Closure scenario in the attached Cost Estimate Proposal Data Sheets for these CASs.

BECHTEL NEVADA

EST ID: CAU 151
CAS 12-03-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 14-Feb-06

TO: Grant Evenson

FROM: Dave Nacht

SUBJECT: **CADD Alternative Cost Estimates for CAU 151: CAS 12-03-01 Sewage Lagoons**

ESTIMATOR: N/A

REF #: N/A

TYPE OF ESTIMATE:

X	ORDER OF MAGNITUDE		TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY		WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET		COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I		OTHER		OTHER

(TYPE OF WORK: last two columns)

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 12-03-01, which is included within Corrective Action Unit (CAU) 151. CAU 151 CAS 12-03-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 12-03-01 is specifically described within the FFACO as sewage lagoons in Area 12 Camp. Two alternatives have been evaluated for closure of the CAS: I. Clean Closure; and II. Closure in Place with Administrative Controls. This estimate will be used to identify the most cost-effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. **Cost for project management, plan preparation, project support, and/or other activities are not included herein.**

SCOPE:

Provide site closure using one of the following alternatives:

I) CLEAN CLOSURE
II) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed a field investigation at CAS 12-03-01. A total of 50 soil samples were collected and analyzed from the lagoons. Samples from locations B09 and B10 from Lagoon A were above the final action limit (FAL) for arsenic. All the other samples from the lagoons were below PALs. Lagoon A will need to be Clean Closed or Closed in Place with Administrative Controls. The other lagoons require no further action. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: Clean Closure
- Excavate 1,510 cubic yards (cy) of arsenic impacted soil (170 x 80 x 3 ft) within Lagoon A
- Dispose of 1,510 cy in the construction landfill
- Collect verification samples

Alternative II: Closure in Place with Administrative Controls
- Post Use Restriction (UR) signs around Lagoon A
- Survey locations of UR around lagoon A

BECHTEL NEVADA

EST ID: CAU 151
CAS 12-03-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 14-Feb-06

TO: Grant Evenson

FROM: Dave Nacht

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- Only Lagoon A will be clean closed or closed in place with administrative controls. All the other lagoons did not have contaminants above FALs
- The arsenic TCLP results were below the construction landfill limits and the waste can go to this landfill.
- Hazardous, mixed, low level, or TSCA waste will not be generated.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation provided by the characterization contractor.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

This estimate does not include costs for preparation of required project plans, permits, reports, mobilization and demobilization, site setup

ESCALATION:

No escalation factors have been applied.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY06 Final Rates (Rev. 1) effective 11/02/05 and were applied using the BN FY06 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I: Clean Closure — **$83,607**

a. Excavate arsenic impacted soil
b. Collect Verification Samples
c. Waste Management

Alternative II: Closure in Place With Administrative Controls — **$15,928**

a. Post UR signs around Lagoon A
b. Survey UR around Lagoon A

REVIEW / CONCURRENCE:

for Jeff Smith 3/2/06
Project Manager — Date

3-6-06
Estimating — Date

3/6/06
Project Controls — Date

BECHTEL NEVADA

EST ID: CAU 151
CAS 12-04-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 6-Feb-06

TO: Grant Evenson **FROM:** Dave Nacht

SUBJECT: **CADD Alternative Cost Estimates for CAU 151: CAS 12-04-01 Septic Tanks**

ESTIMATOR: David Nacht **REF #:**

TYPE OF ESTIMATE:

X	ORDER OF MAGNITUDE		TITLE II
	PRELIMINARY / PLANNING / STUDY		WORK ORDER
	CONCEPTUAL / BUDGET		COMPARATIVE
	TITLE I		OTHER

TYPE OF WORK:

	NON-MANUAL ONLY
	MANUAL ONLY
X	MANUAL & NON-MANUAL
	OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 12-04-01, which is included within Corrective Action Unit (CAU) 151. CAU 151 CAS 12-04-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 12-04-01 is specifically described within the FFACO as septic tanks located in Area 12 Camp approximately 100 ft northeast of Building 12-923 in Area 12. Two alternatives have been evaluated for closure of the CAS: I. Clean Closure; and II. Clean Close (2 tanks) Closure in Place (4 tanks). This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. **Cost for project management, plan preparation, project support, and/or other activities are not included herein.**

SCOPE:

Provide site closure using one of the following alternatives:

I) CLEAN CLOSURE
II) CLEAN CLOSURE (2 TANKS) CLOSURE IN PLACE (4 TANKS)

BASIS:

The characterization contractor recently completed a field investigation at CAS 12-04-01. All six septic tanks were found to contain sanitary liquid. The sludge in tanks 1, 2, 3, and 4 contain total petroleum hydrocarbons (TPH). The sludge in the influent chamber of tank 5 contains 1,4-diclorobenzene, trichloroethane, and THP above the action level. This waste is hazardous and will be disposed off-site. The sludge in the effluent chamber of tank 5 contains TPH and cesium 137 and can be disposed at the construction landfill. The sludge in the influent and effluent chambers of tank 6 contains TPH and 1,4-diclorobenzene above the action level. This waste is hazardous and will be disposed off-site. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database. There is no estimate required for evaluation of the No Further Action alternative since no cost is incurred.

BECHTEL NEVADA

EST ID: CAU 151
CAS 12-04-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 6-Feb-06

TO: Grant Evenson

FROM: Dave Nacht

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: Clean Closure

- Remove soil overburden from atop the tanks (estimate ± 88 cubic yards [cu. yds.]).
- Remove sanitary liquid from the 4 tanks that contain non-hazardous sludge using a pump truck without disturbing the sludge. Dispose the liquid as sanitary waste (estimate 20,000 gallons [gal]).
- Remove sanitary liquid from the 2 tanks (that contain hazardous sludge) using a trash pump into 5 solidification basins without disturbing the sludge. Dispose the solidified liquid in the construction landfill (estimate 5,744 gallons [gal]).
- Scrape off tar coating on all 4 tanks as required, then torch-cut the top to the ends of each tank, wide enough to get a backhoe bucket in.
- Solidify sludge in tanks 1, 2, 3, and 4 (estimated 1,700 gal) with native fill and dispose in the hydrocarbon landfill once samples have been run by ISOCS.
- Excavate and remove tanks 1, 2, 3, and 4.
- Stabilize, remove, and drum hazardous sludge in the influent of Tank 5 with and approved adsorbent (estimate 610 gal).
- Solidify and remove non hazardous sludge in the effluent of Tank 5 with native fill (estimate 122 gal.).
- Stabilize, remove, and drum hazardous sludge in the influent and effluent of Tank 6 with and approved adsorbent (estimate 500 gal).
- Remove all 6 tanks and dispose in the hydrocarbon landfill. There is an active septic line between tanks 2 & 3 and between tanks 5 & 6. These lines will be stabilized by shoring/backfilling the excavation during/after tank removal to ensure they are not damaged.
- Cut and grout inlet and outlet connecting pipes to tanks 1-4.
- Backfill and re-contour to present contours once verification sample results come back below the action limits.

Alternative II: Clean Close (2 tanks) Closure in Place (4 tanks)

- Remove soil overburden from atop the tanks (estimate ± 88 cubic yards [cu. yds.]).
- Remove sanitary liquid from the 4 tanks that contain non-hazardous sludge using a pump truck without disturbing the sludge. Dispose the liquid as sanitary waste (estimate 20,000 gallons [gal]).
- Remove sanitary liquid from the 2 tanks (that contain hazardous sludge) using a trash pump into 5 solidification basins without disturbing the sludge. Dispose the solidified liquid in the construction landfill (estimate 5,744 gallons [gal]).
- Scrape off tar coating on all 4 tanks as required, then torch-cut the top to the ends of each tank, wide enough to get a backhoe bucket in.
- Solidify sludge from tanks 1, 2, 3 and 4 (estimated 1,700 gal) with dry concrete and mix with heavy equipment (estimated 80 cu. yds).
- Fill the remainder of the four tanks with inert material and the top 2 ft of the tank with concrete (estimated 60 cu. yds).
- Stabilize, remove, and drum hazardous sludge in the influent of Tank 5 with and approved adsorbent (estimate 610 gal).
- Solidify and remove non hazardous sludge in the effluent of Tank 5 with native fill (estimate 122 gal).
- Stabilize, remove, and drum hazardous sludge in the influent and effluent of Tank 6 with and approved adsorbent (estimate 500 gal).
- Remove tanks 5 & 6 and dispose in the hydrocarbon landfill. There is an active septic line between these two tanks and the line will be stabilized by shoring/backfilling the excavation during/after tank removal to ensure it is not damaged.
- Backfill and re-contour to present contours once verification sample results come back below the action limits.

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- Preparation of the engineering plans to stabilize the active sewer line between tanks 2 & 3 and 5 & 6 when removing the septic tanks is not included.
- The tanks are all steel and each have a capacity of 10,000 gal.
- An NTS pump truck must be used to transport the sanitary liquid to the lagoon as stated in the lagoon permit. The capacity of the truck is 1,000 gal and 4,000 gal can be disposed per day.
- Hazardous waste from the sludge in tanks 5 & 6 will be generated, drummed, and disposed off-site.
- The solidified waste from the septic tanks will need to be screened by ISOCS before disposal and the waste will meet the waste acceptance criteria for the hydrocarbon landfill.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation provided by the characterization contractor.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4 days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

This estimate does not include costs for preparation of required project plans, permits, reports, mobilization and demobilization, site setup activities, or project management.

ESCALATION:

No escalation factors have been applied.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY06 Final Rates (Rev. 1) effective 11/02/05.

EST ID: CAU 151 CAS 12-04-01	BECHTEL NEVADA COST ESTIMATE PROPOSAL DATA SHEET	Date: 6-Feb-06
TO: Grant Evenson	FROM: Dave Nacht	

COST ALTERNATIVES SUMMARY:

Alternative I: Clean Closure **$468,776**

a. Excavate to uncover tanks and cut open the tops
b. Remove liquid from the tanks
c. Remove sludge from the tanks
d. Remove tanks and backfill to natural contours
c. Collect Verification Samples
d. Waste Management

Alternative II: Clean Close (2 tanks) Closure in Place (4 tanks) **$446,356**

a. Excavate to uncover the 6 tanks and cut open the tops
b. Remove liquid from the 6 tanks
c. Solidify sludge with dry mix in tanks 1, 2, 3, & 4
d. Remove sludge from tanks 5 & 6
e. Fill tanks 1, 2, 3, & 4 with inert material
f. Remove tanks 5 & 6 and backfill to natural contours
g. Collect Verification Samples
h. Waste Management

REVIEW / CONCURRENCE:

for SLS 3-2-06
Project Manager — Date

3-6-06
Estimating — Date

3/6/06
Project Controls — Date

BECHTEL NEVADA

EST ID: CAU 151
CAS 12-04-03

COST ESTIMATE PROPOSAL DATA SHEET

Date: 14-Feb-06

TO: Grant Evenson FROM: Dave Nacht

SUBJECT: CADD Alternative Cost Estimates for CAU 151: CAS 12-04-03 Septic Tanks

ESTIMATOR: David Nacht REF #:

TYPE OF ESTIMATE:

X	ORDER OF MAGNITUDE		TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY		WORK ORDER		MANUAL ONLY
	CONCEPTUAL, BUDGET		COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I		OTHER		OTHER

TYPE OF WORK: (last column)

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 12-04-03, which is included within Corrective Action Unit (CAU) 151. CAU 151 CAS 12-04-03 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 12-04-03 is specifically described within the FFACO as four septic tanks located in Area 12 Camp. Two alternatives have been evaluated for closure of the CAS: I. Clean Closure; and II. Closure in Place . This estimate will be used to identify the most cost-effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. **Cost for project management, plan preparation, project support, and/or other activities are not included herein.**

SCOPE:

Provide site closure using one of the following alternatives:

I) CLEAN CLOSURE
II) CLOSURE IN PLACE

BASIS:

The characterization contractor recently completed a field investigation at CAS 12-04-03. Three of the tanks contain liquid and sludge. Tank #2 was open and found to contain only soil. Liquid, sludge, and soil samples from the 4 tanks were analyzed for total VOCs, total SVOCs, PCBs, TPH-DRO, TPH-GRO, total RCRA metals, beryllium, isotopic uranium and plutonium, strontium-90, and gamma-emitting radionuclides. Sludge samples were also analyzed for TCLP VOCs, TCLP SVOCs, and TCLP metals. No liquid, sludge, or soil samples exceeded the final action limits (FALs), Toxic Substance Control Act (TSCA), or Resource Conservation and Recovery Act limits. Per the sampling, the liquid in the three septic tanks were found to contain only sanitary liquid. The sludge/soil in all four tanks contain total petroleum hydrocarbons (TPH) below the (FAL). No further action is the preferred action, but as a best management practice the tanks will be removed or closed in place with concrete. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: Clean Closure

- Remove soil overburden from atop the tanks (estimate ± 104 cubic yards [cu. yds.]).
- Remove sanitary liquid from 3 of the tanks using a pump truck without disturbing the sludge. Dispose the liquid as sanitary waste (estimate 17,872 gallons [gal]).
- Scrape off tar coating on all 4 tanks as required, then torch-cut the top to the ends of each tank, wide enough to get a backhoe bucket in.
- Solidify sludge from 3 of the tanks (estimated 3,096 gal) with native fill, remove, and dispose in the hydrocarbon landfill once samples have been run by ISOCS.
- Remove TPH impacted soil from tank #2 and dispose in the hydrocarbon landfill.
- Excavate and remove all 4 tanks. There is an 8 inch active septic line between tanks 2 & 3. These lines will be stabilized by shoring/backfilling the excavation. during/after tank removal to ensure they are not damaged.
- Cut and grout inlet and outlet connecting pipes to all tanks.
- Backfill and re-contour to present contours.

Alternative II: Closure in Place

- Remove soil overburden from atop the tanks (estimate ± 104 cubic yards [cu. yds.]).
- Remove sanitary liquid from 3 of the tanks using a pump truck without disturbing the sludge. Dispose the liquid as sanitary waste (estimate 17,872 gal).
- Scrape off tar coating on 3 of the tanks as required, then torch-cut the top to the ends of each tank, wide enough to get a backhoe bucket in.
- Solidify sludge from 3 of the tanks (estimated 3,096 gal) with dry concrete and mix with heavy equipment (estimated 60 cu. yds).
- Fill the remainder of all 4 tanks with inert material and the top 2 ft of the tank with concrete (estimated 60 cu yds).
- Remove distribution box.
- Backfill and re-contour to present contours once verification sample results come back below the action limits.

BECHTEL NEVADA

EST ID: CAU 151
CAS 12-04-03

COST ESTIMATE PROPOSAL DATA SHEET

Date: 14-Feb-06

TO: Grant Evenson **FROM:** Dave Nacht

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- Preparation of the engineering plans to stabilize the active sewer line between tanks 2 & 3 when removing the septic tanks are not included.
- The tanks are all steel and each have a capacity of 10,000 gal.
- An NTS pump truck must be used to transport the sanitary liquid to the lagoon as stated in the lagoon permit. The capacity of the truck is 1,000 gal and 4,000 gal can be disposed per day.
- The tanks do not contain any hazardous, mixed, low-level, or TSCA waste.
- The solidified waste from the septic tanks will need to be screened by ISOCS before disposal and the waste will meet the waste acceptance criteria for the hydrocarbon landfill.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation provided by the characterization contractor.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4 days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

ESCALATION:

No escalation factors have been applied.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY06 Final Rates (Rev. 1) effective 11/02/05.

COST ALTERNATIVES SUMMARY:

Alternative I: Clean Closure **$140,659**

a. Excavate to uncover the 4 tanks and cut open the tanks tops
b. Remove sanitary liquid from 3 tanks
c. Remove TPH impacted sludge from 3 tanks
d. Remove TPH impacted soil from tank #2
e. Remove tanks and backfill to natural contours
f. Collect Verification Samples
g. Waste Management

Alternative II: Closure in Place **$109,791**

a. Excavate to uncover the 4 tanks and cut open 3 of the tanks tops
b. Remove sanitary liquid from the tanks
c. Solidify sludge with dry mix in 3 tanks
d. Fill tanks with inert material
e. Waste Management

REVIEW / CONCURRENCE:

for JLS 3/2/06
Project Manager Date

3-2-06
Estimating Date

3/6/06
Project Controls Date

BECHTEL NEVADA

EST ID: CAU 151
CAS 12-04-02

COST ESTIMATE PROPOSAL DATA SHEET

Date: 6-Feb-06

TO: Grant Evenson **FROM:** Dave Nacht

SUBJECT: **CADD Alternative Cost Estimates for CAU 151: CAS 12-04-02 Septic Tanks**

ESTIMATOR: David Nacht **REF #:**

TYPE OF ESTIMATE:				TYPE OF WORK:	
X	ORDER OF MAGNITUDE		TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY		WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET		COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I		OTHER		OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 12-04-02, which is included within Corrective Action Unit (CAU) 151. CAU 151 CAS 12-04-02 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 12-04-02 is specifically described within the FFACO as septic tanks located in Area 12 Camp approximately 500 ft northeast of Building 12-4. Two alternatives have been evaluated for closure of the CAS: I. Clean Closure; and II. Closure in Place . This estimate will be used to identify the most cost-effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. **Cost for project management, plan preparation, project support, and/or other activities are not included herein.**

SCOPE:

Provide site closure using one of the following alternatives:

I) CLEAN CLOSURE
II) CLOSURE IN PLACE

BASIS:

The characterization contractor recently completed a field investigation at CAS 12-04-02. Liquid and sludge samples from the 6 tanks were analyzed for total VOCs, total SVOCs, PCBs, TPH-DRO, TPH-GRO, total RCRA metals, beryllium, isotopic uranium and plutonium, strontium-90, and gamma-emitting radionuclides. Sludge samples were also analyzed for TCLP VOCs, TCLP SVOCs, and TCLP metals. No liquid or sludge samples exceeded the final action limits (FALs), Toxic Substance Control Act (TSCA), or Resource Conservation and Recovery Act limits. Per the sampling all six septic tanks were found to contain sanitary liquid but the sludge contains total petroleum hydrocarbons (TPH) below the (FAL). No further action is the preferred action, but as a best management practice the tanks will be removed or closed in place with concrete. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: Clean Closure
- Remove soil overburden from atop the tanks (estimate ± 132 cubic yards [cu. yds.]).
- Remove sanitary liquid from the 6 tanks that contain non-hazardous sludge using a pump truck without disturbing the sludge. Dispose the liquid as sanitary waste (estimate 33,000 gallons [gal]).
- Scrape off tar coating on all 6 tanks as required, then torch-cut the top to the ends of each tank, wide enough to get a backhoe bucket in.
- Solidify sludge from the 6 tanks (estimated 4,000 gal) with native fill and dispose in the hydrocarbon landfill once samples have been run by ISOCS.
- Excavate and remove all 6 tanks. There is an 8-inch active septic line between tanks 3 & 4. These lines will be stabilized by shoring/backfilling the excavation during/after tank removal to ensure they are not damaged.
- Cut and grout inlet and outlet connecting pipes to all tanks.
- Backfill and re-contour to present contours once verification sample results come back below the action limits.

Alternative II: Closure in Place
- Remove soil overburden from atop the tanks (estimate ± 132 cubic yards [cu. yds.]).
- Remove sanitary liquid from the 6 tanks that contain non-hazardous sludge using a pump truck without disturbing the sludge. Dispose the liquid as sanitary waste (estimate 33,000 gallons [gal]).
- Scrape off tar coating on all 6 tanks as required, then torch-cut the top to the ends of each tank, wide enough to get a backhoe bucket in.

EST ID: CAU 151
CAS 12-04-02

BECHTEL NEVADA

COST ESTIMATE PROPOSAL DATA SHEET

Date: 6-Feb-06

TO: Grant Evenson **FROM:** Dave Nacht

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- Preparation of the engineering plans to stabilize the active sewer line between tanks 3 & 4 when removing the septic tanks are not included.
- The tanks are all steel and each have a capacity of 10,000 gal.
- An NTS pump truck must be used to transport the sanitary liquid to the lagoon as stated in the lagoon permit. The capacity of the truck is 1,000 gal and 4,000 gal can be disposed per day.
- The tanks do not contain any hazardous, mixed, low level, or TSCA waste.
- The solidified waste from the septic tanks will need to be screened by ISOCS before disposal and the waste will meet the waste acceptance criteria for the hydrocarbon landfill.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation provided by the characterization contractor.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

ESCALATION:

No escalation factors have been applied.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY06 Final Rates (Rev. 1) effective 11/02/05.

COST ALTERNATIVES SUMMARY:

Alternative I: Clean Closure **$165,186**

a. Excavate to uncover the 6 tanks and cut open the tops
b. Remove sanitary liquid from the tanks
c. Remove TPH impacted sludge from the tanks
d. Remove tanks and backfill to natural contours
e. Remove distribution box
f. Collect Verification Samples
g. Waste Management

Alternative II: Closure in Place **$149,171**

a. Excavate to uncover the 6 tanks and cut open the tops
b. Remove sanitary liquid from the tanks
c. Solidify sludge with dry mix in tanks
d. Fill tanks and distribution box with inert material
e. Waste Management

REVIEW / CONCURRENCE:

[signature] for SLS 3-2-06
Project Manager Date

[signature] 3-2-06
Estimating Date

Gary M. Kegan 3/6/06
Project Controls Date

Appendix D

Evaluation of Risk

D.1.0 Evaluation of Risk

The RBCA process used to establish FALs is described in the Industrial Sites Project Establishment of Final Action Levels (DOE, 2006). This process conforms with NAC Section 445A.227 which lists the requirements for sites with soil contamination. For the evaluation of corrective actions, NAC Section 445A.22705 requires the use of ASTM Method E1739-95 to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary."

The evaluation of the need for corrective action will include the potential for wastes that are present at a site to cause the future contamination of site environmental media if the wastes were to be released. To evaluate the potential for septic tank contents to result in the introduction of a COC to the surrounding environmental media, the following conservative assumptions were made:

- That the tank containment would fail at some point and the contents would be released to the surrounding media.
- That the resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in the tank waste.
- That any liquid contaminant in the septic tanks exceeding the RCRA toxicity characteristic concentration can result in introduction of a COC to the surrounding media.

Sludge containing a contaminant exceeding an equivalent FAL concentration would be considered to be potential source material and would require a corrective action. Septic tank liquids with contaminant concentrations exceeding an equivalent toxicity characteristic action level would be considered to be potential source material and would require a corrective action.

This section contains documentation of the risk-based corrective action (RBCA) process used to establish FALs described in the Industrial Sites Project Establishment of Final Action Levels (DOE, 2006). This process defines three tiers (or levels) to establish FALs used to evaluate DQO decisions:

- Tier 1 – sample results from source areas (highest concentrations) compared to risk-based screening levels (RBSLs) (i.e., PALs) based on generic (non-site-specific) conditions.

- Tier 2 – sample results from exposure points compared to SSTLs calculated using site-specific inputs and Tier 1 formulas.

- Tier 3 – sample results from exposure points compared to SSTLs and points of compliance calculated using chemical fate/transport and probabilistic modeling.

The risk-based corrective action decision process stipulated in the Industrial Sites Project Establishment of Final Action Levels (DOE, 2006) is summarized in Figure D.1-1.

D.1.1 Scenario

Corrective Action Unit 151 is comprised of the eight CASs listed below:

- CAS 02-05-01, UE-2ce Pond
- CAS 12-03-01, Sewage Lagoons (6)
- CAS 12-04-01, Septic Tanks
- CAS 12-04-02, Septic Tanks
- CAS 12-04-03, Septic Tank
- CAS 12-47-01, Wastewater Pond
- CAS 18-03-01, Sewage Lagoon
- CAS 18-99-09, Sewer Line (Exposed)

Corrective Action Site 02-05-01 consists of an approximately 68-by-50-ft excavated pond and surrounding berm, and a 60-ft surface trench running between the pond and the UE-2ce Water Well. The UE-2ce Water Well was drilled in 1977 to collect post-test radiological data of the geologic conditions from the Nash test conducted in 1967 (DOE/NV, 1986). According to the Environmental Survey Preliminary Report, Nevada Test Site, Mercury, Nevada (DOE, 1988a), the UE-2ce Water Well was drilled to a depth of 1,647 ft, 453 ft deeper than the Nash detonation level. During construction of the well, the pond was constructed to receive tritium-contaminated water from the well. Pumping was discontinued in 1986. There is also a gravel outwash mound, approximately 3 ft tall by 4 ft wide by 60 ft long, running down the center of the pond.

Corrective Action Sites 12-03-01, 12-04-01, 12-04-02, and 12-04-03 are all located in the east-central portion of the Area 12 camp and serviced the administrative, recreational, and housing buildings. Corrective Action Site 12-47-01 is located in the south-central portion of the Area 12 camp and serviced the Fleet Operations area. Corrective Action Site 12-03-01 consists of seven lagoons that were constructed in the late 1960s and early 1980s northeast of the Area 12 camp. For

Figure D.1-1
Risk-Based Corrective Action Decision Process

this CAI, the features have been identified as Lagoons A through G. Lagoons range in size from 80 by168 ft for Lagoons A through D, to 350 by 250 ft for Lagoons E and G. Lagoons A, B, C, D, and F are associated with the septic systems from the Area 12 Camp (CASs 12-04-01, 12-04-02, and 12-04-03). They received effluent that passed through the septic tanks. Overflow from Lagoons A through D was directed through a surface channel to Lagoon F. These lagoons were used up to the closing of the septic tanks in the early 1980s and the opening of two new lagoons (E and G) to the northeast. Lagoon E became the primary sanitary lagoon and received effluent directly from the Area 12 camp when the septic tanks were abandoned in place and bypassed. There was an overflow standpipe connecting Lagoon E to Lagoon G. These lagoons were used up until the early 1990s and the opening of the new sewage lagoons to the east (REECo, 1992a and 1995).

Corrective Action Sites 12-04-01, 12-04-02, and 12-04-03 are located in the east-central and northeast portions of Area 12. These CASs consists of four separate septic systems named Systems #1, #3, #4, and #5. These systems are associated with and discharge into CAS 12-03-01. Historical documentation indicates that these CASs were used to collect sanitary effluent from the Area 12 Camp administrative, recreational, and housing buildings (REECo, 1992a and 1995).

Corrective Action Site 12-04-01 addresses Systems #1 and #4. System #1 was installed around 1961 and consists of two septic tanks, two manholes, four access covers, and the associated 6-in. VCP. There is an estimated 5,000 gal of septage and liquid in each tank (Bingham, 1992; REECo, 1967a, 1992a and b, and 1995). System #4 was constructed before 1961 and originally contained only two septic tanks and associated VCP. This system was updated between 1961 and 1965 to include two additional tanks. All of the tanks in Systems #1 and #4 are bitumen (tar)-coated and lined 8-by-25-ft cylindrical carbon-steel tanks with a calculated capacity of 9,400 gal. The tanks are separated by an internal baffle into two chambers (inflow and outflow) with an access hatch to each chamber near the ends of the tank. The four tanks of System #4 contain an estimated 3,500 gal of liquid (Bingham, 1992; REECo, 1967a, 1992a and b, and 1995).

Corrective Action Site 12-04-02 addresses System #5. This system was constructed between 1961 and 1962 and consists of six septic tanks, two manholes, and eight visible access covers. The same 6-in. VCP and tank size apply to this system as for Systems #1 and #4. This system contains approximately 3,500 to 5,000 gal of septage in each tank (Bingham, 1992; REECo, 1967a, 1992a and b, and 1995).

Corrective Action Site 12-04-03 addresses System #3. This system consists of four septic tanks, two manholes, one visible access cover, and 6-in. VCP associated with the tanks. These tanks are the same size and type as the other systems above.

Corrective Action Site 12-47-01 is located in the south-central portion of the Area 12 camp. This CAS consists of two sumps (evaporation ponds) and associated inactive piping located at the Area 12 Fleet Operations. The old unlined sump is approximately 35 by 35 ft and was constructed between 1964 and 1966 to receive sewage waste from Buildings 12-8 and 12-16. This sump is located southwest of the new sump. The new sump is approximately 30 by 60 ft and was constructed around 1970 to increase effluent capacity for the addition of Building 12-910 and the women’s restroom trailer. In 1992, the new sump and the old sump were backfilled. It has also been documented that the sumps have overflown on several occasions onto the surrounding area (DOE, 1988a and b).

Corrective Action Sites 18-03-01 and 18-99-09 are located in Area 18 at the Area 17 camp. Corrective Action Site 18-03-01 consists of two sewage lagoons and associated collection piping that was constructed during the early 1960s and was active until the late 1980s. These lagoons were used to collect sanitary effluent from the Area 17 Camp administrative offices, and the sanitary and possibly industrial effluent from the construction support area to the east of the lagoons (AEC, Date Unknown). The northern lagoon measures 163 by 93 ft and is approximately 18 ft deep. The southern lagoon is 141 by 113 by 10 ft deep.

Corrective Action Site 18-99-09 is approximately 3 ft of exposed 6-in. VCP in the vicinity of CAS 18-03-01. The southern end of the pipe elbows downward into the ground. This CAI documented that the pipe is attached to the system associated with CAS 18-03-01 and serviced the USGS trailers at the camp.

D.1.2 Site Assessment

The CAI at CAS 12-04-01 (Septic Tanks), CAS 12-04-02 (Septic Tanks), CAS 12-04-03 (Septic Tank), CAS 18-03-01 (Sewage Lagoon), and CAS 18-99-09 (Sewer Line [Exposed]) involved visual inspections of all components through video survey and/or excavation, and soil sampling adjacent to and/or beneath structural components (septic tanks, manholes, piping) identified as potential sources for contaminant releases. The CAI results showed no residual material present in any of the inactive manholes or piping at each of these CASs. The structural integrity of most of these components at each of these CASs was intact. Four locations of breached pipe were detected and sampled at CAS 18-03-01. No COCs were detected in any of the soil samples from any of these CAS locations.

The CAI at CAS 12-47-01 (Wastewater Pond) involved visual inspection of all components through video survey and/or excavation and soil sampling at locations identified as potential sources for contaminant releases. The CAI results did not identify any COCs at this CAS.

The CAI at CAS 02-05-01 (UE-2ce Pond) involved inspection for areas of possible contamination (staining, elevated FSLs of alpha and beta/gamma) and soil sampling at locations identified as potential sources for contaminant release in the CAU 151 CAIP (NNSA/NSO, 2004a). The CAI results detected no COCs in any of the samples from this CAS.

The CAI at CAS 12-03-01 (Sewage Lagoons [6]) involved inspection for areas of possible contamination (staining, elevated FSLs of alpha and beta/gamma) and soil sampling at locations identified as potential sources for contaminant release in the CAU 151 CAIP (NNSA/NSO, 2004a). The CAI results indicated no COCs were present in any of the samples from Lagoons B through G of this CAS. The CAI results of the soil at two locations within Lagoon A identify arsenic as a COC. The lateral and vertical extent of the COC is confined to the upper native soil horizon at the inlet (proximal) end of Lagoon A and both the upper native soil horizon and lower sample interval at the midpoint of the lagoon.

The CAI results showed residual material is present in the septic tanks at CASs 12-04-01, 12-04-02, and 12-04-03; however, the structural integrity of tanks at each of these CASs appears intact and is the sludge of not releasing material to the surrounding environment. Potential source material was identified in only two (CAS 12-04-01, System #1) of the 16 tanks require CAA evaluation was performed. Potential source material is considered any contained material that, if released, poses the risk of introduction of COCs to the environment. Potential source material was identified because one of the two septic tanks of CAS 12-04-01, System #1, contains PCBs (aroclor-1254), trichloroethene, and Cs-137 above FALs in the sludge. Also, both CAS 12-04-01, System #1 tanks contain trichloroethene and 1,4-dichlorobenzene above RCRA toxicity characteristic limits. Liquid in the septic tanks did not contain any constituents above PALs in CASs 12-04-01, 12-04-02, and 12-04-03, but will be recommended for removal as a BMP. Sludge in the other 14 tanks also did not contain potential source material, and will also be recommended for removal as a BMP.

The maximum concentration of constituents identified in soil from each CAS, and their corresponding FALs are presented in Table D.1-1. The maximum concentration of constituents identified in septic tank liquid and sludge at CASs 12-04-01, 12-04-02, and 12-04-03, and their corresponding FALs are presented in Tables D.1-2 and D.1-3, respectively.

Table D.1-1
Maximum Reported Value for Soil Samples for Tier I Comparison
(Page 1 of 4)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	Qualifier	FAL	Units
Volatile Organic Compounds							
1,2,4-Trimethylbenzene	95-63-6	151B003	B02	1.5	J	170,000	µg/kg
2-Hexanone	591-78-6	151D004	D20	91		110,000,000	µg/kg
Acetone	67-64-1	151G001	G09	7.3	J	400,000	µg/kg
Methylene Chloride	74-87-3	151F010	F05	3.3	J	160,000	µg/kg
Semivolatile Organic Compounds							
Acenaphthene	82-32-9	151F006	F03	3,400	J	29,000,000	µg/kg
Anthracene	120-12-7	151F006	F03	13,000	J	100,000,000	µg/kg
Benzo(a)anthracene	56-55-3	151F006	F03	20,000	J	64,300	µg/kg
Benzo(a)pyrene	50-32-8	151F006	F03	11,000	J	6,470	µg/kg
Benzo(b)fluoranthene	205-99-2	151F006	F03	13,000	J	64,700	µg/kg
Benzo(g,h,i)perylene	191-24-2	151F006	F03	3,100	J	29,000,000	µg/kg
Benzo(k)fluoranthene	207-08-9	151F006	F03	8,900	J	21,000	µg/kg
Bis(2-ethylhexyl)phthalate	117-81-7	151G024RR	G12	14,000	B	120,000	µg/kg
Butyl-benzyl-phthalate	85-68-7	151F015	F03B	180	J	100,000,000	µg/kg
Carbozole	86-74-8	151F006	F03	4,500	J	86,000	µg/kg
Chrysene	218-01-9	151F006	F03	19,000	J	210,000	µg/kg
Dibenzo(a,h)anthracene	53-70-3	151B003	B02	740	J	6,470	µg/kg
Dibenzofuran	1322-64-9	151F006	F03	1,900	J	1,600,000	µg/kg
Diethyl phthalate	84-66-2	151D006	D24	100	J	100,000,000	µg/kg
Dimethyl phthalate	131-11-3	151E011	E17	49	J	100,000,000	µg/kg

Table D.1-1
Maximum Reported Value for Soil Samples for Tier I Comparison
(Page 2 of 4)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	Qualifier	FAL	Units
Di-n-butyl phthalate	84-74-2	151A001	A01	28	J	62,000,000	µg/kg
Di-n-octyl phthalate	117-84-0	151G024RR	G12	330	J	25,000,000	µg/kg
Fluoranthene	206-44-0	151F006	F03	51,000	J	22,000,000	µg/kg
Fluorene	86-73-7	151F006	F03	3,900	J	26,000,000	µg/kg
Indeno(1,2,3-cd)pyrene	193-39-5	151F006	F03	3,500	J	65,700	µg/kg
Naphthalene	91-20-3	151B003	B02	750	J	190,000	µg/kg
Pentachlorophenol	87-86-5	151G034	G16	260	J	462	µg/kg
Phenanthrene	85-01-8	151F006	F03	51,000	J	100,000,000	µg/kg
Pyrene	129-00-0	151F006	F03	47,000	J	29,000,000	µg/kg
Polychlorinated Biphenyls							
Aroclor-1254	11097-69-1	151F006	F03	2,200	J	27,700	µg/kg
Aroclor-1260	11097-69-1	151G012	G01	110	J	740	µg/kg
Pesticides							
4,4'-DDD	72-54-8	151B008	B04	380	J	100,000	µg/kg
4,4'-DDE	72-55-9	151B002	B01	300	J	7,000	µg/kg
4,4'-DDT	50-29-3	151B002	B01	100	J	7,000	µg/kg
Aldrin	309-00-2	151C011	C22	1.10	J	100	µg/kg
Alpha-BHC	319-84-6	151G011	G10	0.76	J	360	µg/kg
Beta-BHC	319-85-7	151D007	D23	3.20	J	1,300	µg/kg
Chlordane	12789-03-6	151G009	G02	6,000	J	6,500	µg/kg
Delta-BHC	N/A	151F005	F03	4.9	J	360	µg/kg

Table D.1-1
Maximum Reported Value for Soil Samples for Tier I Comparison
(Page 3 of 4)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	Qualifier	FAL	Units
Dieldrin	60-57-1	151G012	G01	3.9	J	110	µg/kg
Endosulfan Sulfate	1031-07-8	151G008	G03	1.3	J	3,700,000	µg/kg
Endrin	72-20-8	151C006	C16	17	J	180,000	µg/kg
Endrin Aldehyde	7421-93-4	151B035	B17	1.6	J	180,000	µg/kg
Heptachlor	76-44-8	151E011	E17	2.3	J	380	µg/kg
Heptachlor Epoxide	1024-57-3	151C007	C18	3.4	J	190	µg/kg
Total Petroleum Hydrocarbons							
TPH-DRO	68334-30-5	151F005	F03	190	M, Z	100	mg/kg
TPH-GRO	8006-61-9	151B001	B01	0.26	J	100	mg/kg
Metals							
Arsenic	7440-38-2	151B018	B09	58		45.1	mg/kg
Barium	7440-39-3	151F008	F04	390		67,000	mg/kg
Beryllium	7440-41-7	151F010	F05	1.5	J	1,900	mg/kg
Cadmium	7440-43-9	151F006	F03	1.2		450	mg/kg
Chromium	7440-47-3	151A004	A02	3.8		450	mg/kg
Lead	7439-92-1	151A001	A01	260		800	mg/kg
Mercury	7439-97-6	151C016	C25	0.099		310	mg/kg
Selenium	7782-49-2	151B018	B09	0.82		5,100	mg/kg
Silver	7440-22-4	151F006	F03	0.67	B	5,100	mg/kg
Gamma-Emitting Radionuclides							
Actinium-228	14331-83-0	151B034	B17	2.82	G	15	pCi/g

Table D.1-1
Maximum Reported Value for Soil Samples for Tier I Comparison
(Page 4 of 4)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	Qualifier	FAL	Units
Bismuth-212	14913-49-6	151G032	G17	3.90	G, TI	15	pCi/g
Bismuth-214	14733-03-0	151B004	B02	1.61	G, J	15	pCi/g
Cesium-137	10045-97-3	151B003	B02	1.28	G	12.2	pCi/g
Lead-212	15092-94-1	151G006	G05	3.30	J	15	pCi/g
Lead-214	15067-28-4	151G034	G16	1.80	G, J	15	pCi/g
Thallium-208	14913-50-9	151G004	G06	0.92	J	5	pCi/g
Thorium-234	15065-10-8	151G031	G17	4.40	G, TI	105	pCi/g
Isotopic Radionuclides							
Plutonium-238	13981-16-3	151B037	B18	1.14		13	pCi/g
Plutonium-239	15117-48-3	151B037	B18	2.93		12.7	pCi/g
Strontium-90	10098-97-2	151B022	B12	0.70		838	pCi/g
Uranium-234	13966-29-5	151B039	B21	1.59		143	pCi/g
Uranium-235	15117-96-1	151G024	G12	0.084		17.5	pCi/g
Uranium-238	7440-61-1	151G028	G14	1.52		105	pCi/g
Tritium	10028-17-8	151A004	A02	59.2		400,000	pCi/mL

DRO = Diesel-range organics
FAL = Final action level
GRO = Gasoline-range organics
mg/kg = Milligrams per kilogram
N/A = Not applicable. These compounds are subspecies of the main compound (e.g., alpha-chlordane uses the information for chlordane [technical]).
pCi/mL = Picocuries per milliliter
TPH = Total petroleum hydrocarbons
μg/kg = Micrograms per kilogram

B = Value less than contract required detection limit, but greater than or equal to the instrument detection limit.
G = Sample density differs by more than 15% of laboratory control sample density.
J = Estimated value.
M = A pattern resembling motor oil was detected
TI = Nuclide identification is tentative.
Z = Result did not resemble any common TPH products

Table D.1-2
Maximum Reported Value for Septic Tank Liquid Contents for Tier I Comparison
(Page 1 of 2)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	FAL	Qualifier	Units
Volatile Organic Compounds							
1,2-Dichlorobenzene	95-50-1	151C503	C02	46.00	N/A		µg/L
1,3-Dichlorobenzene	541-73-1	151C503	C02	6.70	N/A		µg/L
1,4-Dichlorobenzene	104-46-7	151C503	C02	81.00	7,500		µg/L
Benzene	71-43-2	151C503	C02	6.60	500		µg/L
Chlorobenzene	108-90-7	151C503	C02	140.00	100,000		µg/L
Cis-1,2-Dichloroethene	156-59-2	151C514	C09	79.00	N/A		µg/L
N-Butylbenzene	104-51-8	151E503	E07	1.20	N/A	J	µg/L
Sec-Butylbenzene	135-98-8	151E503	E07	0.75	N/A	J	µg/L
Tert-Butylbenzene	98-06-6	151E503	E07	0.70	N/A	J	µg/L
Toluene	108-88-3	151C503	C02	0.56	N/A	J	µg/L
Trichloroethene	79-01-6	151C516	C10	2.40	500	J	µg/L
Semivolatile Organic Compounds							
Bis(2-ethylhexyl)phthalate	117-81-7	151E509	E04	19.00	N/A		µg/L
Total Petroleum Hydrocarbons							
TPH-GRO	8006-61-9	151C503	C02	0.32	N/A	Z	mg/L
Metals							
Arsenic	7440-38-2	151D501	D01	0.011	5.0		mg/L
Barium	7440-39-3	151D501	D01	0.19	100.0		mg/L
Cadmium	7440-43-9	151C505	C04	0.0008	1.0	J-	mg/L

Table D.1-2
Maximum Reported Value for Septic Tank Liquid Contents for Tier I Comparison
(Page 2 of 2)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	FAL	Qualifier	Units
Chromium	7440-47-3	151D501	D01	0.017	5.0		mg/L
Lead	7439-92-1	151D501	D01	0.057	5.0		mg/L
Mercury	7439-97-6	151D516	D12	0.0000089	0.2	J+	mg/L
Selenium	7782-49-2	151D501	D01	0.0047	1.0	J+	mg/L
Silver	7440-22-4	151C505	C04	0.0037	5.0	B	mg/L
Isotopic Radionuclides							
Strontium-90	10098-97-2	151C505	C04	2.33	N/A		pCi/L
Uranium-234	13966-29-5	151C514	C09	0.39	N/A		pCi/L
Uranium-238	7440-61-1	151C514	C09	0.137	N/A		pCi/L

FAL = Final action level
GRO = Gasoline-range organics
mg/L = Milligrams per liter
N/A = Not applicable. There is no RCRA toxicity characteristic for this constituent.
pCi/L = Picocuries per liter
TPH = Total petroleum hydrocarbons
μg/kg = Micrograms per kilogram

B = Value less than contract required detection limit, but greater than or equal to the instrument detection limit.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
J- = The result is an estimated quantity, but the result may be biased low.
Z = Result did not resemble any common TPH products.

Table D.1-3
Maximum Reported Value for Septic Tank Sludge for Tier I Comparison
(Page 1 of 5)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	Qualifier	FAL	Units
Volatile Organic Compounds							
1,2,4-Trimethylbenzene	95-63-6	151C517	C10	3,400	J	170,000	µg/kg
1,3,5-Trimethylbenzene	108-67-8	151C517	C10	990	J	70,000	µg/kg
1,2-Dichlorobenzene	95-50-1	151C513RR1	C08	17,000		600,000	µg/kg
1,3-Dichlorobenzene	541-73-1	151C513RR1	C08	2,200		600,000	µg/kg
1,4-Dichlorobenzene	106-46-7	151C515	C09	2,300,000	B	3,060,000	µg/kg
2-Chlorotoluene	95-49-8	151C510	C07	16	J	560,000	µg/kg
Acetone	67-64-1	151C517	C10	890	J	54,000,000	µg/kg
Benzene	71-43-2	151C513	C08	340	J	1,400	µg/kg
Carbon Disulfide	75-15-0	151C512RR1	C05	120	J	720,000	µg/kg
Chlorobenzene	108-90-7	151C513RR1	C08	37,000		530,000	µg/kg
Cis-1,2-dichloroethene	156-59-2	151C515	C09	100,000		150,000	µg/kg
Ethylbenzene	100-41-4	151D510	D07	190	J	400,000	µg/kg
Isopropylbenzene	98-82-8	151C517	C10	40	J	2,000,000	µg/kg
Methylene Chloride	74-87-3	151D521RR1	D09	100,000		1,390,000	µg/kg
N-butylbenzene	104-51-3	151C517	C10	720	J	240,000	µg/kg
N-propylbenzene	103-65-1	151C517	C10	290	J	240,000	µg/kg
Sec-butylbenzene	135-98-8	151C517	C10	410	J	220,000	µg/kg
Tert-butylbenzene	98-06-6	151C517	C10	26	J	390,000	µg/kg
Toluene	108-88-3	151C517	C10	1,700	J	520,000	µg/kg
Total Xylenes	1330-20-7	151C517	C10	510	J	420,000	µg/kg

Table D.1-3
Maximum Reported Value for Septic Tank Sludge for Tier I Comparison
(Page 2 of 5)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	Qualifier	FAL	Units
Trichloroethene	79-01-6	151C515	C09	2,000,000		5,730	µg/kg
Semivolatile Organic Compounds							
2-Chlorophenol	95-57-8	151D509	D05	38	J	240,000	µg/kg
2-Methylnaphthalene	91-57-6	151C517	C10	3,000	J	190,000	µg/kg
3+4-Methylphenol	106-44-5	151C515RR2	C09	80,000		3,100,000	µg/kg
4-Chloroaniline	106-47-8	151E512	E01	3,700	J	2,500	µg/kg
2,4-Dimethylphenol	105-67-9	151C517	C10	360	J	12,000,000	µg/kg
Acenaphthene	82-32-9	151E512	E01	1,200	J	29,000,000	µg/kg
Anthracene	120-12-7	151E512	E01	2,000	J	100,000,000	µg/kg
Benzo(a)anthracene	56-55-3	151E514	E02	1,400	J	64,300	µg/kg
Benzo(a)pyrene	50-32-8	151E510	E04	470	J	6,470	µg/kg
Benzo(b)fluoranthene	205-99-2	151E510	E04	520	J	64,700	µg/kg
Bis(2-ethylhexyl)phthalate	117-81-7	151C517	C10	130,000	J	4,960,000	µg/kg
Butyl-benzyl-phthalate	85-68-7	151C517	C10	2,100	J	100,000,000	µg/kg
Carbazole	86-74-8	151E512	E01	9,100	J	86,000	µg/kg
Chrysene	218-01-9	151C513	C08	990	J	210,000	µg/kg
Diethyl phthalte	84-66-2	151D522	D10	30	J	100,000,000	µg/kg
Di-n-butyl phthalate	84-74-2	151C517	C10	370	J	62,000,000	µg/kg
Di-n-octyl phthalate	117-84-0	151D508	D03	100	J	25,000,000	µg/kg
Fluoranthene	206-44-0	151E510RR1	E04	2,000	J	22,000,000	µg/kg
Fluorene	86-73-7	151E512	E01	1,600	J	26,000,000	µg/kg

Table D.1-3
Maximum Reported Value for Septic Tank Sludge for Tier I Comparison
(Page 3 of 5)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	Qualifier	FAL	Units
Naphthalene	91-20-3	151C513	C08	1,100	J	190,000	µg/kg
Phenanthrene	85-01-8	151E512	E01	13,000	J	100,000,000	µg/kg
Pyrene	129-00-0	151E510	E04	3,700	J	29,000,000	µg/kg
Total Petroleum Hydrocarbons							
TPH-DRO	68334-30-5	151C517	C10	12,000	H, M, Z	100	mg/kg
TPH-GRO	8006-61-9	151C515	C09	3,000	Z	100	mg/kg
Polychlorinated Biphenyls							
Aroclor-1254	11097-69-1	151C517	C10	37,000	J	27,700	µg/kg
Aroclor-1260	11097-69-1	151E508	E03	5,300	J	28,800	µg/kg
Aroclor 1268	11097-69-1	151E512	E01	5,700	J	28,800	µg/kg
Metals							
Arsenic	7440-38-2	151C512	C05	24		45.1	mg/kg
Barium	7440-39-3	151C517	C10	1,700		67,000	mg/kg
Beryllium	7440-41-7	151C512	C05	8		1,900	mg/kg
Cadmium	7440-43-9	151C517	C10	58		450	mg/kg
Chromium	7440-47-3	151C517	C10	120		450	mg/kg
Lead	7439-92-1	151C515	C09	2,300	J	17,079	mg/kg
Mercury	7439-97-6	151C517	C10	2.4		310	mg/kg
Selenium	7782-49-2	151E512	E01	9.6	J+	5,100	mg/kg
Silver	7440-22-4	151C517	C10	53		5,100	mg/kg

Table D.1-3
Maximum Reported Value for Septic Tank Sludge for Tier I Comparison
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Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	Qualifier	FAL	Units
Gamma-Emitting Radionuclides							
Actinium-228	14331-83-0	151E516	E06	2.31	G	15	pCi/g
Americium-241	14596-10-2	151C517	C10	1.27	J	12.7	pCi/g
Bismuth-214	14733-03-0	151E516	E06	1.13	G, J	15	pCi/g
Cesium-137	10045-97-3	151C517	C10	13.6	J	12.2	pCi/g
Lead-212	15092-94-1	151E516	E06	2.43	J	15	pCi/g
Lead-214	15067-28-4	151E516	E06	1.25	G, J	15	pCi/g
Thallium-208	14913-50-9	151D508	D03	1.1	G	5	pCi/g
Isotopic Radionuclides							
Plutonium-238	13981-16-3	151E506	E07	0.242		13	pCi/g
Plutonium-239	15117-48-3	151C517	C10	3.94		12.7	pCi/g
Uranium-234	13966-29-5	151C517	C10	10.9		143	pCi/g
Uranium-235	15117-96-1	151E502	E08	0.51	J	17.5	pCi/g
Uranium-238	7440-61-1	151E502	E08	6.02		105	pCi/g

Table D.1-3
Maximum Reported Value for Septic Tank Sludge for Tier I Comparison
(Page 5 of 5)

Parameter	Chemical Abstracts Service Number	Sample ID	Sample Location	Maximum Result	Qualifier	FAL	Units

DRO = Diesel-range organics
FAL = Final action level
GRO = Gasoline-range organics
mg/kg = Milligrams per kilogram
pCi/g = Picocuries per gram
TPH = Total petroleum hydrocarbons
μg/kg = Micrograms per kilogram

B = Value less than contract required detection limit, but greater than or equal to the instrument detection limit.
G = Sample density differs by more than 15% of laboratory control sample density.
H = Fuel pattern in the heavier end of retention time window.
J = Estimated value.
J+ = The result is an estimated quantity, but the result may be biased high.
M = A pattern resembling motor oil was detected.
Z = Result did not resemble any common TPH products.

D.1.3 Site Classification and Initial Response Action

The four major site classifications listed in Table 3 of the ASTM Method E1739-95 (ASTM, 1995) are: (1) immediate threat to human health, safety, and the environment; (2) short-term (0 to 2 years) threat to human health, safety, and the environment; (3) long-term (> 2 years) threat to human health, safety, or the environment, and (4) no demonstrated long-term threats.

Based on the CAI, none of the CASs present an immediate threat to human health, safety, and the environment; therefore, no interim response actions are necessary at these sites. Based on this information, soils at CASs 02-05-01, 12-03-01 Lagoons B-G, 12-04-01, 12-04-02, 12-04-03, 12-47-01, 18-03-01, and 18-99-09 are determined to be Classification 4 sites as defined by ASTM Method E1739-95 and pose no demonstrated near- or long-term threats. Lagoon A at CAS 12-03-01 is where COCs were identified that may pose long-term threats to human health, safety, or the environment, and it has been determined to be a Classification 3 site as defined by ASTM Method E1739-95. The septic tank contents of CASs 12-04-01, 12-04-02, and 12-04-03, where potential source material was identified that may pose long-term threats to human health, safety, or the environment and have also been determined to be Classification 3 sites as defined by ASTM Method E1739-95.

D.1.4 Development of Tier 1 Lookup Table of Risk-Based Screening Levels

Tier 1 action levels have been defined as the PALs established during the DQO process. The PALs are a tabulation of chemical-specific (but not site-specific) screening levels based on the type of media (soil) and potential exposure scenarios (industrial). These are very conservative estimates of risk, are preliminary in nature, and are used as action levels for site screening purposes. Although the PALs are not intended to be used as FALs, a FAL may be defined as the Tier 1 action level (i.e., PAL) value if individual constituent analytical results are below the corresponding Tier 1 action level value. The FAL may also be established as the Tier 1 action level value if individual constituent analytical results exceed the corresponding Tier 1 action level value and implementing a corrective action based on the Tier 1 action level is practical. The PALs are defined as:

- EPA Region 9 Risk-Based PRGs for Industrial Soils (EPA, 2004).

- Background concentrations for RCRA metals will be evaluated when natural background exceeds the PAL, as is often the case with arsenic. Background is considered the mean plus two times the standard deviation of the mean based on data published in Mineral and Energy Resource Assessment of the Nellis Air Force Range (NBMG, 1998; Moore, 1999).

- TPH concentrations above the action level of 100 mg/kg per NAC 445A.2272 (NAC, 2003).

- For COPCs without established PRGs, a protocol similar to EPA Region 9 will be used to establish an action level; otherwise, an established PRG from another EPA region may be chosen.

- The PALs for material, equipment, and structures with residual surface contamination are the allowable total residual surface contamination values for unrestricted release of material and equipment listed in the DOE Order 5400.5 (DOE, 1993), which is also Table 4-2 of the *NV/YMP Radiation Control Manual* (NNSA/NV, 2004b).

- The PALs for radioactive contaminants are based on the NCRP Report No. 129 recommended screening limits for construction, commercial, industrial land-use scenarios (NCRP, 1999) scaled to 25 mrem/yr dose constraint (Appenzeller-Wing, 2004) and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993).

The PALs were developed based on an industrial use scenario. Because the CAU 151 CASs in Areas 12 and 18 are not assigned work stations, and are considered to be in remote or occasional use areas, the use of industrial use based PALs is conservative. The Tier 1 lookup table is defined as the PAL concentrations or activities defined in the CAIP.

In order to evaluate the potential for septic tank contents to result in the introduction of a COC to the surrounding environmental media, the following conservative assumptions were made:

- That the tank containment would fail at some point in the future and the contents would be released to the surrounding media.

- That the resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in the tank waste.

- That any contaminant in the septic tank liquid or sludge exceeding RCRA toxicity characteristic concentrations can result in a COC introduction to the surrounding media.

Based on these assumptions, septic tank sludge contaminant concentrations were compared to the FALs to evaluate the potential for the future release of COCs to the environment. Sludge containing a contaminant exceeding a FAL would be considered to be potential source material and would require evaluation of CAAs.

For septic tank liquids, contaminant concentrations were compared to toxicity characteristic action levels to evaluate the potential for the future release of COCs to the environment. Liquid containing a contaminant exceeding a toxicity characteristic action level would be considered to be potential source material and would require evaluation of CAAs.

D.1.5 Exposure Pathway Evaluation

The DQOs stated that site workers would only be exposed to COCs through oral ingestion, inhalation, or dermal contact (absorption) due to exposure to potentially contaminated media (i.e., soil) at the CASs. The results of the CAI showed that all COCs identified at CASs within CAU 151 are localized near the release point and have not migrated more than five feet vertically or laterally. Because COCs were only identified in the soil at Lagoon A (CAS 12-03-01), the only potential exposure pathways would be through worker contact with the contaminated soil. The limited migration demonstrated by the analytical results, elapsed time since the suspected release, and depth to groundwater supports the selection and evaluation of only shallow subsurface contact as the complete exposure pathway. Groundwater is not considered to be a significant exposure pathway.

The septic tank contents at CAS 12-04-01, System #1, containing potential source material have the same exposure pathway and are evaluated in the same way.

D.1.6 Comparison of Site Conditions with Tier 1 Risk-Based Screening Levels

All analytical results from CAU 151 samples were less than corresponding Tier 1 action levels (i.e., PALs) except for those listed in Tables D.1-4 and D.1-5.

D.1.7 Evaluation of Tier 1 Results

For all constituents at all CASs not listed in Tables D.1-4 or D.1-5, the FALs were established as the Tier 1 RBSLs. It was determined that no further action is required for these constituents at these CASs.

D.1.8 Tier 1 Remedial Action Evaluation

It was determined by NNSA/NSO that remediation of the remaining constituents listed in Tables D.1-4 and D.1-5 may not be practical. Therefore, a Tier 2 SSTL will be calculated for these constituents at these CASs.

D.1.8.1 Total Petroleum Hydrocarbons Evaluation

Remediation of TPH-DRO and TPH-GRO in soil samples to Tier 1 action levels is neither practical nor technically feasible due to the discontinuous nature of contamination at the various CASs (e.g., isolated locations under piping or on the surface). Therefore, no actions to remediate any of the sites to Tier 1 action levels for TPH-DRO and TPH-GRO are proposed, and both are elevated to a Tier 2 evaluation.

D.1.8.2 Radionuclide Evaluation

Corrective action alternatives are evaluated in Section 3.4 of the main document for the Cs-137 in septic tank sludge contamination at System #1 of CAS 12-04-01 to Tier 1 action levels. Because the location of this sample is already proposed for a corrective action, a Tier 2 evaluation was not considered necessary. The FAL for Cs-137 is established as the Tier 1 action level shown on Table D.1-3.

Table D.1-4
COPCs Detected in Soil Samples Above PALs
(Page 1 of 2)

Sample No.	Parameter	Chemical Abstracts Service Number	Maximum Reported Value			PAL	Units
			12-03-01	12-04-01, 12-04-02	12-47-01		
151B003	Benzo(a)anthracene	56-55-3	4,000	--	--	2,100	µg/kg
	Benzo(b)fluoranthene	205-99-2	6,700	--	--	2,100	µg/kg
	Benzo(a)pyrene	50-32-8	3,700	--	--	210	µg/kg
	Dibenzo(a,h)anthracene	53-70-3	7,400	--	--	210	µg/kg
151B017	Arsenic	7440-38-2	51	--	--	23	mg/kg
151B018	Arsenic	7440-38-2	58	--	--	23	mg/kg
151B019	Arsenic	7440-38-2	47	--	--	23	mg/kg

Table D.1-4
COPCs Detected in Soil Samples Above PALs
(Page 2 of 2)

Sample No.	Parameter	Chemical Abstracts Service Number	Maximum Reported Value			PAL	Units
			12-03-01	12-04-01, 12-04-02	12-47-01		
151B020	Arsenic	7440-38-2	42	--	--	23	mg/kg
151B022	Arsenic	7440-38-2	29	--	--	23	mg/kg
151C006	TPH-DRO	68334-30-5	--	110	--	100	mg/kg
151D001	TPH-DRO	68334-30-5	--	130	--	100	mg/kg
151F005	Aroclor-1254	11097-69-1	--	--	2,000	740	µg/kg
	Benzo(a)pyrene	50-32-8	--	--	240	210	µg/kg
	TPH-DRO	68334-30-5	--	--	190	100	mg/kg
151F006	Aroclor-1254	11097-69-1	--	--	2,200	740	µg/kg
	Benzo(a)anthracene	56-55-3	--	--	20,000	2,100	µg/kg
	Benzo(a)pyrene	50-32-8	--	--	11,000	210	µg/kg
	Benzo(b)fluoranthene	205-99-2	--	--	13,000	2,100	µg/kg
	Indeno(1,2,3-cd)pyrene	193-39-5	--	--	3,500	2,100	µg/kg
	TPH-DRO	68334-30-5	--	--	190	100	mg/kg

COPC = Contaminant of potential concern
DRO = Diesel-range organics
mg/kg = Milligrams per kilogram
PAL = Preliminary action level
TPH = Total petroleum hydrocarbons
µg/kg = Milligrams per kilogram

-- = No analytical results were above PALs

D.1.9 Tier 2 Evaluation

No additional data were needed to complete a Tier 2 evaluation. For septic tank contents, the same assumptions as discussed in Section D.1.4 also apply to Tier 2 evaluations.

D.1.10 Development of Tier 2 Table of Site-Specific Target Levels

Outdoor industrial soil Tier 2 SSTLs were calculated using site-specific inputs to the standard risk procedures contained in the Risk Assessment Information System (RAIS) (ORNL, 2004) located at http://risk.lsd.ornl.gov/cgi-bin/prg/PRG_search. The Tier 2 SSTLs were developed using the

Table D.1-5
COPCs Detected in Septic Tank Contents Above PALs
(Page 1 of 2)

Sample ID	Parameter												
	Arsenic	Lead	TPH-DRO	TPH-GRO	Aroclor-1254	Aroclor-1260	Aroclor-1268	1,4-dichlorobenzene	Bis(2-ethylhexyl)phthalate	Benzo(a)pyrene	Methylene Chloride	Trichloroethene	Cesium-137
PAL	**23**[a]	**800**[a]	**100**[a]	**100**[a]	**740**[b]	**740**[b]	**740**[b]	**7,900**[b]	**120,000**[b]	**210**[b]	**2,100**[b]	**110**[b]	**12.2**[c]
CAS 12-04-01													
151C510	23	--	1,800	--	--	--	--	--	--	--	--	--	--
151C512	24	--	280	--	--	--	--	12,000	--	--	--	--	--
151C513	--	--	1,900	550	1,200	--	--	35,000	--	--	--	--	--
151C515	--	2,300	6,400	3,000	6,400	--	--	2,300,000	--	--	--	2,000,000	--
151C517	--	2,100	12,000	--	37,000	--	--	16,000	130,000	--	--	590	13.6
151C520	--	--	2,700	--	2,200	--	--	37,000	--	--	--	--	--
151C521	--	1,300	2,600	480	4,700	--	--	530,000	--	--	--	--	--
CAS 12-04-02													
151D507	--	--	610	--	--	--	--	--	--	--	--	--	--
151D508	--	--	1,700	--	--	--	--	71,000	--	--	--	--	--
151D509	--	--	390	--	--	--	--	38,000	--	--	--	--	--
151D513	--	--	390	--	--	--	--	--	--	--	--	--	--
151D514	--	--	260	--	--	--	--	--	--	--	--	--	--
151D510	--	--	1,200	720	--	--	--	1,100,000	--	--	--	--	--

Table D.1-5
COPCs Detected in Septic Tank Contents Above PALs
(Page 2 of 2)

Sample ID	Parameter												
	Arsenic	Lead	TPH-DRO	TPH-GRO	Aroclor-1254	Aroclor-1260	Aroclor-1268	1,4-dichlorobenzene	Bis(2-ethylhexyl)phthalate	Benzo(a)pyrene	Methylene Chloride	Trichloroethene	Cesium-137
PAL	**23[a]**	**800[a]**	**100[a]**	**100[a]**	**740[b]**	**740[b]**	**740[b]**	**7,900[b]**	**120,000[b]**	**210[b]**	**2,100[b]**	**110[b]**	**12.2[c]**
151D520	--	--	1,500	160	--	--	--	140,000	--	--	--	--	--
151D521	--	--	2,000	150	--	--	--	500,000	--	--	100,000	--	--
151D522	--	--	230	--	--	--	--	--	--	--	--	--	--
CAS 12-04-03													
151E502	--	--	970	--	--	--	--	350,000	--	--	--	--	--
151E505	--	--	1,200	240	--	--	--	--	--	--	--	--	--
151E506	--	--	2,800	180	--	--	--	300,000	--	--	--	--	--
151E508	--	--	3,100	--	--	5,300	--	--	--	250	--	--	--
151E510	--	--	1,600	--	--	930	--	27,000	--	--	--	--	--
151E512	--	--	2,900	--	--	--	5,700	--	--	--	--	--	--
151E514	--	--	1,900	--	--	--	2,500	--	--	--	--	--	--

[a] Values are in milligrams per kilogram (mg/kg).
[b] Values are in micrograms per kilogram (µg/kg).
[c] Cesium-137 values are in picocuries per gram (pCi/g).

COPC = Contaminant of potential concern
DRO = Diesel-range organics
GRO = Gasoline-range organics
PAL = Preliminary action level
TPH = Total petroleum hydrocarbons
-- = Not detected above minimum reporting limits

occasional use scenario in accordance with the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006).

The contaminant-specific risk input parameters used in the RAIS calculation are from the RAIS chemical-specific database. These parameters were compiled or derived from information found in the Integrated Risk Information System (EPA, 2005) and Health Effects Assessment Summary Tables (EPA, 1997b). The site-specific input parameters used for these calculations in the following subsections are the "NTS standard" parameter values listed in Table D.1-6 for each exposure scenario.

Table D.1-6
Site-Specific Input Parameters with Proposed NTS Standard Values

Parameter	Definition	Units	EPA Region 9 Default Value	Exposure Scenario		
				Industrial Area	Remote Work Area	Occasional Use Area
ED	Exposure duration	yr	25	25[a]	25[a]	5[b]
EF	Exposure frequency	day/yr	250	225[a]	42[b]	10[b]
IR	Soil ingestion rate	kg/day	0.0001	0.00005[a]	0.00005[a]	0.00005[a]
foc	Fraction organic carbon in soil	g/g	0.006	0.001[c]	0.001[c]	0.001[c]
θ_w	Water-filled soil porosity	cm^3/cm^3	0.15	0.1[d]	0.1[d]	0.1[d]
V	Fraction of vegetative cover	unitless	0.5	0.1[a]	0.2-.06[e]	0.2-.06[e]
TR	Target excess individual lifetime cancer risk	unitless	1E-06	1E-06	1E-05	1E-05

Rationale for non-default input values:
[a]*Exposure Factors Handbook* (EPA/600/P-95/002Fa) (EPA, 1997a)
[b]Based on scenarios defined in Section 3.3.1 of NNSA/NSO, 2006
[c]Estimated value based on reduced total organic carbon content of NTS soils
[d]Estimated value based on reduced soil moisture content of NTS soils
[e]Estimated value based on reduced vegetative cover at NTS

cm^3/cm^3 = Cubic centimeters per cubic centimeterkg/day = Kilograms per day
day/yr = Days per yearyr = Year
g/g = Grams per gram

Chemical-specific toxicity information input parameters can be any one or both of two types: carcinogenic information and systemic toxicity information. Risk-based PRGs are calculated for the dominant characteristic of a contaminant.

D.1.10.1 Evaluation of VOC SSTLs

An outdoor occasional use Tier 2 SSTL was calculated for 1,4-dichlorobenzene, trichloroethene, and methylene chloride for evaluation of septic tank contents as potential source material at CASs 12-04-01, 12-04-02, and 12-04-03, using site-specific inputs to the standard risk procedure as detailed in Section D.1.10. Risk-based PRGs calculated for each VOC are shown in Table D.1-7.

Table D.1-7
Tier 2 Site-Specific Target Levels for COPCs Greater Than PALs

Parameter	Tier 2 SSTL	Maximum Reported Value	Sample ID	Units
1,4-Dichlorobenzene	3,060,000	2,300,000	151C515	µg/kg
Trichloroethene[a]	**5,730**	**2,000,000**	**151C515**	**µg/kg**
Methylene Chloride	1,390,000	100,000	151D521RR1	µg/kg
Benzo(a)anthracene	64,300	20,000	151F006	µg/kg
Benzo(b)fluoranthene	64,700	13,000	151F006	µg/kg
Benzo(a)pyrene[b]	**6,470**	**11,000**	**151F006**	**µg/kg**
Bis(2-ethylhexyl)phthalate	4,960,000	130,000	151C517RR1	µg/kg
Dibenzo(a,h)anthracene	6,470	740	151B003	µg/kg
Indeno(1,2,3-cd)pyrene	64,700	3,500	151F006	µg/kg
Arsenic	**45.1**	**58**	**151B018**	**mg/kg**
Lead[c]	17,079	2,300	151C515	mg/kg
Aroclor-1254 (soil)	27,700	2,200	151F006	µg/kg
Aroclor-1254 (septic tank)	**27,700**	**37,000**	**151C517**	**µg/kg**
Aroclor-1260	28,800	5,300	151E508	µg/kg
Aroclor-1268	28,800	5,700	151E512	µg/kg

[a] Bold type indicates constituent exceeds the Tier 2 SSTL.
[b] Although the maximum value for benzo(a)pyrene is greater than the final action level, it is not considered a contaminant of concern because it is related to asphalt present in the sample (see Appendix A, Section A.6.3).
[c] Adult Lead Methodology (EPA, 2003)

COPC = Contaminant of potential concernQA = Quality assurance
mg/kg = Milligrams per kilogram QC = Quality control
PAL = Preliminary action levelSSTL = Site-specific target level

D.1.10.2 Evaluation of SVOC SSTLs

An outdoor occasional use soil Tier 2 SSTL was calculated for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene at CASs 12-03-01 and 12-47-01, using site-specific inputs to the standard risk procedure as detailed in Section D.1.10. The value for benzo(a)pyrene was also used in evaluation of septic tank contents at CAS 12-04-03. A Tier 2 SSTL was also calculated for bis(2-ethylhexyl)phthalte for evaluation of septic tank contents as potential source material at CAS 12-04-01 by the same method. Risk-based PRGs calculated for each SVOC are shown in Table D.1-7.

D.1.10.3 Evaluation of PCB SSTLs

An outdoor occasional use soil Tier 2 SSTL was calculated for aroclor-1254 at CAS 12-47-01 and for evaluation of septic tank contents at CASs 12-04-01 using site-specific inputs to the standard risk procedure as detailed in Section D.1.10. A Tier 2 SSTL was also calculated for aroclor-1260 and aroclor-1268 for evaluation of septic tank contents as potential source material at CAS 12-04-03 by the same method. Risk-based PRGs were calculated for the detected PCBs based on carcinogenicity and are shown in Table D.1-7.

D.1.10.4 Evaluation of TPH-DRO SSTLs

The individual potentially hazardous constituents in TPH-DRO (benzo(a)anthracene and benzo(a)pyrene) and TPH-GRO (benzene) that exceed their corresponding PAL were compared to corresponding Tier 2 SSTLs to evaluate the need for corrective action for each CAS or septic tank containing TPH-DRO or TPH-GRO at concentrations exceeding the PAL. These SSTLs and the maximum reported level for each diesel or gasoline constituent for CASs where TPH-DRO or TPH-GRO exceeded the PAL are presented in Tables D.1-8 and D.1-9.

D.1.10.5 Evaluation of Metals SSTLs

An outdoor occasional use soil Tier 2 SSTL was calculated for arsenic at CAS 12-03-01 and for evaluation of septic tank contents at CAS 12-04-01 using site-specific inputs to the standard risk procedure as detailed in Section D.1.10. A Tier 2 SSTL was also calculated for lead for evaluation

Table D.1-8
Tier 2 SSTLs and CAU 151 Results for Hazardous Constituents of Diesel and Gasoline in Soils

Common Name	SSTL[a]	Maximum Reported Value[a]		
		12-04-01	12-04-02	12-47-01
1,3,5-Trimethylbenzene	70,000	ND	ND	ND
2-Methylnaphthalene[b]	190,000	ND	ND	ND
Benzo(a)anthracene	64,300	ND	ND	20,000
Benzene	1,400	ND	ND	ND
Benzo(a)pyrene	6,470	ND	ND	11,000[c]
Ethylbenzene	400,000	ND	ND	ND
Naphthalene	190,000	ND	ND	ND
Toluene	520,000	ND	ND	ND
Xylenes[d]	420,000	ND	ND	ND
n-Butylbenzene	240,000	ND	ND	ND
n-Propylbenzene	240,000	ND	ND	ND

[a]All values are in micrograms per kilogram (µg/kg).
[b]Uses PRG for napthalene as surrogate.
[c]Although the maximum value for benzo(a)pyrene is greater than the final action level, it is not considered a contaminant of concern because it is related to asphalt present in the sample (see Appendix A, Section A.6.3).
[d]Total of m-, o-, and p-xylenes.

ND = Nondetect
PRG = Preliminary remediation goal
SSTL = Site-specific target level

of septic tank contents as potential source material at CAS 12-04-01 by the same method. Risk-based PRGs calculated for arsenic are shown in Table D.1-7.

D.1.10.6 Comparison of Site Conditions with Tier 2 SSTLs

The Tier 2 action levels are typically compared to individual sample results from reasonable points of exposure (as opposed to the source areas as is done in Tier 1) on a point-by-point basis. Points of exposure are defined as those locations or areas at which an individual or population may come in contact with a COC originating from a CAS. For CAU 151, the Tier 2 action levels were compared to maximum constituent concentrations from each sample location. The calculated SSTLs for each COPC that exceeded a PAL in Table D.1-4 are listed in Table D.1-7.

Table D.1-9
Tier 2 SSTLs and CAU 151 Results for Hazardous Constituents of Diesel and Gasoline in Septic Tank Contents

Common Name	SSTL[a]	Maximum Reported Value[a]		
		12-04-01	12-04-02	12-04-03
1,3,5-Trimethylbenzene	70,000	990	9	20
2-Methylnaphthalene[b]	190,000	3,000	370	320
Benzo(a)anthracene	64,300	680	240	1,400
Benzene	1,400	340	110	ND
Benzo(a)pyrene	6,470	93	77	250
Ethylbenzene	400,000	74	190	60
Naphthalene	190,000	1,100	ND	960
Toluene	520,000	1,700	1.6	ND
Xylenes[c]	420,000	510	ND	ND
n-Butylbenzene	240,000	720	2.9	1.2
n-Propylbenzene	240,000	290	5.2	ND

[a]All values are in micrograms per kilogram (µg/kg).
[b]Uses PRG for napthalene as surrogate.
[c]Total of m-, o-, and p-xylenes.

ND = Nondetect
PRG = Preliminary remediation goal
SSTL = Site-specific target level

As shown in Table D.1-7, the maximum concentration in soils for all constituents except arsenic and benzo(a)pyrene were less than their corresponding Tier 2 SSTLs. Arsenic concentrations from CAS 12-03-01, Sewage Lagoons, Lagoon A were greater than the corresponding Tier 2 action level. Therefore, arsenic is identified as a COC. The FAL for all constituents listed in Table D.1-7 is established as the Tier 2 SSTL.

Although benzo(a)pyrene is greater than the Tier 2 action level, it is not identified as a COC. This compound, as well as the other detected SVOCs in this sample, has been shown to be a common component of asphalt. Positive detections of these SVOC constituents are likely related to a black material included with the sample. This material is most likely degraded asphalt. There is a crushed asphalt parking area approximately 30 ft upslope from this location.

The constituents trichloroethene and aroclor-1254 in septic tank contents exceeded their Tier 2 SSTLs. Therefore, the sludge in this tank (CAS 12-04-01, System #1, Tank #5) is considered potential source material that poses the potential to introduce COCs to the soils surrounding the tank if released. No other potential source material was identified exceeding Tier 2 SSTLs.

D.1.11 Multiple Constituent Analysis

Because the SVOC contamination at CASs 12-03-01, Lagoon B, and 12-47-01 occurred at the same locations the cumulative affect of these constituents must be evaluated. This is done through a multiple constituent analysis by summing the FAL fractions of each constituent. If the result is less than one, then no risk is indicated. The outcome of this analysis at both CAS 12-03-01 and 12-47-01 resulted in a value less than one, indicating no cumulative risk.

D.1.12 Tier 2 Remedial Action Evaluation

Based on the Tier 2 evaluation of arsenic, the only CAS in CAU 151 that poses an unacceptable risk from a health stand point is CAS 12-03-01, Sewage Lagoons (6), Lagoon A. Concentrations at two locations for arsenic at CAS 12-03-01, Lagoon A, exceed its corresponding CAS-specific Tier 2 SSTL. A corrective action of Clean Closure is not practical for this CAS; therefore, the Tier 2 SSTL is established as the FAL. Arsenic is defined as a COC within Lagoon A, and a corrective action will be proposed.

Based on the Tier 2 evaluation of all other contaminants in soils at all other locations, no further action is required; therefore, the Tier 2 SSTLs are established as the FALs.

Based on the Tier 2 evaluation of septic tank contents, the only septic tank contents that pose an unacceptable risk from a health standpoint are those from System #1 at CAS 12-04-01, Septic Tanks. Concentrations of trichloroethene and aroclor-1254 exceeded their corresponding CAS-specific Tier 2 SSTLs. Because a corrective action of Clean Closure is practical for this CAS, the FALs are established as the Tier 2 SSTLs. Trichloroethene and aroclor-1254 are defined as potential source material within the septic tanks at System #1, and a corrective action will be proposed.

Based on the Tier 2 evaluation of all other contaminants in septic tank contents at each of the three CASs, no further action is required; therefore, the Tier 2 SSTLs are established as the FALs.

As all contaminant FALs were established as Tier 1 or Tier 2 action levels, a Tier 3 evaluation was not considered necessary.

D.2.0 Recommendations

As all of the site contaminant concentrations in soils from the analysis of CAU 151 samples were less than the corresponding FALs at all locations with the exception of CAS 12-03-01, Lagoon A (for arsenic), it was determined that contamination at these locations does not pose a significant risk to human health or the environment and therefore, do not warrant corrective actions. However, this does not preclude the consideration of these sites for additional protective measures that may be implemented as BMPs (i.e., application of an administrative use restriction without monitoring, signs, or physical barriers).

As arsenic was identified above the corresponding FAL (Tier 2 SSTL) at CAS 12-03-01, Lagoon A, it was determined that arsenic is a COC and contamination at this CAS warrants corrective action. A corrective action recommendation of Closure in Place with Administrative Controls will be protective of human health, safety, and the environment. This does not preclude the consideration for other additional protective measures that may be implemented as BMPs.

A conservative evaluation of the contents of septic tanks was performed assuming that the contents might, at some future date, be released to the environment. Analytical results of the tank contents were evaluated to identify contaminants that, if released, could introduce a COC to the environment surrounding the tanks. An evaluation against Tier 1 action levels (PALs) was done using the assumptions specified in Section D.1.4. Any contaminant that exceeded a FAL was identified as a potential source material and will require corrective action.

The above evaluation identified aroclor-1254, trichloroethene, and Cs-137 above their corresponding FALs in septic tank contents at CAS 12-04-01, System #1. These constituents are identified as potential source material at this CAS, and will warrant corrective action. A corrective action recommendation of Clean Closure will be protective of human health, safety, and the environment. This does not preclude the consideration for other additional protective measures that may be implemented as BMPs.

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Appendix E

Project Organization for CAU 151

E.1.0 Project Organization

The NNSA/NSO Federal Project Director is Janet Appenzeller-Wing and her telephone number is (702) 295-0461.

The identification of the project Health and Safety Officer and the Quality Assurance Officers can be found in the appropriate plan. However, personnel are subject to change and it is suggested that the appropriate U.S. Department of Energy Project Manager be contacted for further information. The Task Manager is identified in the FFACO Monthly Activity Report.

Appendix F

Sample Location and Points of Interest Coordinates for CAU 151

F.1.0 Introduction

Sample location coordinates for corrective action investigation sampling were determined using a Trimble 5800 GPS Unit with sub 1-meter accuracy. These coordinates identify the CAU 151 Decision I and Decision II sampling locations (easting and northing positions) and ground surface elevations at CAU 151.

Sampling locations and other points of interest (e.g., manholes) are shown on figures in Sections A.3.0 through A.7.0. Corresponding locations are listed in Table F.1-1.

Table F.1-1
Sample Location Coordinates and Points of Interest for CAU 151
(Page 1 of 6)

Easting (UTM)	Northing (UTM)	Elevation (ft amsl)	Location	Description
CAS 02-05-01				
4110773.3	576812.4	1448.09	A01	Discharge ditch
4110774.0	576824.0	1447.19	A02	Washout pile
4110770.2	576838.2	1446.64	A03	Low spot
CAS 12-03-01				
4117311.4	575573.0	1546.87	B01	Lagoon E inlet
4117315.3	575646.5	1542.48	B02	Lagoon E outlet
4117319.1	575646.4	1542.22	B03	Lagoon E alternate low point
4117350.0	575657.1	1543.32	B04	Lagoon E low point
4117304.1	575665.6	1543.91	B05	Lagoon G inlet
4117289.4	575726.0	1537.51	B06	Lagoon G low point
4117338.4	575748.3	1539.00	B07	Lagoon G outlet
4117092.8	575437.6	1563.58	B08	Distribution box to A & B lagoons
4117125.1	575426.9	1563.14	B09	Lagoon A center
4117099.5	575428.9	1565.01	B10	Lagoon A inlet
4117145.1	575432.5	1562.35	B11	Lagoon A outlet
4117095.3	575457.5	1563.22	B12	Lagoon B inlet
4117122.6	575458.1	1562.53	B13	Lagoon B center
4117140.8	575460.1	1561.55	B14	Lagoon B outlet
4117153.6	575442.0	1560.68	B15	Distribution box to C & D lagoons

Table F.1-1
Sample Location Coordinates and Points of Interest for CAU 151
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Easting (UTM)	Northing (UTM)	Elevation (ft amsl)	Location	Description
4117153.3	575464.2	1560.23	B16	Lagoon D inlet
4117177.2	575464.2	1558.24	B17	Lagoon D center
4117206.1	575476.0	1556.93	B18	Lagoon D outlet
4117157.9	575433.6	1560.65	B19	Lagoon C inlet
4117179.0	575440.0	1559.90	B20	Lagoon C center
4117208.8	575443.7	1558.73	B21	Lagoon C outlet
4117249.2	575421.4	1560.49	B22	Lagoon F inlet
4117264.3	575437.2	1559.13	B23	Lagoon F low point
4117280.5	575472.0	1560.60	B24	Lagoon F outlet
4117056.7	575433.9	1564.22	POI	Modified manhole to A-D lagoons
CAS 12-04-01				
4116615.4	575004.2	1588.81	C01	Tank 1 West (inlet) end
4116615.9	575010.5	1589.71	C02	Tank 1 East (outlet) end
4116612.4	575004.1	1588.54	C03	Tank 2 West (inlet) end
4116612.7	575011.4	1588.99	C04	Tank 2 East (outlet) end
4116610.2	575004.1	1588.99	C05	Tank 3 West (inlet) end
4116610.6	575010.9	1588.80	C06	Tank 3 East (outlet) end
4116607.0	575004.6	1589.98	C07	Tank 4 West (inlet) end
4116607.4	575011.2	1589.63	C08	Tank 4 East (outlet) end
4116663.7	575051.9	1585.75	C09	Tank 5 West (inlet) end
4116661.5	575058.4	1585.18	C10	Tank 5 East (outlet) end
4116660.9	575051.9	1585.49	C11	Tank 6 West (inlet) end
4116658.8	575057.9	1584.78	C12	Tank 6 East (outlet) end
4116614.6	575002.7	1589.41	C13	Tank 1 below inlet pipe
4116615.9	575012.2	1588.21	C14	Tank 1 below outlet pipe
4116612.3	575002.8	1588.88	C15	Tank 2 below inlet pipe
4116612.8	575012.5	1588.81	C16	Tank 2 below outlet pipe
4116609.9	575002.7	1589.22	C17	Tank 3 below inlet pipe
4116610.3	575011.8	1588.23	C18	Tank 3 below outlet pipe
4116606.6	575003.0	1589.28	C19	Tank 4 below inlet pipe
4116607.8	575012.2	1589.08	C20	Tank 4 below outlet pipe
4116664.3	575050.9	1585.94	C21	Tank 5 below inlet pipe

Table F.1-1
Sample Location Coordinates and Points of Interest for CAU 151
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Easting (UTM)	Northing (UTM)	Elevation (ft amsl)	Location	Description
4116661.4	575059.4	1584.39	C22	Tank 5 below outlet pipe
4116661.5	575050.9	1585.42	C23	Tank 6 below inlet pipe
4116658.4	575058.7	1584.91	C24	Tank 6 below outlet pipe
4116613.2	575002.8	1589.60	C25	Below bottom of Tanks 1 & 2 west (inlet) end
4116614.7	575011.4	1589.33	C26	Below bottom of Tanks 1 & 2 east (outlet) end
4116608.1	575003.1	1589.11	C27	Below bottom of Tanks 3 & 4 west (inlet) end
4116608.8	575011.9	1588.51	C28	Below bottom of Tanks 3 & 4 east (outlet) end
4116612.2	574996.2	1589.73	C29	Below bottom of distribution box
4116660.2	575050.1	1585.69	C30	Below bottom of Tank 6 NW corner
4116666.1	575051.6	1585.00	C31	Below bottom of Tank 5 NE corner
4116656.3	575059.1	1585.45	C32	Below bottom of Tank 6 SW corner
4116662.7	575060.9	1584.67	C33	Below bottom of Tank 5 SE corner
4116663.4	575048.4	1585.77	POI	North lower tank set bypass manhole
4116658.4	575063.2	1585.24	POI	South lower tank set bypass manhole
4116849.6	575247.9	1572.58	POI	Distribution box for upper tank set
CAS 12-04-02				
4116852.2	575255.9	1572.64	D01	Tank 1 North (inlet) end
4116847.8	575259.9	1571.44	D02	Tank 1 South (outlet) end
4116850.5	575253.3	1573.03	D03	Tank 2 North (inlet) end
4116845.7	575258.3	1572.93	D04	Tank 2 South (outlet) end
4116848.1	575251.7	1572.85	D05	Tank 3 North (inlet) end
4116843.8	575255.3	1572.77	D06	Tank 3 South (outlet) end
4116846.5	575248.5	1571.62	D07	Tank 4 North (inlet) end
4116842.0	575252.0	1570.89	D08	Tank 4 South (outlet) end
4116844.2	575246.1	1571.92	D09	Tank 5 North (inlet) end
4116839.8	575250.2	1570.87	D10	Tank 5 South (outlet) end
4116842.1	575244.6	1572.18	D11	Tank 6 North (inlet) end
4116837.3	575248.8	1572.14	D12	Tank 6 South (outlet) end
4116853.4	575254.4	1571.34	D13	Tank 1 below inlet pipe
4116846.8	575261.2	1572.11	D14	Tank 1 below outlet pipe
4116851.4	575252.1	1572.82	D15	Tank 2 below inlet pipe
4116844.7	575258.5	1571.97	D16	Tank 2 below outlet pipe

Table F.1-1
Sample Location Coordinates and Points of Interest for CAU 151
(Page 4 of 6)

Easting (UTM)	Northing (UTM)	Elevation (ft amsl)	Location	Description
4116849.1	575250.8	1573.10	D17	Tank 3 below inlet pipe
4116843.0	575256.1	1572.53	D18	Tank 3 below outlet pipe
4116846.9	575248.3	1572.28	D19	Tank 4 below inlet pipe
4116840.2	575254.0	1572.62	D20	Tank 4 below outlet pipe
4116845.1	575245.3	1571.69	D21	Tank 5 below inlet pipe
4116838.8	575251.5	1571.85	D22	Tank 5 below outlet pipe
4116843.3	575242.4	1571.55	D23	Tank 6 below inlet pipe
4116836.9	575249.2	1572.26	D24	Tank 6 below outlet pipe
4116852.5	575252.9	1572.42	D25	Below bottom of Tanks 1 & 2 north (inlet) side
4116846.0	575259.2	1571.63	D26	Below bottom of Tanks 1 & 2 south (outlet) side
4116847.6	575248.0	1572.71	D27	Below bottom of Tank 4 north (inlet) end
4116841.8	575256.9	1572.58	D28	Below bottom of Tank 3 south (outlet) end
4116844.7	575243.5	1571.55	D29	Below bottom of Tanks 5 & 6 north (inlet) side
4116837.2	575250.2	1572.42	D30	Below bottom of Tanks 5 & 6 south (outlet) side
4116853.7	575242.8	1572.41	POI	North bypass manhole
4116839.4	575257.2	1571.43	POI	South bypass manhole
4116611.0	574995.5	1588.57	POI	Distribution box
CAS 12-04-03				
4116644.5	575011.3	1586.16	E01	Tank 4 West (inlet) end
4116644.6	575017.7	1586.91	E02	Tank 4 East (outlet) end
4116641.0	575011.2	1587.15	E03	Tank 3 West (inlet) end
4116641.9	575018.4	1586.95	E04	Tank 3 East (outlet) end
4116638.6	575011.0	1587.19	E05	Tank 2 West (inlet) end
4116638.5	575017.7	1587.05	E06	Tank 2 East (outlet) end
4116635.3	575012.0	1586.87	E07	Tank 1 West (inlet) end
4116635.1	575018.8	1586.94	E08	Tank 1 East (outlet) end
4116644.5	575010.2	1585.66	E09	Tank 4 below inlet pipe
4116644.6	575019.3	1586.47	E10	Tank 4 below outlet pipe
4116640.9	575010.3	1586.85	E11	Tank 3 below inlet pipe
4116641.8	575018.9	1586.32	E12	Tank 3 below outlet pipe
4116638.0	575010.1	1586.42	E13	Tank 2 below inlet pipe
4116638.9	575018.5	1586.88	E14	Tank 2 below outlet pipe

Table F.1-1
Sample Location Coordinates and Points of Interest for CAU 151
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Easting (UTM)	Northing (UTM)	Elevation (ft amsl)	Location	Description
4116635.1	575011.3	1586.18	E15	Tank 1 below inlet pipe
4116635.6	575019.0	1586.86	E16	Tank 1 below outlet pipe
4116643.1	575010.0	1586.25	E17	Below bottom of Tanks 3 & 4 west (inlet) end
4116643.0	575020.3	1586.20	E18	Below bottom of Tanks 3 & 4 east (outlet) end
4116636.6	575010.1	1586.57	E19	Below bottom of Tanks 1 & 2 west (inlet) end
4116636.9	575019.9	1587.31	E20	Below bottom of Tanks 1 & 2 east (outlet) end
4116639.9	575042.3	1586.89	POI	East bypass manhole
4116639.7	575005.9	1588.15	POI	West bypass manhole
CAS 12-47-01				
4116365.6	574879.1	1592.07	F01	New sump southern inlet
4116370.1	574876.6	1593.28	F02	New sump northern inlet
4116359.8	574870.2	1593.14	F03	Old sump est. center
4116364.5	574890.7	1592.31	F04	New sump est. outlet
4116367.6	574899.3	1591.15	F05	New sump est. outlet
4116370.1	574883.3	1593.57	F06	New sump est. center
4116362.7	574876.5	1593.14	POI	End of northern abandoned pipe
4116368.4	574874.8	1593.41	POI	End of southern abandoned pipe
CAS 18-03-01				
4112611.6	565274.9	1746.98	G01	Northern pond below inlet
4112606.6	565268.7	1746.80	G02	Northern pond low point
4112590.2	565275.4	1747.25	G03	Northern pond below east outlet pipe
4112595.3	565262.1	1746.15	G04	Northern pond below west outlet pipe
4112576.4	565272.6	1744.92	G05	Southern pond below east inlet pipe
4112579.3	565259.4	1744.86	G06	Southern pond below west inlet pipe
4112563.6	565254.5	1745.04	G07	Southern pond low point
4112541.6	565259.0	1745.64	G08	Southern pond below outlet channel
4112520.5	565251.1	1747.28	G09	In overflow channel from Pond 2
4112597.2	565285.7	1744.92	G10	Northern pond below southern inlet pipe
4112717.9	565355.3	1749.03	G11	Trunk line displaced pipe
4112720.9	565361.0	1749.97	G12	Approx 15 ft upstream from G11
4112714.5	565346.7	1749.06	G13	Approx 15 ft downstream from G11

Table F.1-1
Sample Location Coordinates and Points of Interest for CAU 151
(Page 6 of 6)

Easting (UTM)	Northing (UTM)	Elevation (ft amsl)	Location	Description
4112917.6	565380.6	1758.31	G14	Below in-filled manhole
4112482.3	565400.8	1748.57	G15	Southern trunk line, crushed pipe
4112474.0	565496.0	1750.49	G16	Lateral to southern trunk line, displaced joint
4112672.2	565315.4	1747.88	G17	Trunk line displaced joint

amsl = Above mean sea level
ft = Foot
UTM = Universal Transverse Mercator, Zone 11, North American Datum (NAD) 1927 (U.S. Western)

Appendix G

Nevada Division of Environmental Protection Comments

(5 Pages)

NEVADA ENVIRONMENTAL RESTORATION PROJECT

DOCUMENT REVIEW SHEET

1. Document Title/Number: Draft Corrective Action Decision Document for Corrective Action Unit 151: Septic Systems and Discharge Area, Nevada Test Site, Nevada	**2. Document Date:** 04/20/2006
3. Revision Number: 0	**4. Originator/Organization:** Stoller-Navarro
5. Responsible NNSA/NV ERP Project Manager: Sabine Curtis	**6. Date Comments Due:** 04/18/2006
7. Review Criteria: Full	
8. Reviewer/Organization/Phone No: Don Elle, NDEP, 486-2850	**9. Reviewer's Signature:**

10. Comment Number/Location	11. Type*	12. Comment	13. Comment Response	14. Accept
1.) Page 38, Section 3.2, Screening Criteria		Since December 2004, NDEP has reviewed approximately seven CADD or CADD/CR documents. These documents have included a process which utilizes selection criteria to evaluate corrective action alternatives, and originates in the Statement of Basis used in RCRA corrective action as referenced in the CADD. The submission of the draft CAU 145 CADD prompted a review of these past documents as well as an online literature search in order to further staff's understanding of the process and to gain confidence in its defensibility. Based on this review, NDEP does not agree with the application of the selection criteria as demonstrated in both CAU 145 and 151 draft CADDs. In Section 3.2, it correctly states that corrective action alternatives are evaluated based on four general standards ("threshold criteria") and five selection factors ("evaluation criteria"). NDEP's current understanding of EPA's original intent is that all proposed alternatives are required to meet all four "threshold criteria" before being considered further. This initial step is not a graded or ranked process, instead being a yes/no decision. Corrective measures alternatives that meet the threshold criteria are then compared and evaluated against the five evaluation criteria to determine the remedy that provides the best relative combination of attributes, including cost effectiveness. This is a ranged or graded process. In this CAU 151 draft CADD, all of the nine criteria are grouped together and ranked/graded, instead of just the five evaluation criteria. NDEP sees this as an incorrect application of the process and requests that the section be	The text in Section 3.2, regarding the evaluation of corrective action alternatives, has been changed based on negotiations between NNSA and NDEP in response to the NDEP comments on the CAU 145 Draft CADD.	

10. Comment Number/Location	11. Type*	12. Comment	13. Comment Response	14. Accept
2.) Page 43, Section 3.4, Evaluation and Comparison of Alternatives		The process of evaluating alternatives presented in this section appears to be very subjective. As presented, the choice of remediation alternative could have been arrived at beforehand, with the table and accompanying narrative being constructed after the fact to support that decision. The text discussion of the corrective action alternatives for each corrective action site (CAS) is cursory at best and lacks sufficient detail to allow a memeber of the public to clearly see why one alternative was chosen over another. NDEP would like to see the standards and decision factors supported more clearly with hard data if possible, in order to improve the defensibility of the corrective action decisions. This information may already exist within the document, however as presented it is not utilized in its best possible manner to support the proposed alternative.	The text in Section 3.4 and Tables 3.2 and 3.3, regarding the comparison and selection of corrective action alternatives, have been changed based on negotiations between NNSA and NDEP in response to the NDEP comments on the CAU 145 Draft CADD.	

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10. Comment Number/Location	11. Type*	12. Comment	13. Comment Response	14. Accept
3.) Appendix A, Page A-64, 2nd Paragraph, 1st Sentence		"Trichloroethene was detected in sludge above the FAL of 5,730 ug/kg in the inlet chamber of one tank (CAS 12-04-01, System #1, Tank #5)." Although trichloroethene and its result are referenced in Table 2-3 in the main text, for consistency list them in the relevent table in this Appendix.	The section has been re-written and a table has been added to provide consistency between this Appendix A section (A.5.2.2) and the main document. The added table A.5-5 (Sample Results for VOCs Detected above PALs in Septic Tanks for CASs 12-04-01, 12-04-02, and 12-04-03) presents the VOC results above PALs and comparison to FALs. The trichloroethene information commented on is included in the table, along with the other septic tank VOC results. Specifically, the last three paragraphs of Section A.5.2.1 have been replaced with, "Analytical results for VOCs detected above MDCs in samples collected of septic tank contents are presented in Section A.8.0 on an individual tank basis. In the septic tanks three contaminants (1,4-dichlorobenzene, methylene chloride, and trichloroethene) were detected above PALs. 1, 4-dicholorobenzene was detected above the PAL of 7,900 ug/kg in sludge samples in at least one chamber of almost every tank at the three CASs, but all concentrations were below the FAL of 3,060,000 ug/kg. Methylene chloride was detected above the PAL of 21,000 ug/kg in the outlet chamber of one tank (CAS 12-04-02, System #5, Tank #5), but the concentration was below the FAL of 1,390,000. The only VOC that prompted the identification of the sludge as potential source material was trichloroethene, as it was detected in sludge above the FAL of 5,730 ug/kg in the inlet chamber of one tank (CAS 12-04-01, System #1, Tank #5). These results are presented in Table A.5-6."	

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10. Comment Number/Location	11. Type*	12. Comment	13. Comment Response	14. Accept
4.) Appendix A, Page A-72, 1st Paragraph, Last Sentence		"Only the Aroclor 1254 in System #1, at CAS 12-04-01 exceeded the FAL,..." Although Aroclor 1254 and its result are referenced in Table 2-3 in the main text, for consistency list them in the relevant table in this Appendix.	The section has been re-written and a table has been added to provide consistency between this Appendix A section (A.5.2.5) and the main document. The added table A.5-17 (Sample Results for PCBs Detected above PALs in Septic Tanks for CASs 12-04-01 and 12-04-03) presents the PCB results above PALs and comparison to FALs. The aroclor-1254 information commented on is included in the table, along with the other septic tank PCB results. Specifically, the last paragraph of Section A.5.2.5 has been replaced with, "Analytical results for PCBs detected above MDCs in samples collected of septic tank contents are presented in Section A.8.0 on an individual tank basis. In the septic tanks three PCBs (aroclor-1254, aroclor-1260, and aroclor-1268) were detected above respective PALs in sludge samples in seven chambers of four tanks at CASs 12-04-01, 12-04-02, and 12-04-03. The only PCB that prompted the identification of the sludge as potential source material was arochlor-1254, as it was detected in sludge above the FAL of 27,700 ug/kg in the outlet chamber of one tank (CAS 12-04-01, System #1, Tank #5). These results are presented in Table A.5-17."	
5.) Appendix A, Page A-90, 1st Paragraph, Third to Last Sentence		"A breach in the east line was noted at approximately 100 ft." This is an active sewage line and NNSA must report this to Nevada State Health Division, if this has not yet been done.	The M&O Contractor investigated the issue and has determined that the break is in a sewer line leading to an active septic system. In this case, there are no requirements to notify the state. Building 12-910 is the only structure connected to this tank, and it has not been used for about two years. When the septic tank was permitted in 2004, the system including the sewer pipe operated properly. Since then, the pipe appears to have caved in. The M&O Contractor intends to fix the sewer line before using the septic system.	

NEVADA ENVIRONMENTAL RESTORATION PROJECT

DOCUMENT REVIEW SHEET

10. Comment Number/Location	11. Type*	12. Comment	13. Comment Response	14. Accept
6.) Appendix A, Page A-107, 1st Paragraph, 5th Sentence		"This confirmation will allow for the inclusion of CAS 18-99-09 into CAS 18-03-01." This is incorrect as NNSA has never discussed this with NDEP, and NDEP never approved it.	Accepted. The term "inclusion" is misleading and wasn't intended to imply an FFACO change. To be consistent with the remainder of the document the sentence "This confirmation will allow for the inclusion of CAS 18-99-09 into CAS 18-03-01" has been deleted and replaced with "During the CAI, it was confirmed that this pipe served the U.S. Geological Survey (USGS) trailers (CAS 18-03-01). Activities performed at CAS 18-99-09 were sufficient to meet the DQO requirements."	
7.) Appendix B, Page B-17, 1st Paragraph, 1st and 2nd Sentences		CAS 12-04-10 is cited in both sentences. There is no such CAS. These should be CAS 12-04-01.	Accepted. The CAS name has been changed to 12-04-01.	
8.) Appendix D, Page D-6, 1st Paragraph		There is no statement about the TPH-DRO, TPH-GRO, trichloroethene, aroclor 1254, or the Cs-137 in the sludge of tank #5 in CAS 12-04-01 exceeding the FALs, only the statement concerning "Potential source material." Add a statement to this effect.	Accepted in part. Text has been added after the third sentence to read,"Potential source material was identified because one of the two septic tanks of CAS 12-04-01, System #1, contains polychlorinated biphenyls (aroclor-1254), trichloroethene, and Cesium-137 above FALs in the sludge. Also, both CAS 12-04-01, System #1 tanks contain trichlorothene and 1,4-dichlorobenzene above Resource Conservation and Recovery Act toxicity characteristic limits." No changes to the text regarding the TPH. Based on the Tier 2 evaluation, the hazardous constituents of TPH-DRO and TPH-GRO did not exceed the FALs; therefore, TPH-DRO and TPH-GRO are not considered as potential source material.	
9.) Appendix D, Page D-7, Table D.1-1		In the table header, the second column is "CAS No." Add something here to designate it as a RCRA Chemical Abstracts Service Number rather than confusing it with a "Corrective Action Site" number.	"Chemical Abstracts Service Number" has been added to the Table D.1-1 column header in place of "CAS No.".	

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