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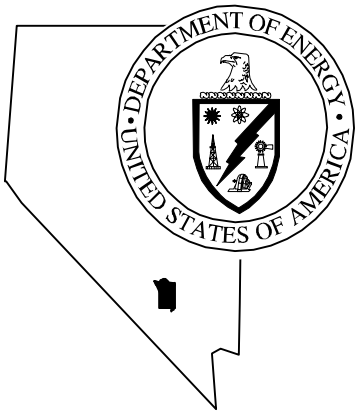

Corrective Action Decision Document for Corrective Action Unit 340: Pesticide Release Sites, Nevada Test Site, Nevada

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CORRECTIVE ACTION DECISION DOCUMENT FOR CORRECTIVE ACTION UNIT 340: PESTICIDE RELEASE SITES, NEVADA TEST SITE, NEVADA

DOE Nevada Operations Office
Las Vegas, Nevada

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CORRECTIVE ACTION DECISION DOCUMENT
FOR CORRECTIVE ACTION UNIT 340:
PESTICIDE RELEASE SITES,
NEVADA TEST SITE, NEVADA

Approved by: Signature on file Date: 11/19/98

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List of Acronyms and Abbreviations

bgs	Below ground surface
CADD	Corrective Action Decision Document
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
CFR	*Code of Federal Regulations*
CLP	Contract Laboratory Program
cm	Centimeter(s)
COC	Contaminant(s) of concern
COPC	Contaminant(s) of potential concern
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethylene
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DQO	Data Quality Objective(s)
EPA	U.S. Environmental Protection Agency
FFACO	*Federal Facility Agreement and Consent Order*
ft	Foot (feet)
ft^2	Square foot (feet)
ICP	Inductively coupled plasma
IDW	Investigation-derived waste
in.	Inch(es)
km	Kilometer(s)
LCS	Laboratory control sample(s)
m	Meter(s)
m^2	Square meter(s)
MEK	Methylethyl ketone

List of Acronyms and Abbreviations *(Continued)*

mi	Mile(s)
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per liter
MS/MSD	Matrix spike/matrix spike duplicate
NAC	*Nevada Administrative Code*
NDEP	Nevada Division of Environmental Protection
NIST	National Institute for Standards and Technology
NTS	Nevada Test Site
PAL	Preliminary action level(s)
ppb	Part(s) per billion
ppm	Part(s) per million
PRG	Preliminary Remediation Goals
PVC	Polyvinyl chloride
QA	Quality Assurance
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	*Resource Conservation and Recovery Act*
RPD	Relative percent difference
SDG	Sample delivery group
SVOC	Semivolatile organic compound(s)
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total petroleum hydrocarbons
VOC	Volatile organic compound(s)
µg/kg	Microgram(s) per kilogram
%R	Percent recovery

Executive Summary

This Corrective Action Decision Document has been prepared for Corrective Action Unit 340, the NTS Pesticide Release Sites, in accordance with the *Federal Facility Agreement and Consent Order* of 1996 (FFACO, 1996). Corrective Action Unit 340 is located at the Nevada Test Site, Nevada, and is comprised of the following Corrective Action Sites:

- 23-21-01, Area 23 Quonset Hut 800 Pesticide Release Ditch
- 23-18-03, Area 23 Skid Huts Pesticide Storage
- 15-18-02, Area 15 Quonset Hut 15-11 Pesticide Storage

The purpose of this Corrective Action Decision Document is to identify and provide a rationale for the selection of a recommended corrective action alternative for each Corrective Action Site.

The scope of this Corrective Action Decision Document consists of the following tasks:

- Develop corrective action objectives.
- Identify corrective action alternative screening criteria.
- Develop corrective action alternatives.
- Perform detailed and comparative evaluations of the corrective action alternatives in relation to the corrective action objectives and screening criteria.
- Recommend and justify a preferred corrective action alternative for each Corrective Action Site.

A corrective action investigation was performed in 1998 as set forth in the *Corrective Action Investigation Plan for Corrective Action Unit 340: Pesticide Release Sites, Nevada Test Site, Nye County, Nevada* (DOE/NV, 1998). Pesticide (primarily Chlordane) contamination exceeding preliminary action levels was discovered in the upper 0.6 meters (2 feet) of soil at the two Corrective Action Sites located in Area 23. Similar contamination was also discovered in the upper 0.3 meters (1 foot) of soil in sections of the disturbed area between these two Corrective Action Sites (Table ES-1). The disturbed area was not originally identified as part of the corrective action investigation. Unknown hydrocarbons were detected at concentrations exceeding 100 milligrams per kilogram and were associated with elevated pesticide concentrations at both the Quonset Hut 800 and Skid Huts sites. Grading operations at the Quonset Hut 800 and Skid Huts sites are believed to be

responsible for spreading the contaminants from the Corrective Action Sites to the surrounding area. Due to the proximity and similarity of the disturbed area to the Area 23 Corrective Action Sites, the disturbed area will be addressed in this Corrective Action Decision Document along with the original three Corrective Action Sites. No corrective action is necessary at Area 15 Quonset Hut 15-11 because no contaminants of concern were identified at this Corrective Action Site. Details regarding the investigation can be found in Appendix A of this document. The results of the investigation indicated that contamination is present at locations shown in Figure 2-1.

Table ES-1
Locations of Contaminants of Concern

Corrective Action Site	Investigation Results	
	No Contaminants of Concern Present	Contaminants of Concern Present
23-21-01, Area 23 Quonset Hut 800 Pesticide Release Ditch		X
23-18-03, Area 23 Skid Huts Pesticide Storage		X
15-18-02, Area 15 Quonset Hut 15-11 Pesticide Storage	X	
Drainage ditch adjacent (northeast) of the Quonset Hut 800 ditch		X
Area immediately adjacent (north, west, south) to the Skid Huts site		X
Flood control channel adjacent to the Skid Huts site	X	
Outfall area immediately south of Quonset Hut 800 ditch		X

Based on the potential exposure pathways, the following corrective action objectives have been identified for Corrective Action Unit 340:

- Prevent or mitigate exposure to surface and near-surface soil containing pesticides at concentrations greater than the contaminant specific preliminary action levels identified in the *Corrective Action Investigation Plan for Corrective Action Unit 340: Pesticide Release Sites, Nevada Test Site, Nye County, Nevada* (DOE/NV, 1998).

- Prevent spread of contaminants of concern beyond the corrective action sites.
- Prevent adverse impacts to groundwater quality.

Based on the review of existing data, future use, and current operations at the Nevada Test Site, the following alternatives were developed for consideration at the Pesticide Release Sites:

- Alternative 1 - No Further Action
- Alternative 2 - Clean Closure by Excavation and Disposal
- Alternative 3 - Closure in Place by Protective Cover

The corrective action alternatives were evaluated based on four general corrective action standards and five remedy selection decision factors. Based on the results of this evaluation, the preferred alternative for Corrective Action Unit 340 is Alternative 2, Clean Closure by Excavation and Disposal.

The preferred corrective action alternative was evaluated on technical merit, focusing on performance, reliability, feasibility, and safety. The alternative was judged to meet all requirements for the technical components evaluated. The alternative meets all applicable state and federal regulations for closure of the site and will eliminate potential future exposure pathways to the contaminated soils at the Pesticide Release Sites.

During corrective action implementation, this alternative will present a potential threat to site workers who come in contact with the contaminated soil. However, procedures will be developed and implemented to ensure worker health and safety.

1.0 Introduction

This Corrective Action Decision Document (CADD) has been prepared for Corrective Action Unit (CAU) 340, Pesticide Release Sites, in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) of 1996 that was agreed to by the U.S. Department of Energy, Nevada Operations Office (DOE/NV); the Nevada Division of Environmental Protection (NDEP); and the U.S. Department of Defense (FFACO, 1996). The CADD provides or references the specific information necessary to recommend corrective actions for the Corrective Action Sites (CASs) within CAU 340, which include the following:

- 23-21-01; Area 23 Quonset Hut 800 Pesticide Release Ditch (Q800)
- 23-18-03; Area 23 Skid Huts Pesticide Storage (Skid Huts)
- 15-18-02; Area 15 Quonset Hut 15-11 Pesticide Storage (Q15-11)

Investigation activities identified an area of concern not included in the original CAS investigation areas. This area is defined by the disturbed soil located between the Q800 and Skid Huts sites. This area is addressed in this CADD along with the CASs mentioned above.

Corrective Action Unit 340 is located at the Nevada Test Site (NTS) in Nevada. The NTS is approximately 105 kilometers (km) (65 miles [mi]) northwest of Las Vegas, Nevada (Figure 1-1 and Figure 1-2).

1.1 Purpose

This CADD identifies and provides a rationale for the selection of a recommended corrective action alternative for each CAS within the CAU. The need for evaluation of corrective action alternatives is based on process knowledge and the results of investigative activities conducted in accordance with the *Corrective Action Investigation Plan for Corrective Action Unit 340: Pesticide Release Sites, Nevada Test Site, Nye County, Nevada* (CAIP) (DOE/NV, 1998).

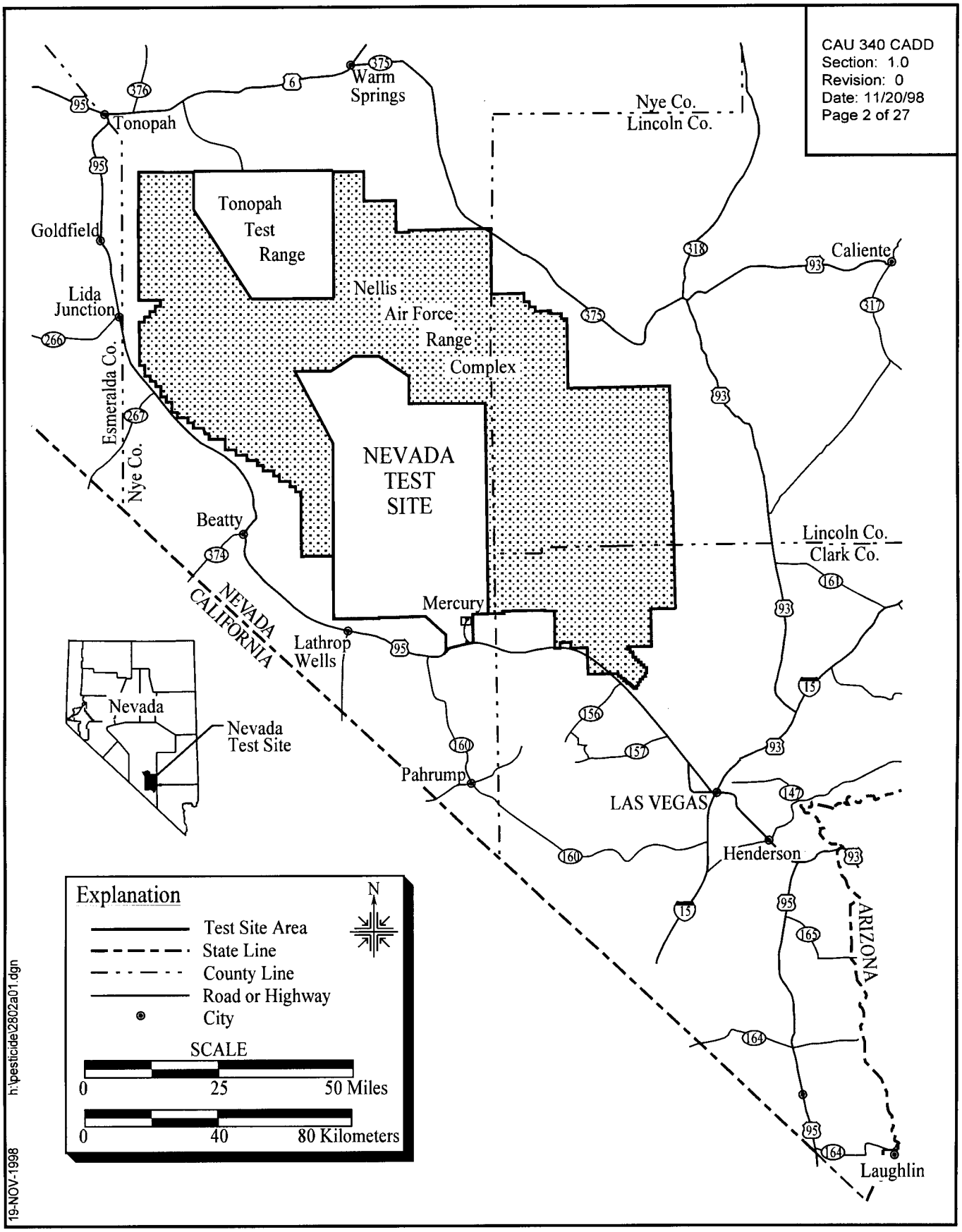
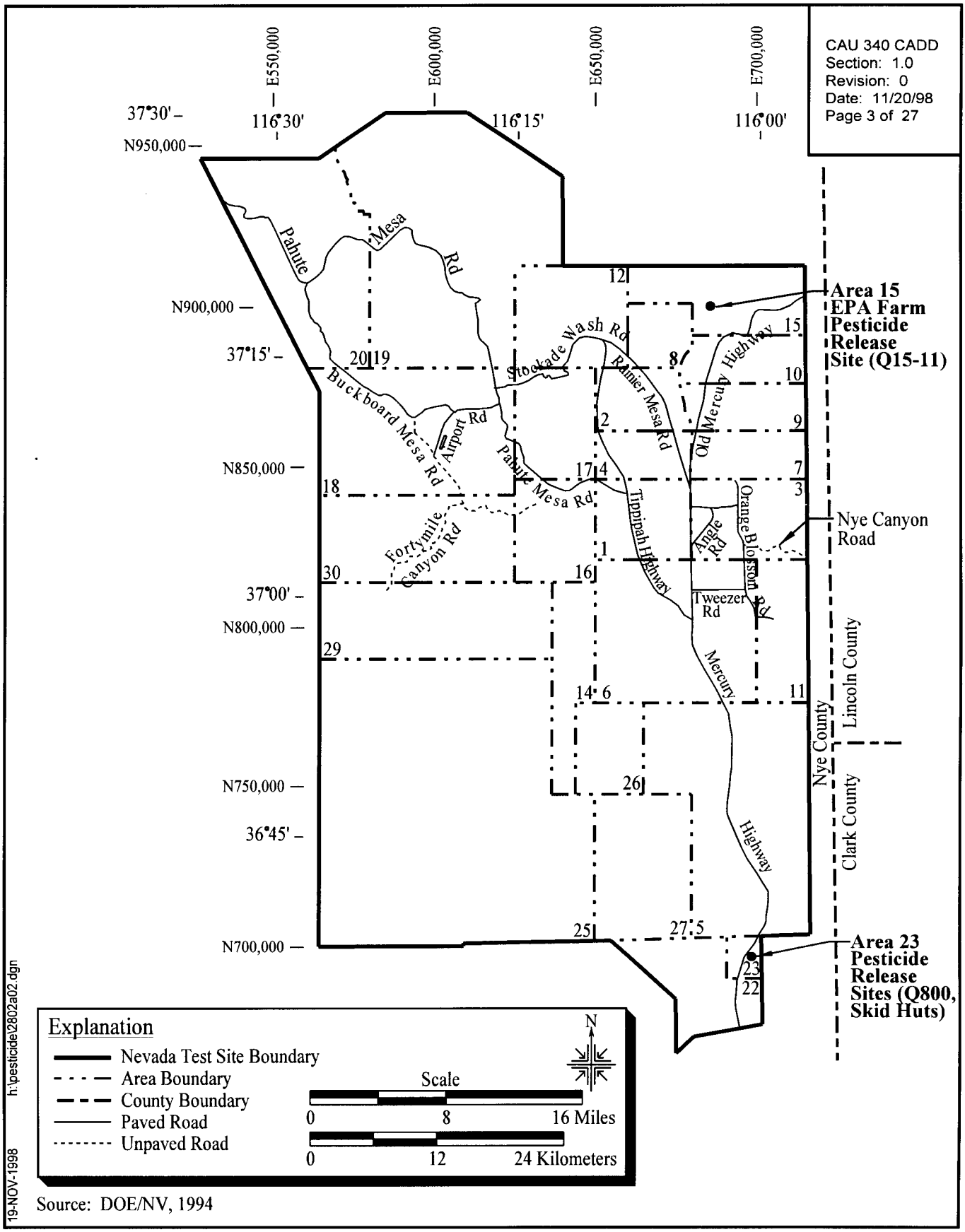


Figure 1-1
Nevada Test Site



Source: DOE/NV, 1994

Figure 1-2
General Location of the Area 23 and Area 15 Pesticide Release Sites

1.2 Scope

The scope of this CADD consists of the following:

- Develop corrective action objectives.
- Identify corrective action alternative screening criteria.
- Develop corrective action alternatives.
- Perform detailed and comparative evaluations of corrective action alternatives in relation to corrective action objectives and screening criteria.
- Recommend and justify a preferred corrective action alternative for each CAS within the CAU and the disturbed area between the Q800 and Skid Huts sites.

1.3 CADD Contents

This CADD is divided into the following sections:

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: documents steps taken to determine a preferred corrective action alternative.

Section 4.0 - Recommended Alternative: presents the preferred corrective action alternative and the rationale for its selection based on the corrective action objectives and alternative screening criteria.

Section 5.0 - References: provides a list of all referenced documents.

Appendix A: *Corrective Action Investigation Report for CAU 340: Pesticide Release Sites, Nevada Test Site, Nevada.*

Appendix B: Cost estimates.

All work was performed in accordance with the following documents:

- CAIP (DOE/NV, 1998)
- *Industrial Sites Quality Assurance Project Plan* (DOE/NV, 1996)
- FFACO (FFACO, 1996)
- *Project Management Plan* (DOE/NV, 1994)

2.0 Corrective Action Investigation Summary

The following sections describe and summarize the results of the investigation activities conducted at CAU 340. For detailed investigation results, please refer to Appendix A.

2.1 Investigation Activities

From March 23, 1998 through April 10, 1998, corrective action investigation activities were performed as set forth in the CAIP (DOE/NV, 1998). The purpose of the investigation was to:

- Identify the presence and nature of contaminants of potential concern (COPCs) at the CAU.
- Determine the vertical and lateral extent of COPCs.
- Provide sufficient information and sample analytical data from which corrective action alternatives may be developed and evaluated in this CADD for the CAU.
- Obtain sufficient sample analytical data for management of investigation-derived waste (IDW).

The investigation activities were conducted in two stages. The activities for each stage are summarized below:

Stage I

- Collected 23 surface/near-surface soil samples from 23 locations at Q800 using hand tools. These samples were collected from 0 to 0.3 meters (m) (0 to 1 feet [ft]) and submitted for laboratory analysis.
- Collected 18 surface and near-surface soil samples from 13 locations at Skid Huts using hand tools. These samples were collected at depths ranging from 0 to 0.6 m (0 to 2 ft) and submitted for laboratory analysis.
- Removed the plywood flooring from the Q15-11 quonset hut. Four plywood samples were collected for waste characterization purposes only and analyzed off site for leachable pesticides only.
- Collected eight surface/near-surface soil samples from seven locations at Q15-11 using hand tools. These samples were collected from 0 to 0.3 m (0 to 1 ft) and submitted for laboratory analysis.

- Field-screened soil samples for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), Chlordane, dichlorodiphenyltrichloroethylene (DDT), and alpha/beta emitters.

- Analyzed soil samples for total VOCs; total semivolatile organic compounds (SVOCs); total and leachable *Resource Conservation and Recovery Act* (RCRA) metals; total and leachable pesticides; total herbicides; TPH as diesel/waste oil (only Q800 samples were analyzed for waste oil); TPH as gasoline; and radioactive isotopes by gamma spectroscopy (approximately 10 percent of the samples submitted were analyzed by gamma spectroscopy).

- Evaluated soil sample analytical results from Stage I to guide soil sampling conducted in Stage II.

Stage II

- At Q800, collected 49 surface and near-surface soil samples from 13 locations at depths ranging from 0.3 to 1.2 m (1.0 to 4.0 ft) using the direct-push method. Twenty-two of these samples were analyzed. The remaining 27 samples were archived and not analyzed because adequate samples had been obtained from similar horizons during Stage I sampling.

- At Skid Huts, collected 10 surface and near-surface soil samples from three locations at depths ranging from 0 to 1.2 m (0 to 4.0 ft) using the direct-push method. Six of these samples were analyzed. The remaining four samples were not analyzed because sufficient samples were collected at similar horizons during the Stage I sampling.

- No activities were conducted at Q15-11 in Stage II.

- Soil samples submitted to an off-site laboratory were analyzed for total RCRA metals; total pesticides; total herbicides; total VOCs; and total SVOCs (at Q800, only samples Q230033C through Q230036C and Q230036D were analyzed for total VOCs and total SVOCs).

Additional soil sampling was conducted on May 27, 1998, using the direct-push method in the disturbed area between the Q800 and Skid Huts sites. Thirty-four soil samples were collected from 17 locations at intervals from 0.0 to 0.3 m (0.0 to 1.0 ft) below ground surface (bgs) and 0.3 to 0.6 m (1.0 to 2.0 ft) bgs. These samples were submitted to an off-site laboratory and analyzed for total RCRA metals, total pesticides, and total herbicides.

A portion of the total pesticides and total herbicides results from the samples collected during the sampling events mentioned above were rejected during the Tier II data evaluation process. These rejected results affected the corrective action alternative selection process. Sampling activities were

conducted in September 1998 to collect data which were used to resolve the inconsistencies posed by the rejected results.

2.2 Results

The corrective action investigation analytical results indicated the following:

- All total VOC, total SVOC, leachable RCRA metals, and total herbicides results were below the preliminary action levels (PALs) outlined in the CAIP (DOE/NV, 1998).

- Total petroleum hydrocarbon concentrations did not exceed the NDEP action level of 100 milligrams per kilogram (mg/kg) for diesel, gasoline, or waste oil ranges. Unknown hydrocarbons were detected at concentrations exceeding 100 mg/kg. These were associated with elevated pesticide concentrations at both the Q800 and Skid Huts sites.

- Reported levels for all total RCRA metal samples (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) were below the PALs established in the CAIP (DOE/NV, 1998) except for arsenic. Arsenic was detected above the PAL of 2.4 mg/kg in most of the samples analyzed. The arsenic concentrations for the samples analyzed ranged from 3.3 to 12.6 mg/kg with one exception, sample Q230035C had the highest arsenic concentration of 30.6 mg/kg. Although these concentrations exceed the PAL for arsenic, these concentrations are not unusual for the State of Nevada (Shacklette and Boerngen, 1984); therefore, these concentrations do not imply contamination and arsenic is not a contaminant of concern (COC).

- All total pesticides results were below the PALs outlined in the CAIP (DOE/NV, 1998) at the Q15-11 site.

- Twenty of the total pesticides results from the Q800 site were determined to exceed the PALs outlined in the CAIP (DOE/NV, 1998). Analysis of the Skid Huts site samples yielded 15 samples with concentrations greater than PALs. Seven samples collected from the disturbed area between the Q800 and Skid Huts sites contained pesticide concentrations exceeding PALs.

- Using the Toxicity Characteristic Leaching Procedures (TCLP), 0.121 milligrams per liter (mg/L) and 0.03 mg/L leachable Chlordane were detected in sample numbers SKH0010A and SKH0010B respectively (Note: concentrations are the sum of the reported alpha- and gamma-Chlordane isomers). Sample SKH0010A was obtained from 0.0 to 0.3 m (0.0 to 1.0 ft) in an area of prominent staining. Sample SKH0010B was obtained from 0.3 to 0.6 m (1.0 to 2.0 ft) directly below sample SKH0010A. All other sample leachable concentrations were not detected or were within the maximum allowable concentrations for the toxicity characteristic; therefore, the extent of characteristic hazardous waste is considered to be limited to the stained area.

- Radiological results were not distinguishable from background concentrations identified in the CAIP (DOE/NV, 1998).

Details of the methods used and results found during the investigation are presented in Appendix A. Based on these results, the nature and extent of COCs at CAU 340 (see Figure 2-1) have been adequately identified to develop and evaluate corrective action alternatives.

2.3 Need for Corrective Action

Analytes detected during the corrective action investigation were evaluated against PALs to determine COCs for CAU 340. Pesticides (4,4'-dichlorodiphenyldichloroethane [DDD], 4,4'-dichlorodiphenyldichloroethylene [DDE], 4,4'-DDT, Chlordane, Aldrin, Dieldrin, Heptachlor, and/or Heptachlor Epoxide) were detected at Q800, Skid Huts, and the disturbed areas between the two CASs at concentrations exceeding PALs. Unknown hydrocarbons were detected at concentrations exceeding the PAL of 100 mg/kg at the Q800 and Skid Huts sites. No other COCs were identified above PALs at these sites. Based on the identification of COCs above PALs in these areas, potential corrective action alternatives are identified and evaluated in this CADD to ensure worker, public, and environmental protection against potential exposure to COCs in accordance with *Nevada Administrative Code* (NAC) 445A (NAC, 1996b).

No corrective action is necessary at Q15-11 because no COCs were identified.

The estimated volume of impacted soil is 1,885 cubic meters (2,466 cubic yards). At the Q800 and Skid Huts CASs, contamination extends to a maximum of 0.6 m (2.0 ft) vertically and completely across the CASs laterally. Contamination between the CASs extends to 0.3 m (1.0 ft) vertically and laterally across the drainage ditch adjacent (northeast) of the Q800 ditch and the area adjacent (north, west, south) to the Skid Huts site. No contamination was detected in the flood control channel with the exception of the outfall area immediately south of the Q800 ditch. The outfall area contamination does not exceed 0.3 m (1.0 ft) vertically.

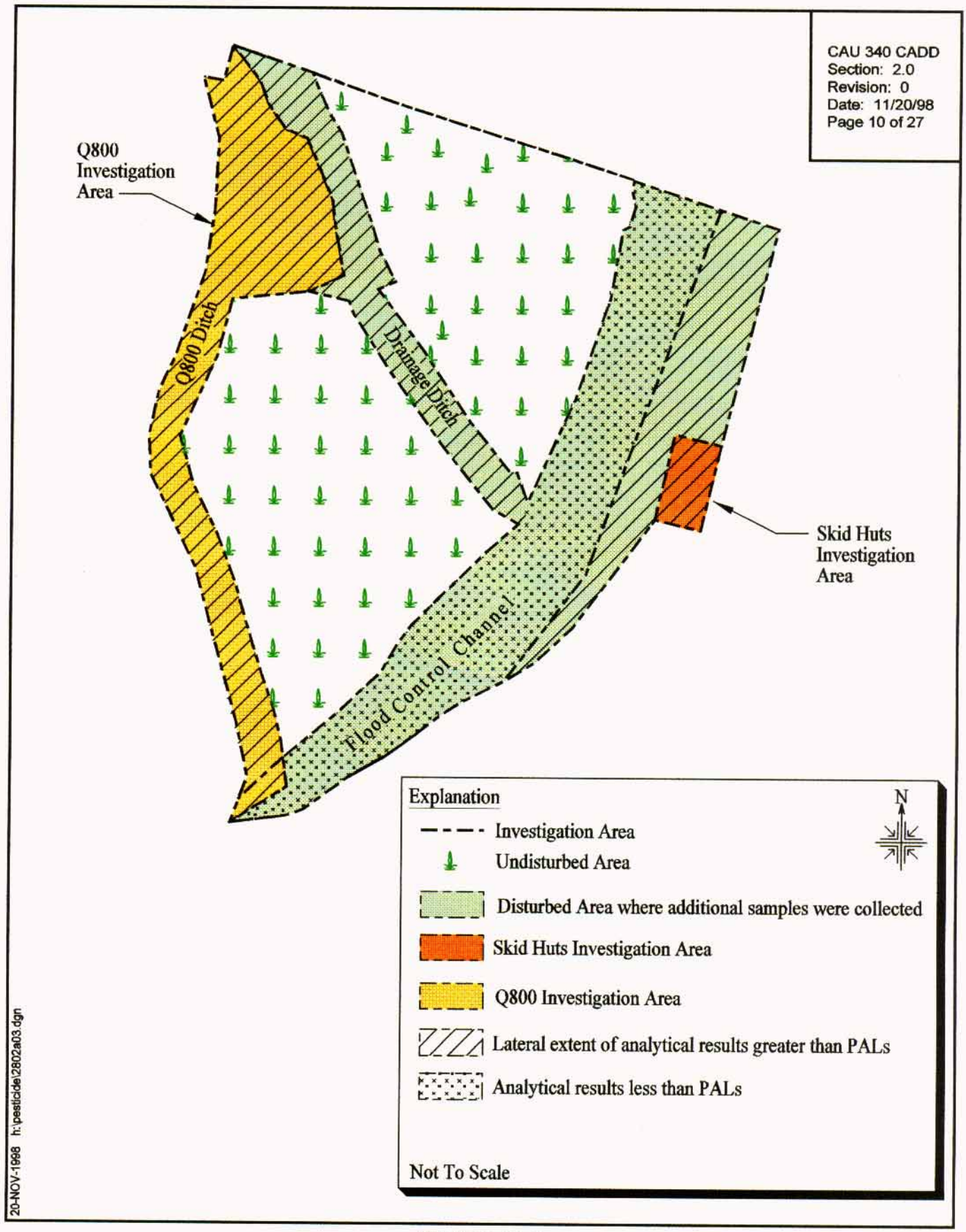


Figure 2-1
Approximate Lateral Extent of Contamination at the Area 23 Pesticide Release Sites, Nevada Test Site

Site-specific characteristics which may constrain remediation include the following:

- Ongoing activities in the surrounding areas.
- Restrictions on modification of the storm channel in the disturbed area between the Q800 and Skid Huts sites.

3.0 Evaluation of Alternatives

The purpose of this section is to present the corrective action objectives for CAU 340, describe the general standards and decision factors used to screen the corrective action alternatives, and develop and evaluate a set of corrective action alternatives that could be used to meet the corrective action objectives.

3.1 Corrective Action Objectives

The corrective action objectives are media-specific goals for protecting human health and the environment. Based on the potential exposure pathways (see Section 3.1.2), the following corrective action objectives have been identified for CAU 340:

- Prevent or mitigate exposure to surface and near-surface soil containing COCs at concentrations exceeding PALs as defined in the CAIP (DOE/NV, 1998).
- Prevent spread of COCs beyond the CAU.
- Prevent adverse impacts to groundwater quality.

3.1.1 Contaminants of Concern

Contaminants of potential concern were determined in the Data Quality Objective (DQO) process as listed in the CAIP (DOE/NV, 1998). Analytical results obtained from the corrective action investigation were evaluated to determine if COPCs were detected above PALs, and would therefore be COCs for CAU 340 that must be addressed by corrective action. Based on the results of this evaluation, pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Chlordane, Aldrin, Dieldrin, Heptachlor, and/or Heptachlor Epoxide) were identified as COCs for the Q800 and Skid Huts CASs as well as for portions of the disturbed area between the two CASs. Total petroleum hydrocarbons (as unknown hydrocarbons) were also identified as COCs for the Q800 and Skid Huts sites. No other COCs were identified.

3.1.2 Potential Exposure Pathways

As identified in the CAIP, the future use for the CAU is assumed to be similar to current use (industrial). As part of the CAIP (DOE/NV, 1998), a conceptual model for CAU 340 was developed which identified the potential exposure mechanism as disturbance of contaminated soil by site workers. This implies a potential exposure pathway through ingestion of, inhalation of, and dermal contact with contaminated soil under industrial scenarios. Site workers could potentially be exposed to contaminated soil during grading activities associated with flood control and general maintenance or through construction and maintenance of underground utilities. Threatened desert tortoises could also potentially be exposed to contaminated soil through burrowing. The depth to groundwater at the Q800 and Skid Huts sites is approximately 240 to 340 m (800 to 1,100 ft) bgs (Winograd and Thordarson, 1975; Robie et al., 1995). Therefore, contaminant migration to groundwater is not considered to be an exposure pathway.

3.2 Screening Criteria

The screening criteria used to evaluate and select the preferred corrective action alternatives are identified in the U.S. Environmental Protection Agency (EPA) *Guidance on RCRA Corrective Action Decision Documents* (EPA, 1991) and the *Final RCRA Corrective Action Plan* (EPA, 1994).

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

The general corrective action standards are:

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

The remedy selection decision factors are:

- 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 corrective action alternatives:

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 protective measures that are needed. These measures may or may not be directly related to media cleanup, source control, or management of wastes. The corrective action alternatives are evaluated for the ability to meet corrective action objectives as defined in Section 3.1.

Compliance with Media Cleanup Standards

Each corrective action alternative must have the ability to meet the proposed media cleanup standards as set forth in applicable state and federal regulations and as specified in the CAIP (DOE/NV, 1998). For this CAU, the EPA's Region 9 Preliminary Remediation Goals, which are derived from the Integrated Risk Information System, are the basis for establishing the PALs for chemical contaminants under NAC 445A.2272 (NAC, 1996b).

Control the Source(s) of the Release

An objective of a corrective action remedy is 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 corrective action alternative must use an effective source control program to ensure the long-term effectiveness and protectiveness of the corrective action.

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

During implementation of any corrective action alternative, all waste management activities must be conducted in accordance with applicable state and federal regulations (e.g., *Nevada Revised Statutes* [NRS] 459.400 - 459.600 "Disposal of Hazardous Waste" [NRS, 1995]; 40 *Code of Federal Regulations* [CFR] 260 - 282 "RCRA Regulations" [CFR, 1996]; NAC 444, "Solid Waste Disposal" [NAC, 1996a]; and NAC 459.9974, "Disposal and Evaluation of Contaminated Soil" [NAC, 1996c]).

The requirements for management of the waste, if any, derived from the corrective action will be determined based on applicable state and federal regulations, field observations, process knowledge, characterization data, and data collected and analyzed during corrective action implementation. Administrative controls (e.g., decontamination procedures and corrective action strategies) will minimize waste generated during site corrective action activities. Decontamination activities will be performed in accordance with approved procedures and will be designated according to the COCs present at the site.

3.2.2 Remedy Selection Decision Factors

The following text describes the remedy selection decision factors used to evaluate the corrective action alternatives:

Short-Term Reliability and Effectiveness

Each corrective action alternative must be evaluated with respect to its effects on human health and the environment during the construction and implementation of the 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 construction and implementation
- Environmental impacts that may result from construction and implementation
- The amount of time until the corrective action objectives are achieved

Reduction of Toxicity, Mobility, and/or Volume

Each corrective action alternative 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 corrective action alternative must be evaluated in terms of risk remaining at the CAU after the corrective action alternative has been implemented. The primary focus of this evaluation is on the

extent and effectiveness of the controls that may be required to manage risk posed by treatment residuals and/or untreated wastes.

Feasibility

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

- Construction and Operation: This refers to the feasibility of implementing a corrective action alternative given the existing set of waste and site-specific conditions.

- Administrative Feasibility: This refers to the administrative activities needed to implement the corrective action alternative (e.g., permits, public acceptance, rights of way, off-site approval).

- Availability of Services and Materials: This refers to the availability of adequate off-site and on-site treatment, storage capacity, disposal services, necessary technical services and materials, and availability of prospective technologies for each corrective action alternative.

Cost

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

- Capital Costs: These costs include both direct and indirect costs. Direct costs may consist of materials, labor, mobilization, demobilization, site preparation, construction materials, equipment purchase and rental, sampling and analysis, waste disposal, and health and safety measures. Indirect costs include such items as engineering design, permits and/or fees, start-up costs, and any contingency allowances.

- Operation and Maintenance: These costs include labor, training, sampling and analysis, maintenance materials, utilities, and health and safety measures.

Cost summaries for this CADD are provided in Appendix B.

3.3 Development of Corrective Action Alternatives

This section identifies and briefly describes the viable corrective action technologies and the corrective action alternatives considered for the affected media. 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 340:

- Alternative 1 - No Further Action
- Alternative 2 - Clean Closure by Excavation and Disposal
- Alternative 3 - Closure in Place by Protective Cover

Other technologies, such as administrative controls and on-site incineration, were considered. Administrative controls were not considered to be protective because the COCs are located at the surface, the area is active hydrologically (the flood control channel for the Area 23 Landfill Complex runs next to the Skid Huts site), and the Q800 and Skid Huts sites are bordered by active operations; maintenance activities for flood control could result in continued spread of contamination. The complexity involved with permitting requirements for on-site incineration is too costly and time consuming for further consideration in this CADD.

The following evaluation of NAC 445A.227 (2) (a-k) (NAC, 1996b) supports the protection of groundwater from CAU 340 COCs and the need for corrective action at the CAU:

a. In Mercury Valley (Area 23 Q800 and Skid Huts sites), the depth to groundwater is approximately 240 to 340 m (800 to 1,100 ft) below land surface (Winograd and Thordarson, 1975; Robie et al., 1995). Field screening and analytical data indicate that COCs are confined primarily from 0 to 0.6 m (0 to 2 ft) bgs. This indicates minimal vertical migration has occurred in the past and, with the removal of man-made driving forces, vertical migration will be negligible in the future.

b. The distance to the nearest water-supply well, Army Well 1, is approximately 8 km (5 mi) southwest of the Q800 and Skid Huts sites (LaCamera and Westenberg, 1994). Army Well 1 is primarily used as a backup water supply for Mercury, Nevada. The groundwater flow direction is generally to the southwest (Laczniak et al., 1996).

c. Soil at the Q800 and Skid Huts sites are silty-to-sandy gravels with some clay. No geotechnical data were collected because COCs were assumed to occur near the ground surface. Field screening and analytical data indicate that COCs are confined primarily from 0 to 0.6 m (0 to 2 ft) bgs.

d. Average annual precipitation for valleys in the South-Central Great Basin ranges from 7 to 13 centimeters (cm) (3 to 6 inches [in.]) (Winograd and Thordarson, 1975). Annual evaporation is roughly 5 to 25 times the annual precipitation (Winograd and Thordarson, 1975). The high evaporation and low precipitation rates create a negative water balance for the area; therefore, no driving force associated with precipitation is available to mobilize COCs

vertically. Ponding is not likely at the Area 23 sites because the ground surface has been graded to promote surface drainage. Precipitation events may mobilize the COCs laterally (downgradient).

e. The types of regulated substances released are pesticides. Unknown hydrocarbons were also detected. The pesticides tend to be relatively immobile and environmentally persistent (Ware, 1978). The unknown hydrocarbons are likely degraded diesel used as surfactant in herbicide mixtures. Herbicides degrade quickly; vegetation is present in the Q800 ditch. Downward migration of COCs is slowed by the following parameters:

- Volume of release - small volumes of COCs were released over a long period of time rather than a large volume over a short duration
- Soil saturation - the soil tends to be very dry, especially near the surface where the COCs are concentrated
- Soil particle adsorption/desorption - the pesticides tend to adsorb to the soil particles with little desorption as suggested by the limited vertical migration of COCs

f. The lateral extent of contamination is defined by the disturbed (graded) surface areas between and within the investigation areas of the CASs excluding the flood control channel. The vertical extent of contamination does not exceed 0.6 m (2 ft) bgs based on field screening and analytical data.

g. Presently, the CAU is located in a government-controlled facility. The NTS is a restricted area that is guarded on a 24-hour, 365-day-per-year basis; unauthorized personnel are not admitted to the facility. Future uses of these sites are likely to be similar to current uses (industrial). Alternatives will be evaluated for control of inadvertent intrusion into the contaminated zone.

h. Preferred routes of vertical migration are nonexistent since the sources have been eliminated and driving forces are not available. Currently, the area is controlled by fence and rope to prevent activities from further contributing to the lateral movement of the COCs; however, surface drainage may mobilize the contaminated surface soil down gradient. Precipitation events are ephemeral and highly variable in the arid environment. Wind could also mobilize the contaminants located at the surface.

i. Facility operations at the Q800 site are presently terminated (i.e., water to the inside of the building has been shut off since 1994, and steam cleaning operations have been terminated). However, activities near the Q800 site include maintenance operations for the Area 23 Landfill Complex. Facility operations near the Skid Huts site include the current storage of pesticides. An abandoned sewage treatment plant is located immediately to the east of the Skid Huts site. The concrete vessels associated with the sewage treatment plant are periodically used during cable testing activities. Active grading operations occur near both the Q800 and Skid Huts sites

for roadway and channel maintenance. Traffic immediately north of the site at times may be heavy for activities at the gunnery range.

j. The potential for a hazard related to fire, vapor, or explosion is nonexistent for the COCs at the CAU.

k. No other site-specific factors are known at this time.

Based on this evaluation, impacts to groundwater are not expected. Therefore, groundwater monitoring is not proposed for this site and is not considered an element of the alternatives.

3.3.1 Alternative 1 - No Further Action

Under the No Further Action Alternative, no corrective action activities will be implemented. This alternative is used as a starting point to establish a baseline for comparison with the other corrective action alternatives. This alternative does not meet the corrective action objectives for Q800 and Skid Huts because no actions are taken to prevent exposure to the COCs or to prevent continued spread of contamination. This alternative will not be compared to the other alternatives using the selection decision factors for these sites.

3.3.2 Alternative 2 - Clean Closure by Excavation and Disposal

Alternative 2 consists of removing soil with COC concentrations greater than the PALs at the Q800 site, the Skid Huts site, and the disturbed area located between the two sites. The excavated soil will then be disposed of in an appropriate disposal facility. The excavated areas will be returned to surficial conditions compatible with existing operations. Excavation would be used to remove clean borrow soil from a nearby location for placement in the remaining voids as necessary.

Under this alternative, soil will be excavated to a depth of 0.6 m (2 ft) bgs at the Q800 and Skid Huts sites. Soil with COCs exceeding PALs in the disturbed areas located between the Q800 and Skid Huts sites will be excavated to a depth of 0.3 m (1 ft) bgs. Activities will include excavation and proper disposal of approximately six cubic yards of hazardous waste from the Skid Huts site. Verification sampling will be performed in approximately the same locations as those identified in the investigation as having COC concentrations exceeding PALs. This will ensure complete removal of soil contaminated by COCs at concentrations exceeding the PALs.

The Pesticide Release Sites will be closed in accordance with NAC 445A (NAC, 1996b) as described in this section.

3.3.3 Alternative 3 - Closure in Place by Protective Cover

Alternative 3 consists of constructing an engineered cover over the areas of CAU 340 where COCs are present (Q800, Skid Huts, and disturbed area located between the two sites). This cover will prevent inadvertent intrusive activities by humans and native wildlife (i.e., Desert Tortoise) and prevent mobilization of the contaminants by wind and stormwater drainage. Because the contaminated zones are present in stormwater drainage channels, special consideration should be taken during design and construction to allow for local hydrological conditions and to prevent stormwater drainage from infiltrating under the cover. Activities should include excavation and proper disposal of approximately six cubic yards of hazardous waste from the Skid Huts site.

Administrative controls will also be implemented under this alternative to prevent/monitor intrusive activities and implement long-term maintenance requirements.

3.4 Evaluation and Comparison of Alternatives

The general corrective action standards and remedy selection decision factors described in Section 3.2 were used to conduct detailed and comparative analyses of each corrective action alternative. The advantages and disadvantages of each alternative were assessed to select a preferred alternative for CAU 340. Table 3-1 presents a summary of the detailed analysis of the alternatives. Table 3-2 presents the comparative analysis of alternatives. Cost summaries are provided in Appendix B.

Table 3-1
Detailed Evaluation of Alternatives
(Page 1 of 3)

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Clean Closure by Excavation and Disposal	Alternative 3 Closure in Place by Protective Cover
Closure Standards			
Protection of Human Health and the Environment	• Does not meet corrective action objective of preventing inadvertent intrusion into the contaminated soil zone (surface and near-surface) • Does not prevent spread of COCs • NAC 445A.227 (2) (a-k) analysis shows the contaminants are not impacting groundwater. • No worker exposure associated with implementation • Does not address the environmental persistence of contaminants	• Meets corrective action objectives by removal of contaminated soil • Moderate to high worker exposure associated with fugitive dust and/or contact with impacted media • Low risk to public because of remote location and controlled access to the NTS • NAC 445A.227 (2) (a-k) analysis shows the contaminants are not impacting groundwater. • Moving contaminated soil to an appropriate disposal facility addresses the persistence of contaminants.	• Meets corrective action objectives • Prevents inadvertent intrusion into the contaminated soil zone. • Moderate risk to workers associated with heavy equipment operation and potential exposure to contaminated soil particles • Low risk to public because of remote location and controlled access to the NTS • NAC 445A.227 (2) (a-k) analysis shows the contaminants are not impacting groundwater. • Cover durability addresses the long-term presence of contaminants.
Compliance with Media Cleanup Standards	• Does not comply with media cleanup standards because COCs remain at levels above PALs, and no corrective action is taken to prevent inadvertent intrusion. • No action implemented to close Pesticide Release Sites • NAC 445A.227 (2) (a-k) analysis shows the contaminants are not impacting groundwater.	• Complies with media cleanup standards because soil containing COCs at concentrations exceeding PALs will be excavated and disposed of at an appropriate facility. • Cleanup standards will be verified with confirmation sampling. • NAC 445A.227 (2) (a-k) analysis shows the contaminants are not impacting groundwater.	• Complies with media cleanup standards by eliminating exposure pathways • NAC 445A.227 (2) (a-k) analysis shows the contaminants are not impacting groundwater.
Control the Source(s) of Release	• The sources (steam cleaning and container rinsing operations) to the Pesticide Release Sites have been discontinued.	• The sources (steam cleaning and container rinsing operations) to the Pesticide Release Sites have been discontinued.	• The sources (steam cleaning and container rinsing operations) to the Pesticide Release Sites have been discontinued.

Table 3-1
Detailed Evaluation of Alternatives
(Page 2 of 3)

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Clean Closure by Excavation and Disposal	Alternative 3 Closure in Place by Protective Cover
Comply with Applicable Federal, State, and Local Standards for Waste Management	No waste generated	All waste (primarily contaminated soil and disposable personal protective equipment) will be handled and disposed of in accordance with applicable standards.	All waste (primarily construction debris and disposable personal protective equipment) will be handled and disposed of in accordance with applicable standards.
Remedy Selection Decision Factors			
Short-Term Reliability and Effectiveness	Not evaluated	• Moderate to high risk to workers associated with fugitive dusts and heavy equipment. • Public protected by remote location and NTS site access controls • Environmental impacts are not anticipated due to implementation. Appropriate measures will be taken at the site to protect desert tortoises. • Implementation should not require an extended period of time.	• Moderate risk to workers associated with fugitive dusts and heavy equipment. • Public protected by remote location and NTS site access controls • Environmental impacts will be minimized by controlling leaching of cover material with a geomembrane. Appropriate measures will be taken at the site to protect desert tortoises. • Implementation should not require an extended period of time.
Reduction of Toxicity, Mobility, and/or Volume	Not evaluated	• Clean closure would effectively eliminate associated toxicity, mobility, and volume of wastes at the Pesticide Release Sites. • If required, treatment of the hazardous waste after removal will result in a reduction of all three. • Landfill disposal of the waste after removal would result in a reduction of mobility.	• Closure in place, inherently, does not reduce toxicity and volume. • Mobility will be decreased by eliminating driving forces associated with surface exposure such as humans and weather elements.

Table 3-1
Detailed Evaluation of Alternatives
(Page 3 of 3)

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Clean Closure by Excavation and Disposal	Alternative 3 Closure in Place by Protective Cover
Long-Term Reliability and Effectiveness	Not evaluated	• All risk will be eliminated upon completion. • No maintenance required • Pesticide Release Sites clean closed • Moving contaminated soil to an appropriate disposal facility addresses the persistent adsorption of contaminants to the soil.	• Controls inadvertent intrusion • Administrative controls required • Cover durability addresses the long-term persistence of contaminants. • Long-term maintenance required
Feasibility	Not evaluated	• An existing, active building and underground utilities are present near the CAU. Special consideration will be required during excavation. • Closure of Pesticide Release Sites is easily implementable.	• Significant planning and coordination and design necessary for implementation • Coordination of all entities is necessary to ensure compliance to prevent intrusion into contaminated soil zones.
Cost	$0	$317,342	$818,889

Table 3-2
Comparative Evaluation of Alternatives

Evaluation Criteria	Comparative Evaluation
Closure Standards	
Protection of Human Health and the Environment	Alternatives 2 and 3 meet corrective action objectives; Alternative 1 does not. No worker exposure to risks is associated with Alternative 1. Moderate risks are associated with Alternative 3 and higher risks with Alternative 2. NAC 445A.227 (2) (a-k) analysis shows the contaminants are not threatening groundwater.
Compliance with Media Cleanup Standards	Alternative 1 does not comply with media cleanup standards. Alternative 2 meets media cleanup standards by removing soil containing COCs at concentrations exceeding PALs and eliminating exposure pathways at the sites. Alternative 3 controls access to contaminants, effectively eliminating exposure pathways.
Control the Source(s) of the Release	The sources (steam cleaning and container rinsing operations) to the Pesticide Release Sites have been discontinued.
Comply with Applicable Federal, State, and Local Standards for Waste Management	Alternative 1 does not generate waste. Alternatives 2 and 3 will generate waste that will be handled in accordance with applicable standards.
Remedy Selection Decision Factors	
Short-Term Reliability and Effectiveness	Moderate risks are associated with Alternative 3 and higher risks with Alternative 2.
Reduction of Toxicity, Mobility, and/or Volume	Alternative 2 results in a reduction of all three characteristics at the CASs for Pesticide Release Sites. Alternative 3 only reduces mobility.
Long-Term Reliability and Effectiveness	Residual risk at the CASs is low for Alternative 3 and nonexistent for Alternative 2. Alternative 3 requires some administrative measures to control intrusive activities.
Feasibility	Alternatives 2 and 3 are feasible; however, Alternative 3 requires special consideration during design and involves more coordination. Both require heavy equipment, operating personnel, and disposal of wastes. Alternative 2 is the most feasible.
Cost	The cost for Alternative 1 is $0. The estimated cost for Alternative 2 is $317,342 for excavation and disposal. Alternative 3 is estimated to cost $818,889 for the installation of a protective cover.

4.0 Recommended Alternative

Based on the results of the detailed and comparative analysis of the potential corrective action alternatives presented in this document, the preferred corrective action alternative selected for implementation at CAU 340 is Alternative 2, Clean Closure by Excavation and Disposal. Alternative 2 was chosen for the following reasons:

- It minimizes health risks by preventing public and worker access to the contaminated soil at the Pesticide Release Sites by moving contaminated soil to an appropriate disposal facility.
- It complies with standards for management of wastes because all waste will be managed in accordance with federal, state, and local requirements.
- Long-term risks are eliminated by moving contaminated soil to an appropriate disposal facility.
- It is easily implementable with standard construction equipment utilized for removal of contaminated soil.
- It provides the most cost-effective method for achieving protection and for meeting closure requirements.

The preferred corrective action alternative was evaluated on its technical merits, focusing on performance, reliability, feasibility, and safety. The alternative was judged to meet all requirements for the technical components evaluated. The alternative meets all applicable state and federal regulations for closure of the site and will eliminate potential future exposure pathways to the contaminated soil at the Pesticide Release Sites.

During corrective action implementation, this alternative will potentially present moderate to high risks to site workers. Therefore, appropriate health and safety procedures will be developed and implemented.

Based on the evaluation in this CADD, closure of the Pesticide Release Sites by excavation and disposal is the preferred closure method.

5.0 References

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Appendix A

Corrective Action Investigation Report for CAU 340: Pesticide Release Sites, Nevada Test Site, Nevada

A.1.0 Introduction

This appendix presents corrective action investigation activities and analytical results for the Pesticide Release Sites, CAU 340, at the NTS. The Pesticide Release Sites CAU includes CAS 15-18-02, Area 15 Quonset Hut, 15-11 Pesticide Storage (Q15-11); CAS 23-21-01, Area 23 Quonset Hut 800 Pesticide Release Ditch (Q800); and CAS 23-18-03, Area 23 Skid Huts Pesticide Storage (Skid Huts) (FFACO, 1996). The corrective action investigation was conducted in accordance with the *Corrective Action Investigation Plan (CAIP) for Corrective Action Unit 340, Pesticide Release Sites, Nevada Test Site, Nye County, Nevada* (DOE/NV, 1998) as developed under the *Federal Facility Agreement and Consent Order* (FFACO, 1996).

The Pesticide Release Sites were investigated because process knowledge indicated that pesticides (e.g., insecticides, herbicides) were stored, mixed, and/or disposed of as rinsate at these sites. Excess pesticide product may have been disposed of at these sites; however, this and product specific information have not been identified. Preliminary analytical results indicated the presence of pesticides in the surface soil at these sites (DOE/NV, 1998). Additional information regarding the history of each site, planning, and the scope of the investigation is presented in the CAIP (DOE/NV, 1998) and will not be repeated in this report.

A.1.1 Project Objectives

The primary objectives of the investigation were to:

- Identify the presence and the vertical and lateral extent of COPCs, specifically pesticides (e.g., insecticides, herbicides).
- Provide sufficient information and data to develop appropriate corrective action alternatives for the Pesticide Release Sites.

The selection of soil sample locations for the three sites was based on site conditions and on the strategy developed during the DQO process as outlined in the CAIP (DOE/NV, 1998).

A.1.2 Report Content

This report contains information and data in sufficient detail to support the selection of a preferred corrective action alternative in the CADD. The contents of this report are as follows:

- Section A.1.0 describes the investigation background, objectives, and the report content.
- Section A.2.0 provides information regarding the field activities and sampling methods.
- Section A.3.0 summarizes the results of the laboratory analysis from the investigation sampling.
- Section A.4.0 discusses the quality assurance (QA) and quality control (QC) procedures that were followed and the results of the QA/QC activities.
- Section A.5.0 is a summary of the investigation results for CAU 340 Pesticide Release Sites.
- Section A.6.0 provides the cited references.

The complete field documentation and laboratory data, including Field Activity Daily Logs, Sample Collection Logs, Analysis Request/Chain-of-Custody Forms, soil sample descriptions, laboratory certificates of analyses, analytical results, and surveillance results are retained in project files as both hard copy files and electronic media.

A.2.0 Field Investigation and Sampling Activities

The field investigation and sampling activities were conducted from March 23 through April 15, 1998, in two stages at the Q800 and Skid Huts sites and in one stage at the Q15-11 site. The first stage of soil sampling for the Q800 and Skid Huts sites consisted of using hand tools for the collection of surface and near-surface soil samples from 0 to 0.6 m (0 to 2 ft) bgs. The first 15 samples collected at the Q800 site were sent to the laboratory with a request for rush-turnaround analyses. The analytical results from the rush-turnaround samples were used to guide the second stage of investigation for the Q800 site. The remaining soil samples collected at the Q800 site and all the samples collected at the Skid Huts site and Q15-11 site were sent to the laboratory on a regular turnaround basis.

The second stage of sampling utilized a direct-push method to collect soil samples from 0 to 1.2 m (0 to 4 ft). At the conclusion of the field investigation, surface and near-surface hand sampling locations were backfilled with a 50/50 dry sand/bentonite mix and direct-push locations were backfilled with dry bentonite.

Additional soil sampling was conducted near the Q800 and Skid Huts sites on May 27, 1998, to further clarify the effects of grading on the lateral extent of contaminants of potential concern. Further soil sampling was conducted at this area as well as the Q15-11 area in September 1998 in order to supplement investigation data which were rejected due to laboratory problems.

The field investigation and sampling program was managed in accordance with the requirements set forth in the CAIP (DOE/NV, 1998). The field activities were performed in accordance with an approved Site-Specific Health and Safety Plan (IT, 1998a). The samples were collected and documented by following approved sampling, field activity and sample collection documentation, decontamination, chain of custody, shipping, and radiation survey protocols and procedures as indicated in the CAIP (DOE/NV, 1998). Quality control samples (e.g., field blanks, equipment rinsate blanks, trip blanks, and sample duplicates) were collected as required by the *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 1996b) and approved procedures. During field activities, waste minimization practices were followed according to approved procedures, including segregation of the waste by waste stream.

A.2.1 Site Descriptions and Conditions

The Q15-11 site is located in the northeastern part of the NTS (see Figure 1-2 of the CADD). The site area is relatively flat and is covered by a quonset hut, except for a small (2.4 by 6.1 m [8 by 20 ft]) area on the south side of the building that was used for parking or as a loading/unloading area. Plywood flooring was removed from the quonset hut to provide access to the underlying soil. A significant amount of rodent droppings was discovered under the plywood flooring. Because of the potential health hazard associated with rodent droppings, the area was disinfected for hanta virus. After disinfection, the rodent droppings were containerized in drums before soil sampling was conducted.

The Area 23 sites (Q800 and Skid Huts) are located in the southeastern part of the NTS (see Figure 1-2 of the CADD). The Q800 site consists of a graded drainage ditch that trends southeast for approximately 150 m (500 ft) and ranges in width from 4.3 m (14 ft) to 11 m (37 ft). The Skid Huts site is located about 90 m (300 ft) east of the Q800 site. The Skid Huts site is a flat (graded), rectangular area (12.2 by 17.7 m [40 by 58 ft]).

During the investigation, the weather conditions at the sites were generally favorable and varied from sunny to intermittent rain showers and some snow (at the Q15-11 site). Despite the changes in weather conditions, there were no major impacts to sampling activities or the field investigation schedule.

Soil conditions at these sites made sample collection difficult because of the alluvial fan material (i.e., gravel, cobbles, boulders). No caliche was encountered at any of the sites during sampling.

A.2.2 Sampling Logistics

This section describes sample collection and investigation activities for each of the Pesticide Release Sites.

A.2.2.1 Sample Locations

The sampling locations for each site were selected based on preliminary analytical results, visual observation (e.g., stained soil), process knowledge (e.g., sink drainage locations), and graded or

disturbed areas (e.g., soil mounds or windrows). The planned sample locations are shown in the CAIP (DOE/NV, 1998). Actual sample locations are shown in Figure A.2-1 through Figure A.2-4. Some locations vary slightly from those planned because of field observations or conditions encountered during sampling.

A.2.2.2 Hand Sampling

Surface and near-surface sampling was conducted at all three sites with hand tools (manual and powered) including a split-spoon powered with a pneumatic hammer, hand-auger, post-hole digger, scoops, and spoons depending on soil conditions at each sample location. The poorly sorted alluvial fan soil with numerous gravel, cobbles, and boulders made hand sampling difficult. In general, a split spoon powered by a pneumatic hammer was used to collect soil to be analyzed for VOCs, SVOCs, and TPH-gasoline. Then a post-hole digger or hand-auger was used at the same location to collect soil to be analyzed for the remaining parameters that required homogenization (e.g., total pesticides, total herbicides, total RCRA metals).

A.2.2.3 Direct-Push Sampling

A direct-push method (Geoprobe™) was used to collect samples at the Area 23 Q800 and Skid Huts sites from 0 to 1.2 m (0 to 4 ft) bgs. Soil samples were collected using a Macrocore™ sampler (5 cm [2 in.] outside diameter) with stainless-steel or polyvinyl chloride (PVC) liners. The samples were removed from the liners in 0.3 m (1 ft) intervals and placed into the appropriate containers. The VOC, TPH-gasoline, and SVOC soil samples were collected in stainless steel liners and then immediately placed into jars and sealed. The total pesticides, total herbicides, and total RCRA metals soil samples were collected in a PVC liner, removed and homogenized in a steel bowl, then containerized and sealed. Direct-push sampling was not conducted at the Q15-11 site.

A.2.3 Field Screening

In general, two consecutive “clean” samples, as measured by field-screening methods and confirmed through off-site laboratory analyses, defined the lower or lateral limits of the impacted soils. Field

screening and surveys were performed as specified in the CAIP (DOE/NV, 1998). The screening and survey methods included:

- Immunoassay screening for Chlordane and DDT
- Radiological survey for alpha and beta emitters using an Electra™ instrument
- Headspace screening for VOCs using a photoionization detector
- TPH screening using a colorimetric field testing kit manufactured by Hanby Environmental Laboratory Procedures, Inc.

Field-screening preliminary action levels were used to guide sample collection both laterally and vertically and to provide a basis for the collection of additional environmental samples. The field screening levels for the immunoassay were 1.0 parts per million (ppm) for DDT (or DDE, DDD) and 600 parts per billion (ppb) for Chlordane. The field screening level for TPH field-screening results was established at 100 ppm in accordance with the NDEP action level for TPH (NAC, 1996). The field screening level for VOCs was 20 ppm or 2.5 times background, whichever was higher. The survey level for radiological monitoring was established at two times background levels (DOE/NV, 1998).

A.2.4 Sample Collection

Sample collection was performed as specified in the CAIP (DOE/NV, 1998). At the end of each soil sample number is a designation letter "A, B, C, or D" to indicate the sample collection interval. The depth interval "A" is 0 to 0.3 m (0 to1 ft); "B" is 0.3 to 0.6 m (1 to 2 ft); "C" is 0.6 to 0.9 m (2 to 3 ft); and "D" is 0.9 to 1.2 m (3 to 4 ft). The depth interval at each sample location varied depending on whether the location was used for identification of lateral and/or vertical extent of the contaminants of potential concern (for example, at some locations only the "A" interval was sampled and at other locations a combination of the intervals "A, B, C, and D" were sampled). Soil descriptions were performed by the sampling team and recorded on a Visual Classification of Soil Log (project files).

A.2.4.1 Quonset Hut 800

Process knowledge indicated that prior activities at the Q800 site included rinsing pesticide containers at the steam-cleaning pad. The steam-cleaning pad drained to a solids/oil separator which

drained to the Q800 ditch. Effluent from two sinks and a washing machine inside the Q800 building also drained to the Q800 ditch. The ditch was graded on a least two occasions and the dirt was placed in mounds (windrows) on both banks.

The sampling at this site focused on establishing types of COPCs, the vertical and lateral extent of COPCs, and effects of grading on COPC distribution. Twenty-three surface and near-surface soil samples were collected with hand tools at the Q800 site (Figure A.2-1). Fifteen soil samples were sent to an off-site laboratory for rush-turnaround analyses and the remaining eight samples were sent in for regular turnaround analyses. The rush-turnaround analytical results were used to guide the second stage of investigation in selection of sample locations and/or modification of analytical parameters. The second stage of the investigation was conducted using a direct-push method (Geoprobe™). Forty-nine soil samples were collected from 13 sample locations. Twenty-two soil samples were sent to an off-site laboratory for analyses. The remaining 27 samples were archived and not analyzed because these samples were generally collected from shallower depths ranging from 0 to 0.6 m (0 to 2 ft) and sufficient soil samples were collected from these depths during Stage I sampling. The soil samples for the Q800 site are identified by sample numbers Q230001A through Q230036D.

A.2.4.2 Skid Huts

Process knowledge indicated that pesticides were stored in three skid huts and mixed near the water spigot/hose bibb. Excess pesticide solution was often sprayed around the three skid huts. Pesticide applicators were also rinsed at the Skid Huts and the rinsate was disposed of on the ground. A sink from the skid hut nearest the hose bibb drained to the ground surface. The area around the Skid Huts site has been graded as part of road maintenance and flood control activities.

The sampling efforts at this site focused on further identification of COPCs, vertical and lateral extent of COPCs, and the effects of grading on COPC distribution. Twenty-eight soil samples were collected (with hand sampling techniques and by direct-push) from 16 locations; 24 of these samples were sent to an off-site laboratory for analyses (Figure A.2-2). The remaining four samples were archived and not analyzed because these samples were generally collected from shallower depths ranging from 0 to 0.6 m (0 to 2 ft) and sufficient soil samples were collected from these depths during Stage I sampling. The samples for this site were identified as SKH0001A through SKH0016D.

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Explanation

- ---------- Investigation Area
- ★ Geoprobe Sample Locations
- ● Surface/Near-Surface Sample Locations
- ✚ Soil Mound Locations (Ditch Bank)
- ✦ Geoprobe Sample Location through Soil Mound of Ditch Bank

N

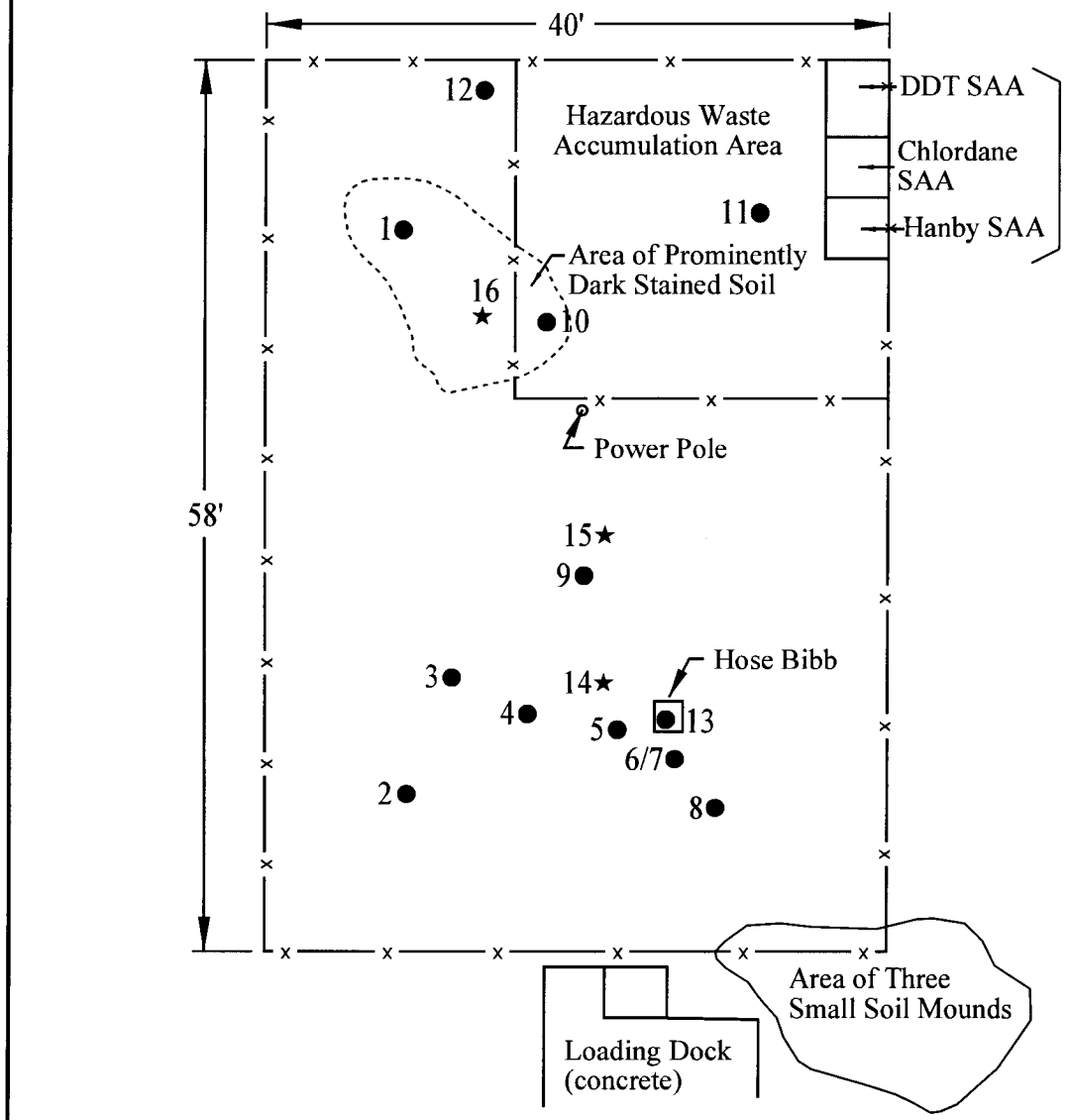
Notes

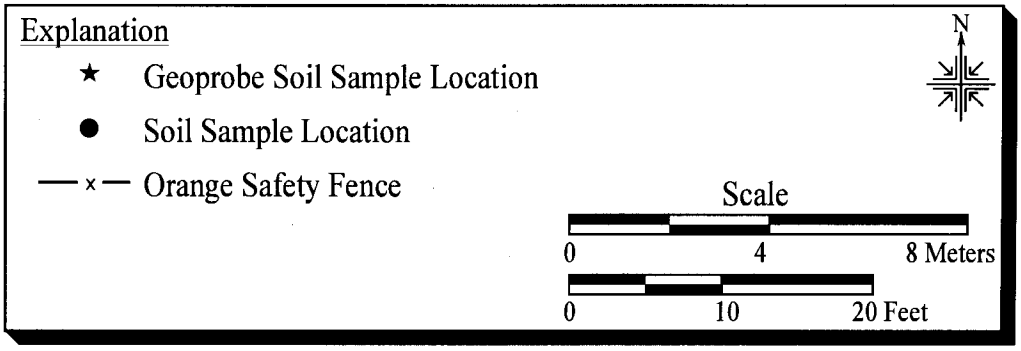
Ditch length ~500 feet.
Photograph taken February 17, 1993.

NOT TO SCALE

Source: EG&G/EM, 1993; IT, 1997; IT, 1998b

Figure A.2-1
Quonset Hut 800 Investigation Area and Soil Sample Locations, Nevada Test Site, Pesticide Release Sites





h:\pesticide\7502a24.dgn
19-NOV-1998

Source: IT, 1997; IT, 1998b

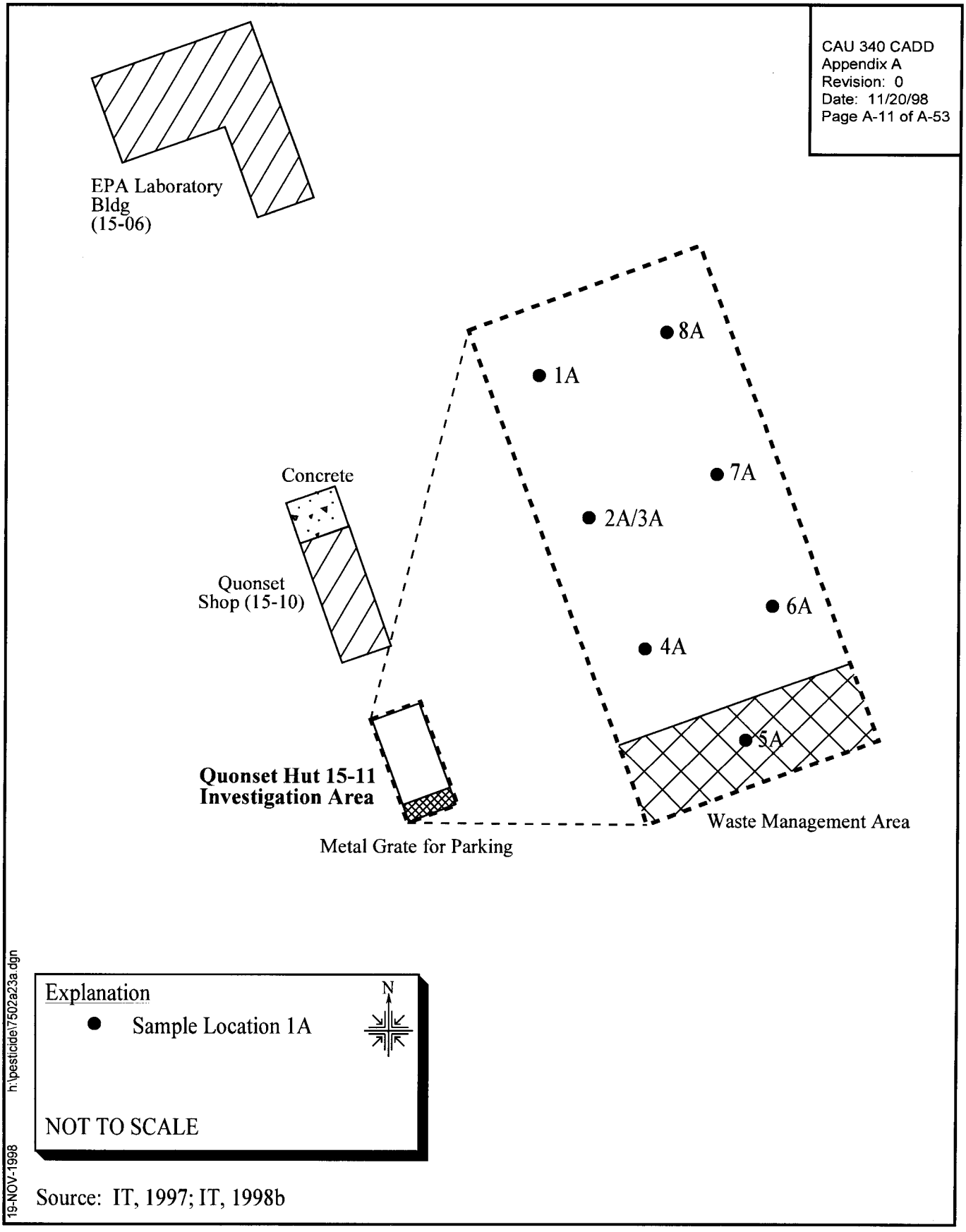
Figure A.2-2
Area 23 Skid Huts Investigation Area and
Soil Sample Locations, Nevada Test Site, Pesticide Release Sites

A.2.4.3 Quonset Hut 15-11

Process knowledge indicated that pesticides were stored at the Q15-11 site. The building has a rectangular base (93 square meters [m^2] [~1,000 square feet (ft^2)]) with an insulated dome shaped metal roof. Four samples were collected from the plywood flooring for waste characterization purposes. The plywood samples were collected from the most heavily stained areas using a router connected to a high efficiency particulate air (HEPA)-filtered vacuum equipped with an in-line sample collection container. These samples were placed in a plastic bag, custody sealed, and sent to an off-site laboratory for analyses (i.e., TCLP Pesticides). After the plywood samples were collected, the plywood flooring was removed. The plywood flooring was cut out with a circular saw because it could not be removed easily from the building's metal framework. The plywood was wrapped in plastic and kept inside the building to protect it from the elements. While the plywood was being removed, an extensive amount of rodent droppings was discovered from 0 to 10 cm (0 to 4 in.) over the entire area. The rodent droppings presented a serious health concern as a potential source for hanta virus exposure. After being disinfected, the droppings were removed, bagged, and drummed before soil sampling was conducted. Eight soil samples were collected from seven sample locations at 0 to 0.3 m (0 to 1 ft) (Figure A.2-3). The field screening results for Chlordane, DDT, TPH, and VOCs were negative (or nondetect). Therefore, no further sampling was conducted at the Q15-11 site. The samples collected for this site were identified as Q15001WM through Q15004WM and Q150001A through Q150008A.

A.2.4.4 Additional Soil Sampling Conducted Near the Q800 and Skid Huts Sites

Field screening results for DDT and Chlordane indicated that pesticides may be present beyond the Q800 and Skid Huts planned investigation sites. Additional soil sampling was conducted on May 27, 1998, between the Q800 and Skid Huts. The sample locations are shown in Figure A.2-4. Sample locations were selected in areas where grading operations may have spread contaminants of potential concern from the Q800 and Skid Huts sites to the surrounding area. The sample locations included a second drainage ditch adjacent (northeast) of the Q800 ditch, soil mounds (windrows) along the flood control channel, the bottom of the flood control channel, and the area adjacent (north, west, south) to the Skid Huts. Thirty-four samples were collected from 17 locations with a direct-push method (Geoprobe™) from depth intervals at 0 to 0.3 m (0 to 1 ft) and from 0.3 to 0.6 m (1 to 2 ft). All 34 samples were sent to an off-site laboratory to be analyzed for total RCRA metals,



Source: IT, 1997; IT, 1998b

Figure A.2-3
Area 15 Quonset Hut 15-11 Investigation Area and Soil Sample Locations, Nevada Test Site, Pesticide Release Sites

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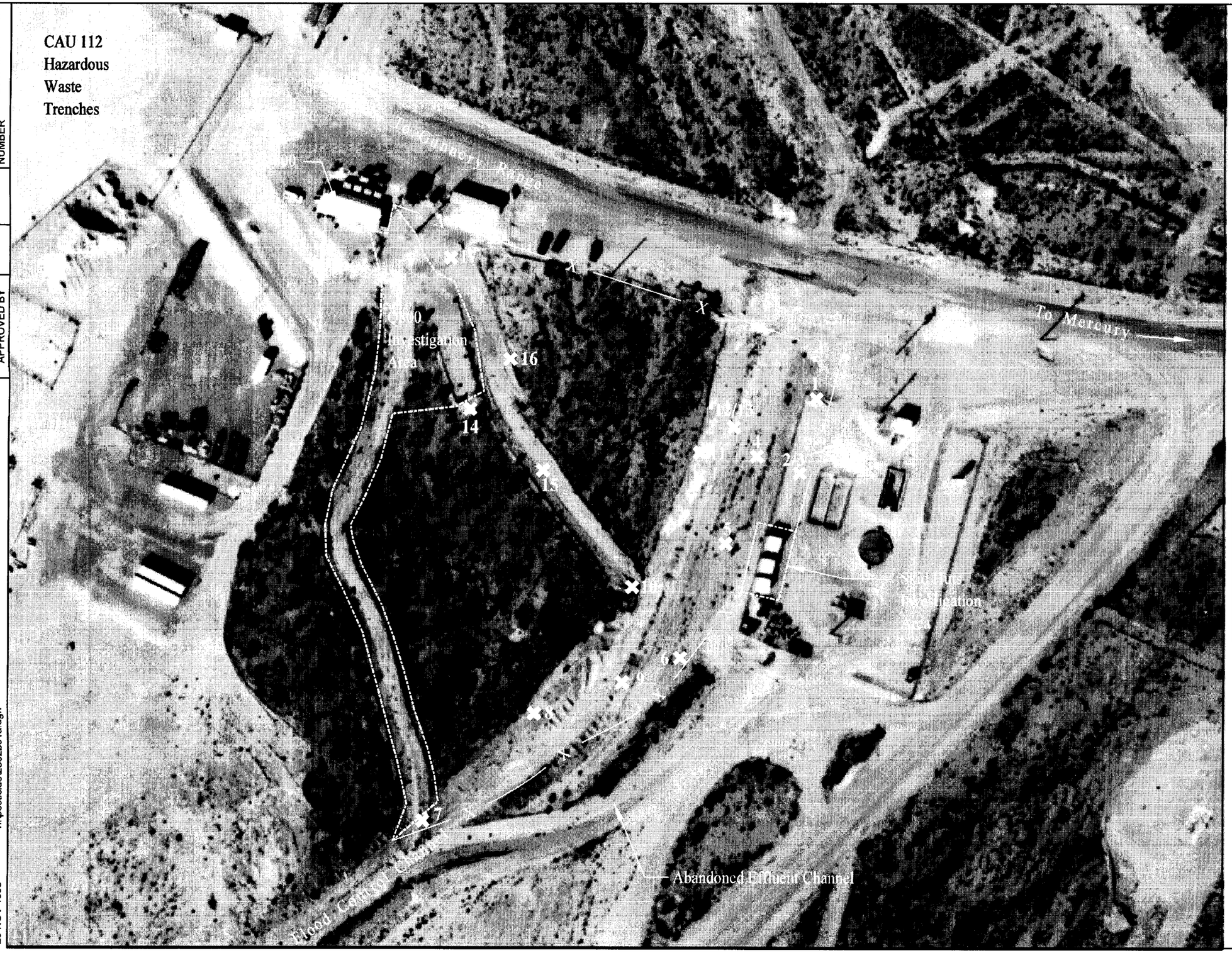
PROJECT NUMBER 772847.02020200

CAU 112
Hazardous
Waste
Trenches



Explanation

N

---------- Investigation Area

X —— X Fence

✖ Additional Soil Sample Locations

Note

Photograph taken February 17, 1993.

Not to Scale

Figure A.2-4
Area 23 Location of Additional Soil Samples Between the Q800 and Skid Huts Sites, Pesticide Release Sites, Nevada Test Site

Source: EG&G/EM, 1993; IT, 1998b

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20 NOV 1998

total pesticides, and total herbicides. These soil samples were numbered PD00001A through PD00017B.

A.2.4.5 Confirmatory Sampling

Confirmation sampling was conducted in September 1998 at the Q15-11 site and the disturbed area between the Q800 and Skid Huts sites. Sample locations and analyses were chosen based on results rejected during the Tier II evaluation of sample analytical results obtained from those samples mentioned in the two previous subsections. Eight soil samples (identified as AQ150001A through AQ150008A) were collected from seven locations at the 0 to 15 cm (0 to 6 in.) interval at Q15-11 and submitted for total herbicides analysis. Nineteen soil samples (identified as APD0001A, APD0001B, APD0002A, APD0002B, APD0003A, APD0005A, APD0006A, APD0007A, APD0011A, APD0012A, APD0012B, APD0013A, APD0013B, APD0014A, APD0014B, APD0015A, APD0015B, APD0016A, and APD0016B) were collected from 12 locations from the disturbed area between the Q800 and Skid Huts sites. These samples were collected from the 0 to 0.3 m (0 to 1 ft) and 0.3 to 0.6 m (1 to 2 ft) intervals and submitted to an off-site laboratory for analysis for leachable (TCLP) and total pesticides as well as total herbicides.

A.2.5 Geology

The alluvial fan soil at the Area 23 sites is poorly-sorted with abundant gravel, cobbles, and boulders. Thin lenses of sand and silt were present at some locations. At the Q15-11 site, the alluvial fan soil was poorly sorted with abundant pebbles, gravel, and some cobbles. Field descriptions were performed by the sampling team at each sample location and recorded on Visual Classification of Soil Logs (project files).

A.2.6 Hydrology

Groundwater at the Pesticide Release Sites is not expected to be impacted by COPC migration due to the depth to groundwater. At Mercury Valley (Area 23 Q800 and Skid Huts sites), the depth to groundwater ranges from 240 to 340 m (800 to 1,100 ft) bgs (Winograd and Thordarson, 1975; Robie et al., 1995). At the Q15-11 site, the depth to groundwater is about 204 m (668 ft) bgs (USGS, 1973).

There are no perennial surface water sources at the any of the CAU 340 Pesticide Release Sites that would impact the investigation sites. However, the Area 23 sites could potentially be impacted by ephemeral drainage due to localized flooding. The natural drainage near or at these sites has been significantly modified by grading and berming activities associated with construction of a gunnery range, landfill activities, and channel modification for flood control purposes.

A.3.0 Investigation Results

The analytical results of samples collected from the CAU 340 Pesticide Release Sites investigation have been compiled and evaluated to determine the presence and/or extent of contamination. The analytical results that are above the minimum reporting limits are summarized in the following subsections.

During the Stage I and Stage II investigation activities, four plywood samples and 77 soil samples were submitted to Quanterra Environmental Services, St. Louis, Missouri, for laboratory analysis. The plywood samples were submitted for waste management purposes only and were analyzed for TCLP pesticides. The TCLP pesticide results for the plywood samples indicated that no pesticide concentrations exceeded the maximum concentration for the toxicity characteristic (CFR, 1997). An additional 34 soil samples were submitted to Quanterra Environmental Services laboratory for analysis from the disturbed area between the Q800 and Skid Huts sites. The 27 soil samples collected in September were submitted to EMAX Laboratories, Inc., Torrance, California. A total of 138 soil samples were submitted for laboratory analyses for the CAU 340 Pesticide Release Sites investigation. A list of the samples collected and analyzed for the investigation are presented in Table A.3-1. The analytical parameters and laboratory analytical methods requested for this investigation are presented in Table A.3-2.

The analytical parameters were selected through the application of site process knowledge according to the EPA's *Guidance for the Data Quality Objectives Process* (EPA, 1994a). Preliminary action levels for off-site laboratory analytical methods were determined during the DQO process and are documented in the CAIP (DOE/NV, 1998). Sampling activities were conducted to confirm or disprove assumptions (i.e., models outlined in CAIP) made in the DQO process (DOE/NV, 1998).

A.3.1 Total Volatile Organic Compound Analytical Results

The total VOC analytical results detected above minimum reporting limits established in the CAIP (DOE/NV, 1998), along with the associated preliminary action levels, are presented in Table A.3-3. None of these results exceed the PALs (DOE/NV, 1998).

Table A.3-1
Samples Collected During the CAU 340 Pesticide Release Site Corrective Action Investigation

(Page 1 of 6)

Sample Location	Depth (feet below ground surface)	Sample Matrix	Quality Control Comments	Parameters Analyzed
Q15-11				
Q15001WM	NA	Plywood	Waste Management Sample	TCLP Pesticides
Q15002WM	NA	Plywood	Waste Management Sample	TCLP Pesticides
Q15003WM	NA	Plywood	Waste Management Sample	TCLP Pesticides
Q15004WM	NA	Plywood	Waste Management Sample	TCLP Pesticides
Q150001A	1	Soil	--	Set 1
Q150002A	1	Soil	--	Set 2
Q150003A	1	Soil	Duplicate of Q150002A	Set 2
Q150004A	1	Soil	Designated as an MS/MSD Sample	Set 2
Q150005A	1	Soil	--	Set 2
Q150006A	1	Soil	--	Set 2
Q150007A	1	Soil	--	Set 2
Q150008A	1	Soil	--	Set 2
AQ150001A	1	Soil	--	Herbicides
AQ150002A	1	Soil	--	Herbicides
AQ150003A	1	Soil	Duplicate of AQ150002A	Herbicides
AQ150004A	1	Soil	Designated as an MS/MSD Sample	Herbicides
AQ150005A	1	Soil	--	Herbicides
AQ150006A	1	Soil	--	Herbicides
AQ150007A	1	Soil	--	Herbicides
AQ150008A	1	Soil	--	Herbicides
Q800				
Q230001A	1	Soil	--	Set 1
Q230002A	1	Soil	--	Set 2
Q230003A	1	Soil	--	Set 2
Q230004A	1	Soil	--	Set 2
Q230005A	1	Soil	--	Set 2
Q230006A	1	Soil	--	Set 2
Q230007A	1	Soil	--	Set 2

Table A.3-1
Samples Collected During the CAU 340 Pesticide Release Site Corrective Action Investigation

(Page 2 of 6)

Sample Location	Depth (feet below ground surface)	Sample Matrix	Quality Control Comments	Parameters Analyzed
Q230008A	1	Soil	Designated as an MS/MSD Sample	Set 2
Q230009A	1	Soil	--	Set 2
Q230010A	1	Soil	--	Set 1
Q230011A	1	Soil	--	Set 2
Q230012A	1	Soil	--	Set 2
Q230013A	1	Soil	--	Set 2
Q230014A	1	Soil	--	Set 2
Q230015A	1	Soil	Duplicate of Q230014A	Set 2
Q230016A	1	Soil	--	Set 2
Q230017A	1	Soil	--	Set 2
Q230018A	1	Soil	--	Set 2
Q230019A	1	Soil	--	Set 2
Q230020A	1	Soil	--	Set 2
Q230021A	1	Soil	--	Set 2
Q230022A	1	Soil	--	Set 2
Q230023A	1	Soil	--	Set 2
Q230024C	3	Soil	--	Set 5
Q230025C	3	Soil	--	Set 5
Q230025D	4	Soil	--	Set 5
Q230026C	3	Soil	--	Set 5
Q230027A	1	Soil	Designated as an MS/MSD Sample	Set 5
Q230027B	2	Soil	--	Set 5
Q230037B	2	Soil	Duplicate of Q230027B	Set 5
Q230027C	3	Soil	--	Set 5
Q230028C	3	Soil	--	Set 5
Q230028D	4	Soil	--	Set 5
Q230029C	3	Soil	--	Set 5
Q230030C	3	Soil	--	Set 5
Q230031C	3	Soil	--	Set 5
Q230031D	4	Soil	--	Set 5
Q230032C	3	Soil	--	Set 5
Q230032D	4	Soil	--	Set 5
Q230033C	3	Soil	--	Set 4

Table A.3-1
Samples Collected During the CAU 340 Pesticide Release Site Corrective Action Investigation
(Page 3 of 6)

Sample Location	Depth (feet below ground surface)	Sample Matrix	Quality Control Comments	Parameters Analyzed
Q230034C	3	Soil	--	Set 4
Q230035C	3	Soil	--	Set 4
Q230035D	4	Soil	--	Set 4
Q230036C	3	Soil	--	Set 4
Q230036D	4	Soil	--	Set 4
Skid Huts				
SKH0001A	1	Soil	--	Set 1
SKH0001B	1.5	Soil	--	Set 2
SKH0002A	1	Soil	--	Set 2
SKH0003A	1	Soil	--	Set 2
SKH0003B	1.75	Soil	--	Set 2
SKH0004A	1	Soil	--	Set 2
SKH0005A	1	Soil	--	Set 2
SKH0005B	2	Soil	--	Set 2
SKH0006A	1	Soil	--	Set 1
SKH0006B	2	Soil	--	Set 2
SKH0007A	1	Soil	Duplicate of SKH0006A	Set 1
SKH0008A	1	Soil	--	Set 2
SKH0009A	1	Soil	--	Set 2
SKH0010A	1	Soil	Designated as an MS/MSD Sample	Set 2
SKH0010B	2	Soil	--	Set 2
SKH0011A	0.5	Soil	--	Set 2
SKH0012A	1	Soil	--	Set 2
SKH0013A	1	Soil	--	Set 2
SKH0014B	2	Soil	--	Set 3
SKH0014C	3	Soil	--	Set 3
SKH0015B	2	Soil	--	Set 3
SKH0015C	3	Soil	--	Set 3
SKH0016B	2	Soil	--	Set 3
SKH0016C	3	Soil	--	Set 3
Additional Soil Samples Between Q800 and Skid Huts				
PD00001A	1	Soil	--	Set 5
PD00001B	2	Soil	--	Set 5

Table A.3-1
Samples Collected During the CAU 340 Pesticide Release Site Corrective Action Investigation
(Page 4 of 6)

Sample Location	Depth (feet below ground surface)	Sample Matrix	Quality Control Comments	Parameters Analyzed
PD00002A	1	Soil	--	Set 5
PD00002B	2	Soil	--	Set 5
PD00003A	1	Soil	Duplicate of PD0002A	Set 5
PD00003B	2	Soil	Duplicate of PD0002B	Set 5
PD00004A	1	Soil	--	Set 5
PD00004B	2	Soil	--	Set 5
PD00005A	1	Soil	--	Set 5
PD00005B	2	Soil	--	Set 5
PD00006A	1	Soil	--	Set 5
PD00006B	2	Soil	--	Set 5
PD00007A	1	Soil	--	Set 5
PD00007B	2	Soil	--	Set 5
PD00008A	1	Soil	--	Set 5
PD00008B	2	Soil	--	Set 5
PD00009A	1	Soil	--	Set 5
PD00009B	2	Soil	--	Set 5
PD00010A	1	Soil	Designated as an MS/MSD sample	Set 5
PD00010B	2	Soil	--	Set 5
PD00011A	1	Soil	--	Set 5
PD00011B	2	Soil	--	Set 5
PD00012A	1	Soil	--	Set 5
PD00012B	2	Soil	--	Set 5
PD00013A	1	Soil	Duplicate of PD00012A	Set 5
PD00013B	2	Soil	Duplicate of PD00012B	Set 5
PD00014A	1	Soil	--	Set 5
PD00014B	2	Soil	--	Set 5
PD00015A	1	Soil	--	Set 5
PD00015B	2	Soil	Designated as an MS/MSD sample	Set 5
PD00016A	1	Soil	--	Set 5
PD00016B	2	Soil	--	Set 5
PD00017A	1	Soil	--	Set 5
PD00017B	2	Soil	--	Set 5
APD0001A	1	Soil	--	TCLP Pesticides & Herbicides

Table A.3-1
Samples Collected During the CAU 340 Pesticide Release Site Corrective Action Investigation

(Page 5 of 6)

Sample Location	Depth (feet below ground surface)	Sample Matrix	Quality Control Comments	Parameters Analyzed
APD0001B	2	Soil	--	Herbicides
APD0002A	1	Soil	--	TCLP Pesticides & Pesticides
APD0002B	2	Soil	--	Herbicides
APD0003A	1	Soil	Duplicate of APD0002A	TCLP Pesticides & Pesticides
APD0005A	1	Soil	--	TCLP Pesticides & Pesticides
APD0006A	1	Soil	--	TCLP Pesticides & Pesticides
APD0007A	1	Soil	Designated as an MS/MSD sample	TCLP Pesticides & Pesticides
APD0011A	1	Soil	--	TCLP Pesticides & Herbicides
APD0012A	1	Soil	--	TCLP Pesticides & Herbicides
APD0012B	2	Soil	--	Herbicides
APD0013A	1	Soil	Duplicate of APD0012A	TCLP Pesticides & Herbicides
APD0013B	2	Soil	--	Herbicides
APD0014A	1	Soil	--	TCLP Pesticides & Pesticides
APD0014B	2	Soil	--	Herbicides
APD0015A	1	Soil	--	TCLP Pesticides & Herbicides
APD0015B	2	Soil	--	Herbicides
APD0016A	1	Soil	Designated as an MS/MSD sample	TCLP Pesticides & Pesticides
APD0016B	2	Soil	--	Herbicides
Quality Control				
Q2300001	NA	Water	Trip Blank	VOC
Q2300002	NA	Water	Equipment Rinsate Blank	Set 2.5
Q2300003	NA	Water	Trip Blank	VOC
Q2300004	NA	Water	Trip Blank	VOC
Q2300005	NA	Water	Trip Blank	VOC
Q2300006	NA	Water	Field Blank	Set 2.5
Q2300007	NA	Water	Trip Blank	VOC
Q2300008	NA	Water	Trip Blank	VOC
Q2300009	NA	Water	Trip Blank	VOC
Q2300010	NA	Water	Field Blank	Set 2.5
Q2300011	NA	Water	Field Blank	Set 2.5
Q2300012	NA	Water	Trip Blank	VOC
Q2300013	NA	Water	Trip Blank	VOC
Q2300014	NA	Water	Equipment Rinsate Blank	Set 2.5

Table A.3-1
Samples Collected During the CAU 340 Pesticide Release Site Corrective Action Investigation
(Page 6 of 6)

Sample Location	Depth (feet below ground surface)	Sample Matrix	Quality Control Comments	Parameters Analyzed
Q2300015	NA	Water	Field Blank	Set 2.5
Q2300016	NA	Water	Trip Blank	VOC
Q2300017	NA	Water	Trip Blank	VOC
Q2300018	NA	Water	Equipment Rinsate Blank	Set 2.5
Q2300019	NA	Water	Trip Blank	VOC
Q2300020	NA	Water	Trip Blank	VOC
Q2300021	NA	Water	Field Blank	Set 2.5
Q2300022	NA	Water	Trip Blank	VOC
Q2300023	NA	Water	Trip Blank	VOC
PD00018	NA	Water	Equipment Rinsate Blank	Set 5
PD00019	NA	Water	Field Blank	Set 5
AQ150009	NA	Water	Equipment Rinsate Blank	Herbicides
AQ150010	NA	Water	Field Blank	Herbicides
APD00004	NA	Water	Equipment Rinsate Blank	Set 6
APD00008	NA	Water	Field Blank	Set 6

Set 1: Analytical parameters are Total VOC, Total SVOC, TPH-Gasoline, TPH-Diesel/Oil, Total RCRA Metals, Total Pesticides, Total Herbicides, Gross Alpha/Beta, Gamma Spectroscopy, TCLP Pesticides, TCLP Metals
Set 2: Analytical parameters are all of the analytical parameters for Set 1 except Gross Alpha/Beta and Gamma Spectroscopy
Set 2.5: Analytical parameters are all of the analytical parameters for Set 1 except TCLP Pesticides and TCLP Metals
Set 3: Analytical parameters are Total RCRA Metals, Total Pesticides, Total Herbicides, VOCs, and SVOCs
Set 4: Analytical parameters are Total RCRA Metals, Total Pesticides, Total Herbicides, TPH-gasoline, and TPH-diesel
Set 5: Analytical parameters are Total RCRA Metals, Total Pesticides, and Total Herbicides
Set 6: Analytical parameters are TCLP Pesticides, Total Pesticides, and Total Herbicides
MS/MSD = Matrix Spike/Matrix Spike Duplicate
NA = Not Applicable
VOC = Volatile Organic Compounds
TPH = Total Petroleum Hydrocarbons
SVOC = Semivolatile Organic Compounds
RCRA = *Resource Conservation and Recovery Act*
TCLP = Toxicity Characteristic Leaching Procedure

Table A.3-2
Laboratory Analytical Methods Used for Samples Collected at the CAU 340 Pesticide Release Sites, Nevada Test Site

Analytical Parameter	Analytical Method
Total volatile organic compounds	EPA 8260B[a]
Total petroleum hydrocarbons - gasoline and diesel/oil	EPA 8015B (modified)[a]
Total semivolatile organic compounds	EPA 8270C[a]
Total RCRA metals (arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury)	EPA 6010B/7470A[a] EPA 6010B/7471A[a]
Gross Alpha/Beta	SM 7110[b]
Gamma Spectroscopy	HASL 300, 4.5.2.3[c]
TCLP Metals	EPA 1311/6010B/7470A[a]
TCLP Pesticides	EPA 1311/8081[a]
Total Pesticides	EPA 8081[a]
Total Herbicides	EPA 8151A[a]

[a]EPA *Test Methods for Evaluating Solid Waste*, 3rd Edition, Parts 1-4, SW-846 (EPA, 1996b)
[b]*Standard Methods for the Examination of Water and Wastewater*, American Public Health Association (APHA, 1992)
[c]*Environmental Measurements Laboratory Procedures Manual*, HASL-300 (DOE, 1992)

A.3.2 Total Semivolatile Organic Compound Analytical Results

Analytical results for sample SKH0010B indicated the presence of 2,4,5-Trichlorophenol at a concentration of 2.4 mg/kg. The PAL for 2,4,5-Trichlorophenol is 68,000 mg/kg. All other SVOC results were reported as nondetects or at concentrations below their minimum reporting limits; therefore, SVOCs were not detected at concentrations exceeding PALs.

A.3.3 Total Petroleum Hydrocarbon Results

Total petroleum hydrocarbons were not detected in the gasoline or diesel ranges above the NDEP regulatory action level of 100 mg/kg for TPH. Total petroleum hydrocarbons were detected as waste oil in sample Q230017A at 92 mg/kg. Several sample locations had detectable unknown hydrocarbons as shown in Table A.3-4. Unknown hydrocarbon concentrations ranged from 28 mg/kg to 970 mg/kg. The unknown hydrocarbons were associated with elevated pesticide concentrations at

Table A.3-3
Soil Sample Results for Total Volatile Organic Compounds Detected Above Minimum Reporting Limits, Pesticide Release Sites, Nevada Test Site

Sample Location	Sample Depth (ft bgs)	Contaminants of Potential Concern in Micrograms per Kilogram (µg/kg)	
		Acetone	Carbon Tetrachloride
	Industrial PRG[a]	8,800,000	500
Q15-11			
Q150004A	1	510 (J)	--
Q150006A	1	200 (J)	--
Q150007A	1	350 (J)	--
Q800			
Q230020A	1	--	9
Skid Huts			
SKH0003A	1	140 (J)	--

[a]Environmental Protection Agency Region 9, Industrial Preliminary Remediation Goals (PRG) (EPA, 1996a)

J = Estimated value
-- = Not detected above minimum reporting limit

both the Q800 and Skid Huts sites. The highest concentrations were found at the stained soil area at the Skid Huts site (Figure A.2-2).

A.3.4 Total RCRA Metals Results

The total RCRA metals detected above the minimum reporting limits (DOE/NV, 1998) are presented in Table A.3-5. The total RCRA metal results were all below the PALs except for arsenic (DOE/NV, 1998; EPA, 1996a). Arsenic was detected above the PAL of 2.4 mg/kg in most of the samples analyzed. The arsenic concentrations for the samples analyzed ranged from 3.3 mg/kg to 12.6 mg/kg with one exception; sample Q230035C had the highest arsenic concentration of 30.6 mg/kg. Although these concentrations exceed the PAL for arsenic, these concentrations are not unusual for the State of Nevada (Shacklette and Boerngen, 1984) and are considered representative of ambient conditions.

Table A.3-4
Soil Sample Results for Total Petroleum Hydrocarbons Detected Above Minimum Reporting Limits, Pesticide Release Sites, Nevada Test Site

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
		Waste Oil	Unknown Hydrocarbons
Q800			
Q230001A	1	--	81
Q230002A	1	--	100
Q230004A	1	--	45
Q230005A	1	--	28
Q230006A	1	--	96
Q230008A	1	--	58
Q230016A	1	--	36
Q230017A	1	92	--
Q230022A	1	--	29
Q230023A	1	--	44
Skid Huts			
SKH0001A	1	--	970
SKH0001B	2	--	390
SKH0004A	1	--	34
SKH0005A	1	--	38
SKH0006A	1	--	59
SKH0007A	1	--	86
SKH0008A	1	--	70
SKH0010A	1	--	330
SKH0010B	2	--	100

-- = Not detected above minimum reporting limit
Shading indicates analytical result exceeds the 100 mg/kg NDEP established action level

Table A.3-5
Summary of Total RCRA Metals Results Detected Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site

(Page 1 of 4)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)						
		Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Silver
	Industrial PRG[a]	2.4	100000	850	450	1000	68	8500
Q15-11								
Q150001A	1	5.0	60.6	--	4.9 (J)	10.1	--	--
Q150002A	1	7.3	85.3	--	9.8 (J)	9.8	--	--
Q150003A	1	5.0	82.1	--	5.5 (J)	11.9	--	--
Q150004A	1	5.8	87.9	--	4.8 (J)	11.0	--	--
Q150005A	1	4.7	107.0	--	3.8 (J)	10.7	--	--
Q150006A	1	6.0	84.4	--	5.1 (J)	11.6	--	--
Q150007A	1	6.8	70.3	--	3.9 (J)	8.9	--	--
Q150008A	1	5.3	91.0	--	4.3 (J)	38.5	--	--
Q800								
Q230001A	1	3.9	71.7	0.66	12.0	214	0.14	1.5
Q230002A	1	4.7	150.0	1.2	44.4	91.8	0.60	3.8
Q230003A	1	7.7	107.0	--	10.4	29.6	--	--
Q230004A	1	6.6	92.0	--	6.7	13.9	--	--
Q230005A	1	7.2	159.0	1.0	21.8 (J)	74.6 (J)	0.16	3.3
Q230006A	1	6.3	140.0	0.89	14.3 (J)	105.0 (J)	0.16	1.2
Q230007A	1	8.1	137.0	0.60	17.2 (J)	41.4 (J)	--	2.7
Q230008A	1	7.5	109.0	--	10.5 (J)	30.9 (J)	--	--
Q230009A	1	8.4	85.6	--	6.8 (J)	9.9 (J)	--	--
Q230010A	1	8.3	80.9	--	7.7 (J)	25.6 (J)	--	--
Q230011A	1	7.0	105.0	--	9.8 (J)	19.0 (J)	--	1.5
Q230012A	1	6.8	114.0	--	19.6 (J)	29.9 (J)	0.16	5.7
Q230013A	1	7.5	101.0	--	7.0 (J)	13.3 (J)	--	1.1
Q230014A	1	6.6	86.3	--	5.9 (J)	10.9 (J)	--	--
Q230015A	1	8.0	104.0	--	7.4 (J)	13.5 (J)	--	--
Q230016A	1	5.4	125.0	0.89	17.5	203	0.18	--
Q230017A	1	4.9	365.0	2.2	27.2	88.6	0.12	--
Q230018A	1	7.2	114.0	--	9.1	21.2	--	--
Q230019A	1	7.0	120.0	--	9.5	25.2	--	--
Q230020A	1	8.0	114.0	--	7.4	12.0	--	--

Table A.3-5
Summary of Total RCRA Metals Results Detected Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site
(Page 2 of 4)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)						
		Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Silver
	Industrial PRG[a]	2.4	100000	850	450	1000	68	8500
Q230021A	1	7.4	81.0	--	4.8	12.5	--	--
Q230022A	1	7.7	100.0	--	8.9	33.0	--	--
Q230023A	1	6.3	114.0	--	12.9	44.3	--	--
Q230024C	3	7.0	61.7	--	4.0	3.2	--	--
Q230025C	3	4.6	50.9	--	4.1	2.8	--	--
Q230025D	4	3.6	38.7	--	2.7	2.0	--	--
Q230026C	3	4.2	56.9	--	3.5	2.9	--	--
Q230027A	1	9.1	64.0	--	3.7	4.3	--	--
Q230027B	2	9.2	66.3	--	3.3	4.7	--	--
Q230027C	3	5.8	65.4	--	3.7	2.8	--	--
Q230028C	3	7.7	84.6	--	4.0	3.2	--	--
Q230028D	4	6.4	52.0	--	3.6	2.4	--	--
Q230029C	3	8.4	69.0	--	3.8	3.2	--	--
Q230030C	3	8.5	68.3	--	4.1	4.0	--	--
Q230031C	3	9.4	74.5	--	4.1	3.3	--	--
Q230031D	4	6.8	81.7	--	14.9	4.1	--	--
Q230032C	3	7.0	53.2	--	3.8	2.9	--	--
Q230032D	4	9.0	81.6	--	3.9	3.0	--	--
Q230033C	3	10.3	71.8	--	3.8	4.5	--	--
Q230034C	3	6.9	52.8	--	69.7	3.0	--	--
Q230035C	3	30.6	52.0	--	2.5	2.6	--	--
Q230035D	4	7.3	52.4	--	3.1	2.4	--	--
Q230036C	3	7.9	60.6	--	3.4	2.8	--	--
Q230036D	4	8.7	55.6	--	2.5	2.5	--	--
Q230037B	2	6.2	80.4	--	4.8	4.1	--	--
Skid Huts								
SKH0001A	1	4.7	73.3	--	6.2 (J)	301 (J)	--	--
SKH0001B	2	4.5	70.3	--	14.7 (J)	54.3 (J)	--	--
SKH0002A	1	3.4	55.4	--	4.3 (J)	4.4 (J)	--	--
SKH0003A	1	4.0	57.8	--	4.4 (J)	70.9 (J)	--	--

Table A.3-5
Summary of Total RCRA Metals Results Detected Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site
(Page 3 of 4)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)						
		Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Silver
	Industrial PRG[a]	2.4	100000	850	450	1000	68	8500
SKH0003B	2	3.6	60.1	--	4.4 (J)	9.5 (J)	--	--
SKH0004A	1	4.6	73.5	--	5.8 (J)	114 (J)	--	--
SKH0005A	1	4.3	67.8	--	5.8 (J)	97.6 (J)	--	--
SKH0005B	2	3.7	67.5	--	5.9 (J)	86.6 (J)	--	--
SKH0006A	1	3.7	63.4	0.79	7.0 (J)	180 (J)	0.14	--
SKH0006B	2	3.3	57.9	--	4.7 (J)	64.0 (J)	--	--
SKH0007A	1	5.0	74.0	0.73	10.1 (J)	409 (J)	0.12	--
SKH0008A	1	3.6	70.6	--	5.5 (J)	126 (J)	--	--
SKH0009A	1	3.9	61.1	--	4.0 (J)	22.6 (J)	--	--
SKH0010A	1	4.0	69.0	--	4.1 (J)	30.5 (J)	--	--
SKH0010B	2	3.3	52.4	--	7.0 (J)	15.8 (J)	--	--
SKH0011A	1	4.4	77.2	--	4.7 (J)	21.3 (J)	--	--
SKH0012A	1	4.7	77.0	--	9.8 (J)	11.0 (J)	--	--
SKH0013A	1	8.7	62.2	--	5.1 (J)	34.9 (J)	--	--
SKH0014B	2	5.1	64.7	--	5.4	3.9	--	--
SKH0014C	3	4.0	54.9	--	3.8	3.1	--	--
SKH0015B	2	5.0	50.3	--	4.7	2.8	--	--
SKH0015C	3	3.8	41.7	--	8.8	2.6	--	--
SKH0016B	2	4.9	55.9	--	4.4	2.8	--	--
SKH0016C	3	7.7	65.0	--	5.0	3.4	--	--
Additional Soil Samples Between Q800 and Skid Huts								
PD00001A	1	5.1 (J)	70.3	--	7.2	4.7 (J)	--	--
PD00001B	2	4.6 (J)	67.2	--	3.8	2.3 (J)	--	--
PD00002A	1	4.3 (J)	58.2	--	4.4	6.3 (J)	--	--
PD00002B	2	4.3 (J)	63.3	--	6.7	3.5 (J)	--	--
PD00003A	1	4.9 (J)	60.8	--	4.4	8.5 (J)	--	--
PD00003B	2	4.7 (J)	54.9	--	4.4	4.5 (J)	--	--
PD00004A	1	5.6 (J)	81.8	--	5.4	5.5 (J)	--	--
PD00004B	2	5.9 (J)	59.7	--	3.8	3.1 (J)	--	--
PD00005A	1	7.0 (J)	66.4	--	5.2	7.8 (J)	--	--

Table A.3-5
Summary of Total RCRA Metals Results Detected Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site
(Page 4 of 4)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)						
		Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Silver
	Industrial PRG[a]	2.4	100000	850	450	1000	68	8500
PD00005B	2	5.1 (J)	61.6	--	4.7	3.2 (J)	--	--
PD00006A	1	3.8 (J)	61.3	--	5.9	31.0 (J)	--	--
PD00006B	2	4.2 (J)	48.8	--	16.3	2.3 (J)	--	--
PD00007A	1	6.4 (J)	96.5	--	25.2	13.7 (J)	--	--
PD00007B	2	5.2 (J)	72.8	--	5.0	2.9 (J)	--	--
PD00008A	1	7.4 (J)	71.6	--	4.4	4.4 (J)	--	--
PD00008B	2	7.7 (J)	68.6	--	4.4	3.2 (J)	--	--
PD00009A	1	6.4 (J)	74.0	--	4.9	9.1 (J)	--	--
PD00009B	2	3.0 (J)	42.9	--	3.3	2.3 (J)	--	--
PD00010A	1	9.6 (J)	123	0.70	10.5	17.2 (J)	--	--
PD00010B	2	5.5 (J)	56.8	--	4.9	3.2 (J)	--	--
PD00011A	1	5.9 (J)	83.0	--	4.6	5.3 (J)	--	--
PD00011B	2	5.7 (J)	56.5	--	4.8	2.9 (J)	--	--
PD00012A	1	4.4 (J)	57.6	--	3.9	12.9 (J)	--	--
PD00012B	2	8.1 (J)	43.8	--	3.5	2.3 (J)	--	--
PD00013A	1	4.9 (J)	51.6	--	4.3	7.5 (J)	--	--
PD00013B	2	6.3 (J)	45.2	--	3.9	1.9 (J)	--	--
PD00014A	1	4.5 (J)	212	1.2	14.3	75.3 (J)	0.11	--
PD00014B	2	8.4 (J)	66.0	--	5.5	3.1 (J)	--	--
PD00015A	1	7.8 (J)	90.4	--	7.1	5.7 (J)	--	--
PD00015B	2	9.3 (J)	78.5	--	3.6	2.8 (J)	--	--
PD00016A	1	8.0 (J)	187	0.94	18.4	43.7 (J)	0.11	--
PD00016B	2	8.4 (J)	69.6	--	4.4	3.2 (J)	--	--
PD00017A	1	8.8 (J)	148	0.91	8.4	21.6 (J)	--	--
PD00017B	2	12.6 (J)	73.6	--	7.5	3.8 (J)	--	--

[a]EPA Region 9 Industrial PRGs (EPA, 1996a)

J = Estimated value
-- = Not detected above minimum reporting limit

A.3.5 TCLP Metals Results

The analytical results that exceeded minimum reporting limits for the TCLP for metals are shown in Table A.3-6. None of these results exceed the maximum concentrations for the toxicity characteristic (CFR, 1997).

Table A.3-6
Summary of TCLP Metals Results Detected Above Minimum Detectable Concentrations, CAU 340 Pesticide Release Sites, Nevada Test Site
(Page 1 of 2)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern in Milligrams per Liter (mg/L)				
		Barium	Cadmium	Chromium	Lead	Silver
	Maximum Concentration Toxicity Characteristic[a]	100	1.0	5.0	5.0	5.0
Q15-11						
Q150001A	1	0.53 (B)	--	0.012 (B)	--	--
Q150002A	1	0.42 (B)	--	--	--	--
Q150003A	1	0.22 (B)	--	--	--	--
Q150004A	1	0.38 (B)	--	--	--	--
Q150006A	1	0.22 (B)	--	--	--	--
Q150007A	1	0.32 (B)	--	--	--	--
Q800						
Q230001A	1	0.36 (B)	--	--	--	0.011 (B)
Q230002A	1	0.29 (B)	0.0050 (B)	--	--	--
Q230003A	1	0.22 (B)	--	--	--	--
Q230004A	1	0.21 (B)	--	--	--	--
Q230005A	1	0.87	0.018 (B)	--	--	--
Q230006A	1	0.85	--	--	--	--
Q230007A	1	0.58 (B)	--	--	--	--
Q230008A	1	0.59 (B)	--	--	--	--
Q230009A	1	0.50 (B)	--	--	--	--
Q230010A	1	0.46 (B)	--	--	--	--
Q230011A	1	0.49 (B)	--	--	--	--
Q230012A	1	0.51 (B)	--	--	--	--
Q230013A	1	0.42 (B)	--	--	--	--
Q230014A	1	0.57 (B)	--	--	--	--
Q230015A	1	0.40 (B)	--	--	--	--
Q230016A	1	0.60 (B)	0.022	--	--	--
Q230017A	1	0.69 (B)	0.017 (B)	--	--	--

Table A.3-6
Summary of TCLP Metals Results Detected Above Minimum Detectable Concentrations, CAU 340 Pesticide Release Sites, Nevada Test Site

(Page 2 of 2)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern in Milligrams per Liter (mg/L)				
		Barium	Cadmium	Chromium	Lead	Silver
	Maximum Concentration Toxicity Characteristic[a]	100	1.0	5.0	5.0	5.0
Q230018A	1	0.52 (B)	--	--	--	--
Q230019A	1	0.47 (B)	--	--	--	--
Q230021A	1	0.30 (B)	--	--	--	--
Q230023A	1	0.39 (B)	--	--	--	--
Skid Huts						
SKH0001A	1	0.87	--	--	0.93	--
SKH0001B	2	0.72 (B)	--	--	--	--
SKH0002A	1	0.91	--	--	--	--
SKH0003A	1	0.94	--	--	0.18 (B)	--
SKH0003B	2	0.72 (B)	--	--	--	--
SKH0004A	1	0.86	--	--	0.32 (B)	--
SKH0005A	1	0.76 (B)	--	--	--	--
SKH0005B	2	0.72 (B)	--	--	--	--
SKH0006A	1	1.8	0.020	--	1.7	--
SKH0006B	2	0.70 (B)	--	--	--	--
SKH0007A	1	0.83	0.039	--	2.0	--
SKH0008A	1	0.78 (B)	--	--	0.35 (B)	--
SKH0009A	1	1.0	--	--	--	--
SKH0010A	1	0.59 (B)	--	--	--	--
SKH0010B	2	0.95	--	--	--	--
SKH0011A	1	0.58 (B)	--	--	--	--
SKH0012A	1	0.89	--	--	--	--
SKH0013A	1	0.73 (B)	--	--	--	--

[a] 40 CFR 261.24, “Identification and Listing of Hazardous Waste” (CFR, 1997)

B = Reported value is less than the Contract Required Detection Limit but greater than the Instrument Detection Limit

A.3.6 Gamma Spectroscopy Results

The radiological results were not distinguishable from background concentrations listed in the *Off-Site Radiation Exposure Review Project* (McArthur and Miller, 1989) or the *Environmental Monitoring Report for the Proposed Ward Valley California Low Level Radioactive Waste (LLRW) Facility* (Atlan-Tech, 1992). The CAIP states that radiological PALs are twice those levels listed for surface contamination in the *DOE Nevada Test Site/Yucca Mountain Project Radiological Control Manual* (DOE/NV, 1996a). However, the background concentrations derived from the MacArthur and Miller (1989) and the Atlan-Tech (1992) reports were used for comparison to sample results because they are radiological background concentrations in soil rather than radiological surface activities.

A.3.7 Total Pesticides Results

The total pesticides results detected above the minimum reporting limits are presented in Table A.3-7. Only one sample from the Q15-11 site, Q150008A, indicated that pesticides were present above the minimum reporting limits; however, these results were well below the PALs for DDE, DDT, and Endrin. Pesticides results for several samples from the Q800 and Skid Huts sites and the disturbed area between the two sites exceed the PALs for DDT, DDD, DDE, Chlordane, Aldrin, Heptachlor, and Heptachlor Epoxide. For some samples, the alpha- and gamma-Chlordane isomer concentrations were reported instead of the Chlordane concentration. To compare these concentrations to PALs, the alpha- and gamma-Chlordane isomer concentrations were summed and presented in Table A.3-7 as Chlordane.

The Tier II evaluation process for the total pesticides results rejected 119 results. These rejected data have been supplemented as necessary with valid data obtained from samples collected in September 1998.

A.3.8 TCLP Pesticides Results

The TCLP for pesticides analytical results exceeding minimum reporting limits are shown in Table A.3-8. Leachable Chlordane was detected at 0.121 mg/L and 0.030 mg/L in sample numbers SKH0010A and SKH0010B respectively (Note: concentrations are the sum of the reported alpha- and gamma-Chlordane isomers). Sample SKH0010A was obtained from 0.0 to 0.3 m (0.0 to 1.0 ft) in an

Table A.3-7
Summary of Total Pesticides Results Detected
Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site
(Page 1 of 5)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)															
		4,4'-DDD	4,4'-DDE	4,4'-DDT	Chlordane	Aldrin	Alpha-BHC (HCH)	Delta-BHC (HCH)	Gamma-BHC (HCH) (Lindane)	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde	Heptachlor	Heptachlor Epoxide
	Industrial PRG[a]	7900	5600	5600	1500	110	300	NI	1500	120	NI	NI	NI	200000	NI	420	210
Q15-11																	
Q150008A	1	--	3.4 (J)	8.5	--	--	--	--	--	--	--	--	--	5.3	--	--	--
Q800																	
Q230001A	1	5600 (J)	5700 (J)	5900 (J)	89000[b] (J)	710 (J)	--	--	--	--	--	--	--	--	--	650 (J)	420 (J)
Q230002A	1	8700 (J)	7200 (J)	5100 (J)	>103000[b] (J)	1200 (J)	--	--	--	1300 (J)	--	--	--	930 (J)	11000 (J)	740 (J)	2100 (J)
Q230003A	1	1500 (J)	2500 (J)	3900 (J)	8600[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230004A	1	590 (J)	1100 (J)	1500 (J)	2600[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230005A	1	4100 (J)	4500 (J)	7500 (J)	3900[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230006A	1	5600 (J)	2900 (J)	2100 (J)	14400[b] (J)	250 (J)	--	--	--	--	--	--	--	--	540 (J)	650 (J)	1000 (J)
Q230007A	1	820 (J)	1200 (J)	1500 (J)	3700[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230008A	1	360 (J)	600 (J)	700 (J)	1570[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230009A	1	112 (J)	260 (J)	230 (J)	1890[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230010A	1	310 (J)	690 (J)	470 (J)	2300[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230011A	1	60 (J)	130 (J)	79 (J)	620[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230012A	1	--	1600 (J)	950 (J)	12000[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230013A	1	--	--	--	8700[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230014A	1	--	430 (J)	300 (J)	2300[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230015A	1	140 (J)	330 (J)	190 (J)	1480[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230016A	1	1300 (J)	8900 (J)	3000 (J)	7400[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230017A	1	370 (J)	1100 (J)	2300 (J)	1170[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230018A	1	540 (J)	3200 (J)	1900 (J)	2080[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--

Table A.3-7
Summary of Total Pesticides Results Detected
Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site
(Page 2 of 5)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)															
		4,4'-DDD	4,4'-DDE	4,4'-DDT	Chlordane	Aldrin	Alpha-BHC (HCH)	Delta-BHC (HCH)	Gamma-BHC (HCH) (Lindane)	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde	Heptachlor	Heptachlor Epoxide
	Industrial PRG[a]	7900	5600	5600	1500	110	300	NI	1500	120	NI	NI	NI	200000	NI	420	210
Q230019A	1	650 (J)	860 (J)	490 (J)	5400[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230020A	1	140 (J)	150 (J)	--	1560[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230021A	1	580 (J)	240 (J)	190 (J)	6000[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
Q230022A	1	2300 (J)	950 (J)	770 (J)	26000[b] (J)	200 (J)	--	--	--	--	--	620 (J)	240 (J)	--	--	260 (J)	--
Q230023A	1	2600 (J)	920 (J)	750 (J)	26000[b] (J)	--	--	--	--	--	--	900 (J)	300 (J)	280 (J)	--	--	--
Q230026C	3	--	--	--	11[b]	--	--	--	--	--	--	--	--	--	--	--	--
Q230027A	1	--	--	--	26[b]	--	--	--	--	--	--	--	--	--	--	--	--
Q230028C	3	--	--	--	160[b]	9.4	8.2	--	3.3	--	--	--	--	--	--	16	170
Q230032C	3	26	3.0	--	310[b]	--	--	26	--	--	--	18	--	4.8	--	12	--
Q230032D	4	--	--	--	11[b]	--	--	--	--	--	--	--	--	--	--	--	--
Q230035C	3	--	--	--	780[b] (E)	--	--	--	--	--	--	--	--	--	--	3.4	--
Q230036D	4	--	--	--	100[b] (J)	--	--	--	--	--	--	--	--	--	--	--	66 (J)
Skid Huts																	
SKH0001A	1	6500 (J)	4900 (J)	11000 (J)	30000[b] (J)	660 (J)	--	--	--	--	--	--	900 (J)	420 (J)	--	--	--
SKH0001B	2	2400 (J)	980 (J)	3100 (J)	9700[b] (J)	--	--	--	--	--	--	1100 (J)	--	--	--	--	--
SKH0002A	1	--	--	190 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--
SKH0003A	1	440 (J)	480 (J)	1400 (J)	920[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
SKH0003B	2	120 (J)	100 (J)	340 (J)	260[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
SKH0004A	1	5200 (J)	6500 (J)	15000 (J)	16100[b] (J)	--	--	--	--	--	--	4200 (J)	420 (J)	--	--	--	--
SKH0005A	1	4100 (J)	2100 (J)	10000 (J)	17300[b] (J)	--	--	--	--	--	--	3200 (J)	330 (J)	--	--	--	--
SKH0005B	2	2400 (J)	780 (J)	4200 (J)	11700[b] (J)	--	--	--	--	--	--	1300 (J)	--	--	--	--	--

Table A.3-7
Summary of Total Pesticides Results Detected
Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site
(Page 3 of 5)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)															
		4,4'-DDD	4,4'-DDE	4,4'-DDT	Chlordane	Aldrin	Alpha-BHC (HCH)	Delta-BHC (HCH)	Gamma-BHC (HCH) (Lindane)	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde	Heptachlor	Heptachlor Epoxide
	Industrial PRG[a]	7900	5600	5600	1500	110	300	NI	1500	120	NI	NI	NI	200000	NI	420	210
SKH0006A	1	9300 (J)	5100 (J)	26000 (J)	37000[b] (J)	280 (J)	--	--	--	--	--	--	440 (J)	--	--	1300 (J)	--
SKH0006B	2	3400 (J)	1400 (J)	4800 (J)	15300[b] (J)	--	--	--	--	--	--	--	250 (J)	--	--	510 (J)	--
SKH0007A	1	8100 (J)	4800 (J)	15000 (J)	42000[b] (J)	270 (J)	--	--	--	--	--	1100 (J)	750 (J)	--	--	2700 (J)	--
SKH0008A	1	9300 (J)	2500 (J)	8600 (J)	49000[b] (J)	750 (J)	--	--	--	--	--	3800 (J)	870 (J)	950 (J)	--	1300 (J)	--
SKH0009A	1	--	--	13000 (J)	5300[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
SKH0010A	1	18000 (J)	6000 (J)	31000 (J)	72000[b] (J)	6400 (J)	--	4000 (J)	610 (J)	--	--	11000 (J)	1200 (J)	1400 (J)	--	8500 (J)	--
SKH0010B	2	8200 (J)	2700 (J)	4800 (J)	44000[b] (J)	2500 (J)	--	1700 (J)	210 (J)	--	--	--	1200 (J)	370 (J)	--	3500 (J)	--
SKH0011A	1	1700 (J)	560 (J)	2400 (J)	4900[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
SKH0012A	1	890 (J)	870 (J)	2200 (J)	1840[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
SKH0013A	1	1600 (J)	730 (J)	2200 (J)	8100[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--
SKH0014B	2	--	--	--	--	--	7.5	--	--	--	--	--	--	--	--	--	--
SKH0016B	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.0	--
Additional Soil Samples Between Q800 and Skid Huts																	
PD00001A	1	--	18 (J)	74 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00002A	1	**	**	730 (J)	9200 (J)	**	**	**	**	**	--	**	**	**	**	**	**
PD00002B	2	--	--	8.0	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00003A	1	**	**	610 (J)	7800 (J)	**	**	**	**	**	--	**	**	**	**	**	**
PD00004A	1	12 (J)	3.7	24	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00005A	1	**	**	3500 (J)	14000 (J)	**	**	**	**	**	--	**	**	**	**	**	**
PD00005B	2	--	4.2 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table A.3-7
Summary of Total Pesticides Results Detected
Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site
(Page 4 of 5)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)															
		4,4'-DDD	4,4'-DDE	4,4'-DDT	Chlordane	Aldrin	Alpha-BHC (HCH)	Delta-BHC (HCH)	Gamma-BHC (HCH) (Lindane)	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde	Heptachlor	Heptachlor Epoxide
	Industrial PRG[a]	7900	5600	5600	1500	110	300	NI	1500	120	NI	NI	NI	200000	NI	420	210
PD00006A	1	**	1000 (J)	2700 (J)	8000 (J)	**	**	**	**	**	--	**	**	**	**	**	**
PD00007A	1	**	**	**	100000 (J)	**	**	**	**	**	--	**	**	**	**	**	**
PD00007B	2	150 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00008A	1	11 (J)	2.7 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00009A	1	17 (J)	5.3 (J)	17 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00010A	1	--	4.4 (J)	15 (J)	--	--	--	--	--	1.7 (J)	--	--	--	--	--	--	--
PD00011A	1	--	2.7	--	39	--	--	--	--	--	--	--	--	--	--	--	--
PD00011B	2	--	--	--	--	--	--	--	--	--	--	3.5	--	--	--	--	--
PD00012A	1	--	--	21 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00013A	1	--	--	17 (J)	120	--	--	--	--	--	--	--	--	--	--	--	--
PD00014A	1	**	**	120 (J)	3000 (J)	**	**	**	**	**	--	**	**	**	**	**	**
PD00015A	1	7.5 (J)	--	8.8 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00015B	2	7.5 (J)	3.3 (J)	9.5 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00016A	1	**	**	170 (J)	4600 (J)	**	**	**	**	**	--	**	**	**	**	**	**
PD00017A	1	--	3.1 (J)	38 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--
PD00017B	2	9.4 (J)	24 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
APD0002A	1	--	136 (J)	589 (J)	1,529[b] (J)		--	--	--	--	--	--	--	--	--	--	118 (J)
APD0003A	1	--	--	433 (J)	1,528[b] (J)	--	--	--	--	--	103 (J)	--	--	--	--	--	144 (J)
APD0005A	1	--	2,280 (J)	22,200 (J)	456[b] (J)	--	--	--	--	--	--	--	--	--	--	--	--

Table A.3-7
Summary of Total Pesticides Results Detected
Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site
(Page 5 of 5)

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)															
		4,4'-DDD	4,4'-DDE	4,4'-DDT	Chlordane	Aldrin	Alpha-BHC (HCH)	Delta-BHC (HCH)	Gamma-BHC (HCH) (Lindane)	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde	Heptachlor	Heptachlor Epoxide
	Industrial PRG[a]	7900	5600	5600	1500	110	300	NI	1500	120	NI	NI	NI	200000	NI	420	210
APD0006A	1	--	436 (J)	529 (J)	1,037[b] (J)	--	--	--	--	--	--	--	--	--	--	--	113 (J)
APD0007A	1	--	--	--	1,617[b] (J)	--	--	--	--	--	--	--	--	--	--	--	73.3 (J)
APD0014A	1	--	--	210 (J)	2,172[b] (J)	--	--	--	--	--	--	--	--	--	--	--	205 (J)
APD0016A	1	--	--	62.6 (J)	363[b] (J)	--	--	--	--	--	--	--	--	--	--	--	22.4 (J)

[a]EPA Region 9 Industrial PRGs (EPA, 1996a)
[b]Sum of alpha- and gamma-Chlordane isomers

J = Estimated value
NI = Not identified
-- = Not detected above the minimum reporting limit
** = Result for this COPC in this sample was rejected
Shading indicates analytical result is equal to or greater than the PAL (i.e., Industrial PRG)

Table A.3-8
Summary of TCLP Pesticides Results Detected Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (mg/L)			
		Chlordane	Gamma-BHC (HCH) (Lindane)	Endrin	Heptachlor Epoxide
	Maximum Concentration Toxicity Characteristic[a]	0.03	0.4	0.02	0.008
Q15-11					
Q15001WM	N/A- Plywood Sample	--	0.0016	--	--
Q15004WM	N/A- Plywood Sample	--	0.0015	--	--
Q800					
Q230021A	1	0.0072[b]	--	--	--
Q230022A	1	0.0113[b]	--	--	--
Q230023A	1	0.0194[b]	--	--	0.0018
Skid Huts					
SKH0001A	1	0.0071[b]	--	0.0011	--
SKH0004A	1	0.0061[b]	--	0.0022	--
SKH0005A	1	0.0118[b]	--	0.0019	0.0029
SKH0005B	2	0.0076[b]	--	0.0015 (J)	0.0013 (J)
SKH0006A	1	--	--	0.0012	--
SKH0006B	2	0.0060[b]	--	--	0.0015
SKH0007A	1	0.0053[b]	--	0.0014	--
SKH0008A	1	0.023[b]	--	0.0062	0.0064
SKH0009A	1	--	--	0.0012	0.0012
SKH0010A	1	0.121[b]	--	--	--
SKH0010B	2	0.030[b]	--	--	--
SKH0011A	1	--	--	0.0008	0.0009

[a]40 CFR 261.24, "Identification and Listing of Hazardous Waste" (CFR, 1997)
[b]Sum of alpha- and gamma-Chlordane isomers

J = Estimated value
-- = Not detected above the minimum reporting limit
Shading indicates analytical result is equal to or greater than the Maximum Concentration for the Toxicity Characteristic (CFR, 1997)

area of prominent staining. Sample SKH0010B was obtained from 0.3 to 0.6 m (1.0 to 2.0 ft) directly below sample SKH0010A. All other sample leachable concentrations were not detected or were within the maximum allowable concentrations for the toxicity characteristic (EPA, 1996a); therefore, the extent of characteristic waste is believed to be limited to the heavily stained area.

A.3.9 Total Herbicides Results

Total herbicides detected above the minimum reporting limits are shown in Table A.3-9. Total herbicides sample results for the Q15-11 site, the Q800 site, and the disturbed area between the Q800 and Skid Huts sites were rejected during the Tier II evaluation process. All sample locations at the Q15-11 site were resampled and analyzed for total herbicides. The Q800 site was not resampled because sufficient usable total pesticides results exist for the site to recommend corrective action alternatives. Sample locations for the disturbed area between the Q800 and Skid Huts sites were only resampled for total herbicides analysis if existing total pesticides results did not exceed PALs. The results of the resampling were usable and indicated that herbicides were not present at the Q15-11 site or the disturbed area between the Q800 and Skid Huts sites. The herbicides Dinoseb, 2,4,5-T, and 2,4,5-TP (silvex) were detected above the minimum reporting limits for the Q800 and Skid Huts sites. All herbicide concentrations were below the PALs (DOE/NV, 1998).

Table A.3-9
Summary of Total Herbicides Results Detected Above Minimum Reporting Limits, CAU 340 Pesticide Release Sites, Nevada Test Site

Sample Number	Sample Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)		
		Dinoseb	2,4,5-T	2,4,5-TP (Silvex)
	Industrial PRG[a]	680,000	6,800,000	5,500,000
Q800				
Q230001A	1	62	74	--
Q230002A	1	28	--	--
Q230006A	1	24	--	--
Q230012A	1	23	--	--
Skid Huts				
SKH0006B	2	18	--	--
SKH0008A	1	--	52	270
SKH0009A	1	32	140	--
SKH0010A	1	240 (J)	2200 (J)	--
SKH0010B	2	490	2300	--
SKH0011A	1	130	160	--

[a]EPA Region 9 Industrial PRGs (EPA, 1996a)

J = Estimated value
NI = Not identified
-- = Not detected above minimum reporting limit

A.4.0 Quality Assurance

The results of the QA/QC activities for the Pesticide Release Sites Corrective Action Investigation sampling events are summarized in the following text. Detailed information regarding the QA program is contained in the Industrial Sites QAPP (DOE/NV, 1996b).

Quality control results are typically judged in terms of precision, accuracy, representativeness, completeness, and comparability and are described in the following sections.

A.4.1 Precision

Precision is a quantitative measure of the variability of a group of measurements from their average value. Precision is assessed for inorganic analysis by collecting and analyzing duplicate field samples and comparing the results with the original sample. Precision is also assessed by creating, preparing, analyzing, and comparing laboratory duplicates from one or more field samples in inorganic analyses and matrix spike and matrix spike duplicate samples for organic analyses. Precision is reported as relative percent difference (RPD) which is calculated as the difference between the measured concentrations of duplicate samples, divided by the average of the two concentrations, and multiplied by 100. Any deviation from these requirements has been documented and explained and the related data qualified accordingly. The qualification process is described in Section A.4.7.1

A.4.2 Accuracy

Analytical accuracy is defined as the nearness of a measurement to the true or accepted reference value. It is the composite of the random and systematic components of the measurement system and measures bias in the measurement system. The random component of accuracy is measured and documented through the analyses of spiked samples. Sampling accuracy is assessed by evaluating the results of spiked samples and laboratory control samples. Accuracy measurements are calculated as percent recovery by dividing the measured sample concentration by the true concentration and multiplying the quotient by 100.

Field accuracy is assessed by confirming that the documents of record track the sample from its origin, through transfer of custody, to disposal. The goal of field accuracy is for all samples to be

collected from the correct locations at the correct time, placed in a correctly labeled container with the correct preservative, and sealed with custody tape to prevent tampering. All samples in this sampling event were properly collected and forwarded to the laboratories as described above.

A.4.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition (EPA, 1987). Sample representativeness was achieved through the implementation of a sampling program designed to ensure proper sampling locations, number of samples, and the use of validated analytical methods. Representativeness was assessed through analysis of duplicate samples. Representativeness of the samples taken in this sampling event was assured by collecting the specified number of samples (DOE/NV, 1998) and by analyzing them by the approved analytical methods shown in Table A.3-2.

A.4.4 Completeness

Completeness is defined as a percentage of measurements made that are judged to be valid. A sampling and analytical requirement of 80 percent completeness was established and achieved for this project (DOE/NV, 1996b).

The specified sampling locations were utilized as planned. All samples were collected as specified in the CAIP (DOE/NV, 1998), and all sample containers reached the laboratory intact and properly preserved (when applicable). Sample temperatures were maintained during shipment to the laboratory, and sample chain of custody was maintained during sample storage and/or shipment.

A.4.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another (EPA, 1987). To ensure comparability, the Pesticide Release Sites field and sampling activities were performed and documented in accordance with approved procedures, and all samples were collected in accordance with the CAIP (DOE/NV, 1998). Approved standardized methods and procedures were also used to analyze and report the data (e.g., Contract Laboratory Program [CLP] and/or CLP-like data packages). This approach ensures that the data from this project

can be compared to other data sets. Based on the minimum comparability requirements specified in the Industrial Sites QAPP (DOE/NV, 1996b), all requirements were met.

Field (i.e., sample-handling) documentation, laboratory nonconformance reports, and the precision and accuracy of quality-control sample results were evaluated for their effect on the results of the associated environmental soil samples. The environmental sample results were then qualified according to processes outlined in the following sections. Documentation of the data qualifications resulting from these reviews is retained in project files as both hard copy and electronic media.

A.4.6 Tier I and Tier II Data Evaluations

All laboratory data from samples collected at the CAU 340 Pesticide Release Sites have been evaluated for data quality according to the EPA Functional Guidelines (EPA, 1994b and 1994c). These guidelines are implemented in a tiered process and are presented in the following text. No data rejected during the data evaluation process were used to draw the conclusions presented in the CADD. Only valid data, whether estimated (i.e., J-qualified) or not, were used.

The changes resulting from the data evaluation process were documented in project files and were summarized in memoranda for each sample delivery group (SDG). These memoranda are maintained in IT project files.

A.4.6.1 Tier I Evaluation

Tier I evaluation for both chemical and radiological 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 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.4.6.2 Tier II Evaluation

Tier II evaluation for both chemical and radiological analysis examines (but is not limited to):

Chemical:

- Sample date, preparation date, and analysis date for each sample
- Holding time criteria met
- QC 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
- Matrix spike/matrix spike duplicate (MS/MSD) percent recoveries (%R) and RPDs evaluated and applied to laboratory results/qualifiers
- Field duplicate RPDs evaluated using professional judgement and applied to laboratory results/qualifiers
- Laboratory duplicate RPDs evaluated and applied to laboratory results/qualifiers
- Surrogate %R evaluated and applied to laboratory results/qualifiers
- Laboratory control sample %R evaluated and applied to laboratory results/qualifiers
- Initial and continuing calibration evaluated and applied to laboratory results/qualifiers
- Internal standard evaluated and applied to laboratory results/qualifiers
- Recalculation of 10 percent of laboratory results from raw data

Radioanalytical:

- Blank contamination evaluated and applied to sample results/qualifiers
- Certificate of Analysis consistent with data package documentation
- Quality control sample results (duplicates, laboratory control samples, MS/MSD) evaluated and applied to laboratory result qualifiers
- Sample results, error, and minimum detectable activity evaluated and applied to laboratory result qualifiers

- Detector system calibrated to 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, weekly, and monthly background and calibration checks for peak energy, peak centroid, peak full-width half-maximum, and peak efficiency
- 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, emissions, particle energies, peak areas, and background peak areas support the identified radionuclide and its concentration

A.4.6.3 Tier III

Data quality considerations that are included in EPA data review functional guidelines (EPA, 1994b and 1994c) as a Tier III review include the additional evaluations:

Chemical:

- Mass spectrometer tuning criteria
- Initial and continuing calibration verification
- Internal standard evaluation
- Organic compound quantitation
- Inductively coupled plasma (ICP) interference check sample evaluation
- Graphite furnace atomic absorption quality control
- ICP serial dilution effects
- Recalculation of all laboratory results from raw data

Radioanalytical:

- QC sample results (e.g., calibration source concentration, percent recovery, and RPD) verified
- Radionuclides and their concentration 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

Tier III review of at least 5 percent of the sample analytical data was performed by Lockheed-Martin Environmental Services in Las Vegas, Nevada. Changes to the data resulting from this review have

been documented in IT project files. These changes did not affect the data included in the analytical summary tables in Section A.3.0.

A.4.7 Quality Control Samples

There were 15 trip blanks, 8 field blanks, 6 equipment rinsate blanks, 8 MS/MSD, and 11 field duplicates collected and submitted for laboratory analysis as shown in Table A.3-1. The samples and duplicates were assigned individual sample numbers and sent to the laboratory "blind." Additional samples were selected by the laboratory to be analyzed as laboratory duplicates. The field blanks were taken by placing distilled water into appropriate sample bottles and preserving them according to the requirements specified in the Industrial Sites QAPP (DOE/NV, 1996b). The equipment rinsate blanks were obtained by collecting the final rinse solution (i.e., distilled water), which was poured over the decontaminated sampling equipment into the appropriate sample bottles and preserved as applicable. The trip blanks, which were received sealed and preserved from the laboratory, were placed in each cooler containing samples for VOC analysis. The results of the QC samples are discussed in the following sections.

A.4.7.1 Field Quality Control Samples

Review of the field-collected blank analytical data for the investigation sampling indicates that cross-contamination from field methods did not occur during sample collection. Field and equipment rinsate blanks were analyzed for the parameters listed in Table A.3-2 and trip blanks were analyzed for VOCs only. None of the results for these field-collected blanks exceeded the minimum laboratory reporting limits (DOE/NV, 1998).

During the sampling event, 11 field duplicate soil samples were sent as blind samples to the laboratory to be analyzed for the investigation parameters listed in Table A.3-2. For these samples, the duplicate results precision (i.e., RPDs between the environmental sample results and their corresponding field duplicate sample results) were evaluated to the guidelines set forth in EPA Functional Guidelines (EPA, 1994b and 1994c). The EPA Functional Guidelines state that there are no required review criteria for field duplicate analyses comparability, but allow the data reviewer to exercise professional judgement. The RPD between the environmental samples results and their corresponding field duplicate sample results exceeded the 20 percent criteria stated in the Industrial

Sites QAPP (DOE/NV, 1996b) for some target analytes. The variability in the results between the environmental samples and their corresponding field duplicate samples could be attributed to nonhomogeneous samples and the difficulties associated with collecting identical field samples. It is expected that soil field duplicate results will have a greater variance than water matrices.

The laboratory duplicate samples were compared to the criteria set forth in the EPA Functional Guidelines (EPA, 1994c) and the associated sample results were qualified accordingly. Both detections and nondetections have been qualified as estimated (J and UJ, respectively) if the relative percent difference between an environmental sample and its laboratory duplicate fell outside established criteria.

Eight field samples were selected for use as MS/MSD samples. The percent recoveries of these samples (a measure of accuracy) and the relative percent differences in these sample results (a measure of precision) were compared to EPA Functional Guideline criteria (EPA, 1994b and 1994c). The results were used to qualify associated environmental sample results accordingly.

The EPA Functional Guidelines for review of organic data state that no data qualification action is taken on the basis of MS/MSD results alone. The data reviewer exercises professional judgement in considering these results in conjunction with the results of laboratory control samples (LCSs) and other QC criteria in applying qualifications to the data.

The inorganic data review in EPA Functional Guidelines allows professional judgement to be applied in evaluating the results of both matrix spikes and laboratory duplicates. Generally, if spike recovery is greater than the upper acceptance limits, nondetections are not qualified. If spike recovery is greater than the upper acceptance limit or less than the lower acceptance limit, positive results are qualified as estimated (J) and nondetections are qualified as estimated (UJ). If spike recovery is less than 30 percent (grossly low), positive results are not qualified and nondetections are qualified as unusable (R).

A.4.7.2 Laboratory Quality Control Samples

Analysis of method QC blanks and surrogate spikes for organic analyses, method blanks, preparation blanks, initial and continuing calibration blanks for total metals and TCLP metals, and LCS were

performed for each SDG by Quanterra Environmental Services laboratory. The results of these analyses were used to qualify associated environmental sample results according to EPA Functional Guidelines (EPA, 1994b and 1994c).

The EPA Functional Guidelines (EPA, 1994b and 1994c) state that no qualification action is taken if a compound is found in an associated blank, but not in the sample or if a compound is found in the sample, but not in an associated blank. The action taken when a compound is detected in both the sample and the associated blank varies depending upon the analyte involved and is described in the "The 5X/10X Rule."

For most VOCs, SVOCs, herbicides, and pesticides, if an analyte is detected in the sample and was also detected in an associated blank the result is qualified as undetected (U) if the sample concentration is less than five times (5X) the blank concentration.

For the common laboratory contaminants (e.g., methylene chloride, acetone, 2-butanone [methylethyl ketone or MEK], and phthalate esters [especially bis(2-ethylhexyl)phthalate]), the factor is raised to ten times (10X) the blank concentration. The sample result is elevated to the quantitation limit if it is less than the quantitation limit or remains unaltered if the sample result is greater than or equal to the quantitation limit.

For inorganics (i.e., metals), sample results greater than the instrument detection limit, but less than five times (5X) the amount found in an associated blank, are qualified as undetected (U). There are no metallic common laboratory contaminants, so there is no "10X Rule" for metals, and the sample result is never altered. When applying the 5X criteria to soil sample data or calibration blank data, the raw data results are used to evaluate and qualify the reported results on the Certificate of Analysis.

Surrogate spikes, or system monitoring compounds, are added to the environmental samples analyzed by chromatographic techniques for VOCs, SVOCs, gasoline, and diesel, for the Q15-11, Q800, and Skid Huts sites. Surrogate compounds are analytes that are not expected to be present in associated environmental samples, but behave the same as similar target compounds chromatographically. Known amounts of each surrogate are added prior to sample preparation and are carried throughout the preparation/analysis procedure. The percent recoveries of these surrogate

compounds give some measure of the anticipated recoveries of the target compounds whose chromatographic behavior they mimic.

If any surrogate percent recoveries are out of the acceptable range (which differs for each surrogate in each method), laboratory protocol calls for the sample to be reprepared and/or reanalyzed. When the surrogate recoveries are acceptable on the second run, only the second analysis results are reported. When both analyses yield the same unacceptable range, the results of both analyses are reported.

The evaluation of surrogate spike percent recovery results is not straightforward. The functional guidelines suggest several optional approaches, but require the data reviewer to exercise professional judgement in reviewing surrogate data and qualifying associated data as estimated (J or UJ, for detections or nondetections, respectively) or unusable (R). Documentation of data qualifications resulting from the application of these guidelines is retained in the project files as both hard copy and electronic media.

One laboratory duplicate analysis for metals and TCLP metals was performed for each SDG that reported total and TCLP metals. The duplicate results are compared to the results of the original sample to give a measure of analytical laboratory precision. If the results from a duplicate analysis for a particular analyte fall outside the control limits, the EPA Functional Guidelines for Inorganic Data Review (EPA, 1994c) call for all results for that analyte in all associated samples of the same matrix to be qualified as estimated (J). Documentation of data qualifications resulting from the application of these guidelines is retained in the project files as both hard copy and electronic media.

Laboratory control samples, also known as blank spikes, consist of known quantities of target compounds added to purified sand or deionized, distilled water and analyzed along with the environmental samples in the sample delivery group. The percent recoveries of the compounds in the LCS give a measure of laboratory accuracy. The functional guidelines call for the data reviewer to use professional judgement to qualify associated data according to established criteria. Documentation of data qualifications resulting from the application of these guidelines is retained in project files as both hard copy and electronic media.

A.4.8 Field Nonconformances

During the corrective action investigation, one QA surveillance was conducted by IT Corporation to verify that sampling activities were performed in accordance with applicable requirements. The results of the surveillance indicated no findings, deficiencies, or nonconformances with sampling activities as they met the requirements of the plans and procedures governing the activities at the site. Documentation of these results is retained in project files.

A.4.9 Laboratory Nonconformances

Laboratory nonconformances are generally due to inconsistencies in analytical instrumentation operation, sample preparations, extractions, and fluctuations in internal standard and calibration results. Several laboratory nonconformances were documented for this project. These nonconformances have been accounted for in the data qualification process. A significant amount of data were rejected as a result of these nonconformances. Confirmatory sampling was conducted to compensate for the rejected data. The results of the confirmatory sampling are incorporated in this CADD. Documentation of these results is retained in project files.

A.5.0 Summary

Analysis of the data generated from corrective action investigation activities conducted at the Pesticide Release Sites indicates the following:

- Many of the total pesticides analytical results for the Q800 and Skid Huts sites and the disturbed area between the two CASs exceed the PALs. These include 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Chlordane, Aldrin, Dieldrin, Heptachlor, and Heptachlor Epoxide.

- None of the total pesticides analytical results exceeded the PALs at the Q15-11 site.

- Leachable Chlordane was detected at 0.121 mg/L and 0.03 mg/L in sample numbers SKH0010A and SKH0010B respectively (Note: concentrations are the sum of the reported alpha- and gamma-Chlordane isomers). All other sample leachable concentrations were not detected or were within the maximum allowable concentrations for the toxicity characteristic (EPA, 1996a); therefore, the extent of characteristic waste is believed to be limited to the stained soil from which these two samples were collected.

- Total petroleum hydrocarbon concentrations did not exceed the NDEP action level of 100 mg/kg for diesel, gasoline, or waste oil ranges. Unknown hydrocarbons were detected at concentrations exceeding 100 mg/kg. These were associated with elevated pesticide concentrations at both the Q800 and Skid Huts sites.

- The PALs were not exceeded in any of the samples collected for total VOCs, total SVOCs, total herbicides, TCLP metals, or total RCRA metals with the exception of arsenic.

- Arsenic concentrations were above the PAL of 2.4 mg/kg and ranged from 3.3 mg/kg to 12.6 mg/kg with one exception, sample Q230035C, that had an arsenic concentration of 30.6 mg/kg. These arsenic concentrations are not unusual for the State of Nevada and represent naturally occurring (background) concentrations.

- Radiological analytical results were not distinguishable from background concentrations (DOE/NV, 1998).

A.6.0 References

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Appendix B

Cost Estimates

EST: CAU 340-CADD alt 2	**BN ENVIRONMENTAL RESTORATION**	
WBS : 104010213090302	**COST ESTIMATE SUMMARY**	DATE: 11/16/98

TO: ANGELA OLSON - ENVIRONMENTAL RESTORATION FROM: ABDEL AGALLOUCH- ER Project Controls

SUBJECT: **CADD ALTERNATIVE 2: Clean Closure by Excavation and Disposal** TEC: **$317,342**

WORK PACKAGE: CAU 340 - Pesticide Release Sites TAP: Spill Sites Source Group

TYPE OF ESTIMATE				TYPE OF WORK	
	ORDER OF MAGNITUDE		PRELIMINARY TITLE II		RI / FS
	PLANNING/STUDY		WORK ORDER	X	REMEDIATION
X	CONCEPTUAL/BUDGET		COMPARATIVE	X	CONSTRUCTION
	TITLE I / PRELIMINARY		OTHER		OTHER

BN REMEDIATION PROJECT			WORK TO BE PERFORMED BY			
ESTIMATOR:	Abdel Agallouch	702-295-5275	X	DOE PRIME CONTRACTOR		NATIONAL LAB
TASK MGR:	Angela Olson	702-295-7276		NTS GENERAL		SUBCONTRACT
PROJECT MGR:	Steve Nacht	702-295-7234		NTS MAINTENANCE		OTHER

STATEMENT OF WORK :

This estimate has been prepared at the request of DOE/NV to provide remedial alternative costs for closure of Corrective Action Unit (CAU) 340, an environmental restoration site listed in the Federal Facilities Agreement and Consent Order (FFACO). CAU 340 consists of the Area 23 Quonset Hut, Q800 Pesticide Release Ditch; the Area 23 Skid Huts Pesticide Storage; and the Area 15 Quonset Hut, Q15-11 Pesticide Storage. The Q15-11 site is not included in this estimate because no COCs were identified. However, COCs were identified in the disturbed area between the Area 23 sites; therefore, the disturbed area is included in this cost estimate, excluding the main stormwater channel adjacent to the skid Huts. This cost estimate summary assumes the sites will be closed by Clean Closure by Excavation and Disposal. This estimate will be used to identify the most cost effective alternative for closure of the site while being protective of human health and the environment.

Total Estimated Costs are intended for comparative analysis of remedial field work and field management only. Costs for Project Management, project support, or other overhead functions are not included. Assume additional cost will be required for documentation for Clean Closure alternative including extended HASP, and Construction Work Plan.

SCOPE :

Clean closure of Quonset 800/Skid Huts and associated area and dispose of waste. Field work includes removal and disposal of approximately 2460 CY of non hazardous (approximately 1400 CY for Quonset 800, 200 CY for the Skid Huts and 860 CY for the disturbed area between the sites) and 6 CY of hazardous waste which exhibits the characteristic of toxicity for Chlordane.

BASIS OF ESTIMATE/ ASSUMPTIONS :

- Total volume includes an expansion factor of 20 percent
- *Quonset 800*: Removal and disposal of approximately 1400 CY of non hazardous soil at the Quonset 800 (30' X 500' X 2' and 65' X 20' X 1' deep).
- *Skid Huts*: Removal and disposal of approximately 200 CY of non hazardous soil at the Skid Huts (40' X 58' X 2' deep) and 6 CY (equivalent of 1212 gallons) of hazardous waste which exhibits the toxicity characteristic for Chlordane.
- *Disturbed Area*: Removal and disposal of approximately 860 CY of non hazardous soil at the area between sites (300' X 25' X 1' and 11,885 sq.ft X 1' deep).
- Based on the above three different areas: the total volume will be approximately 2466 CY
- Nonhazardous soil will be disposed of in the Area 23 Sanitary Landfill.
- Clean native soil will be used to backfill excavation to original topography, if necessary for drainage control.

Review / Concurrence:

Abdel Agallouch — Estimator — 11/16/98 — Date

Angela Olson — Checked By — 11/16/98 — Date

EST: CAU 340-CADD alt 2	**BN ENVIRONMENTAL RESTORATION**	
WBS : 104010213090302	**COST ESTIMATE SUMMARY**	**DATE:** 11/16/98

- Assume Self Contained Breathing Apparatus (SCBA) will be needed for 4 hrs/day for laborers and operators.
- 42 Verification samples will be analyzed for total pesticides and pesticides using TCLP. 38 of these samples will be for surface soil and 4 will be for QA/decontamination of equipment. Results will be used to determine whether or not further excavation is required.
- The total number of loads is approximately 165 loads @ 15 CY/Load
- Field work will be completed in approximately 2 weeks.

ESCALATION:

Escalation is not included in this estimate. All costs are in FY99 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES

FY99 indirect rates, Revision 0, effective 10/1/98 were applied using the BN FY98 cost model.

COST SUMMARY - TOTAL ESTIMATED COST:	**$317,342**
Quonset 800:	**$122,318**
Skid Huts:	**$119,886**
Disturbed Area:	**$75,138**

EST: CAU 340 CADD alt 3	**BN ENVIRONMENTAL RESTORATION**	
WBS : 104010213090302	**COST ESTIMATE SUMMARY**	DATE: 11/16/98

TO: ANGELA OLSON - ENVIRONMENTAL RESTORATION FROM: ABDEL AGALLOUCH-ER Project Controls

SUBJECT: **CADD ALTERNATIVE 3: Closure in Place by Protective Cover** TEC: **$818,889**

WORK PACKAGE: CAU 340 - Pesticide Release Sites TAP: Spill Sites Source Group

TYPE OF ESTIMATE				TYPE OF WORK	
	ORDER OF MAGNITUDE		PRELIMINARY TITLE II		RI / FS
	PLANNING/STUDY		WORK ORDER	X	REMEDIATION
X	CONCEPTUAL/BUDGET		COMPARATIVE	X	CONSTRUCTION
	TITLE I / PRELIMINARY		OTHER		OTHER

BN REMEDIATION PROJECT		WORK TO BE PERFORMED BY			
ESTIMATOR:	Abdel Agallouch 702-295-5275	X	DOE PRIME CONTRACTOR		NATIONAL LAB
TASK MGR:	Angela Olson 702-295-7276		NTS GENERAL		SUBCONTRACT
PROJECT MGR:	Steve Nacht 702-295-7234		NTS MAINTENANCE		OTHER

STATEMENT OF WORK :

This estimate has been prepared at the request of DOE/NV to provide remedial alternative costs for closure of Corrective Action Unit (CAU) 340, an environmental restoration site listed in the Federal Facilities Agreement and Consent Order (FFACO). CAU 340 consists of the Area 23 Quonset Hut, Q800 Pesticide Release Ditch; the Area 23 Skid Huts Pesticide Storage; and the Area 15 Quonset Hut, Q15-11 Pesticide Storage. The Q15-11 site is not included in this estimate because no COCs were identified. However, COCs were identified in the disturbed area between the Area 23 sites; therefore, the disturbed area is included in this cost estimate, excluding the main stormwater channel adjacent to the skid huts. The following alternative will be used for closure of the site: Closure in Place (CIP) by Protective Cover. This will be accomplished by installing concrete liners in the two existing drainage channels (Q800 ditch, ditch adjacent to the Q800 ditch) and concrete covers where surface drainage is not an issue. This estimate will be used to identify the most cost effective alternative for closure of the site while being protective of human health and the environment. Total Estimated Costs are intended for comparative analysis of remedial field work and field management only. Costs for Project Management, project support, or other overhead functions are not included. Assume additional cost will be required for documentation for Closure In Place alternative including extended HASP, and Construction Work Plan.

SCOPE :

Installation of concrete liners in the two existing drainage ditches, clearing, grubbing, bentonite/soil liner walls in the ground along both sides of existing ditches, soil concrete CAP over the Skid Hut site after removal of approximately 6 CY of soil as hazardous waste and project team to be included.

BASIS OF ESTIMATE/ ASSUMPTIONS :

- Work to be done by BN Construction
- Project Team is included at this time
- Work will be done during normal work hours (No overtime provisions allowed)
- Estimate is for budget costs at this time
- Assume a level "B" work environment
- Portable Decon Unit for vehicle decon process will be provided
- Fencing of perimeter contaminated areas not included.
- Disposal of all contaminated waste by others
- Estimate based on aerial photo and existing sketches provided
- Cost includes installation of a geomembrane liner
- Assume a total volume of 6 CY (equivalent of 1212 gallons) of soil will be disposed of as hazardous waste which exhibits the toxicity characteristic for Chlordane.
- Assume 5 years for long term maintenance including annual inspections and minimal repairs.

Review / Concurrence:

Abdel Agallouch — Estimator — 11/16/98 — Date

Angela Olson — Checked By — 11/16/98 — Date

EST: CAU 340 CADD alt 3	**BN ENVIRONMENTAL RESTORATION**	
WBS : 104010213090302	**COST ESTIMATE SUMMARY**	DATE: 11/16/98

ESCALATION:

Escalation is not included in this estimate. All costs are in FY99 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES

FY99 indirect rates, Revision 0, effective 10/1/98 were applied using the BN FY98 cost model.

COST SUMMARY - TOTAL ESTIMATED COST:	**$818,889**
Quonset 800:	**$441,063**
Skid Huts:	**$75,926**
Disturbed Area:	**$301,900**

Distribution

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