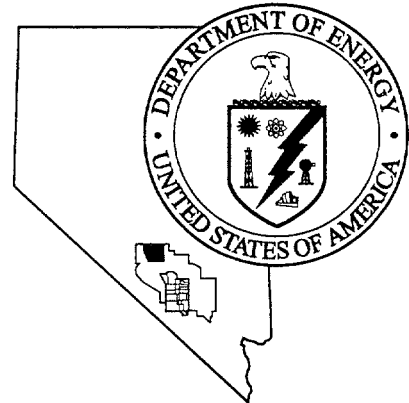


Nevada
Environmental
Restoration
Project

DOE/NV--614



Corrective Action Plan
for Corrective Action Unit 407:
Roller Coaster RADSAFE Area,
Tonopah Test Range, Nevada

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Revision: 0

May 2000

Environmental Restoration
Division

U.S. Department of Energy
Nevada Operations Office

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**CORRECTIVE ACTION PLAN FOR
CORRECTIVE ACTION UNIT 407:
ROLLER COASTER RADSAFE AREA,
TONOPAH TEST RANGE, NEVADA**

**Prepared for
U. S. Department of Energy
Nevada Operations Office
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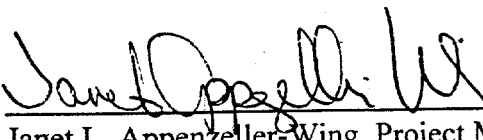
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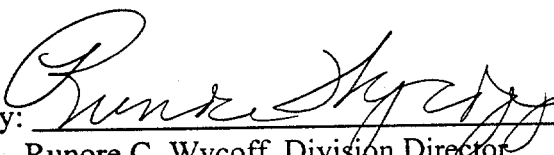
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**CORRECTIVE ACTION PLAN FOR
CORRECTIVE ACTION UNIT 407:
ROLLER COASTER RADSAFE AREA,
TONOPAH TEST RANGE, NEVADA**

Approved by: 
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Date: 5/10/00

Approved by: 
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Environmental Restoration Project

Date: 5/10/00

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APPENDIX A-2 Project Organization

APPENDIX B Flood Study

APPENDIX C NDEP Closure Plan Comment Response

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ACRONYMS AND ABBREVIATIONS

BN	Bechtel Nevada
CADD	Corrective Action Decision Document
CAP	Corrective Action Plan
CAU	Corrective Action Unit
COCs	Constituent(s) of Concern
CR	Closure Report
DOE/NV	U.S. Department of Energy, Nevada Operations Office
FFACO	Federal Facility Agreement and Consent Order
FIDLER	Field Instrument for the Detection of Low Energy Radiation
FMP	Field Management Plan
ft	foot (feet)
gal	gallon
g/cm ³	grams per cubic centimeter
km	kilometer(s)
km ²	square kilometer(s)
L	liter
m	meter
mi	mile(s)
NDEP	Nevada Division of Environmental Protection
NTS	Nevada Test Site
PPE	Personal Protective equipment
SITA	Sampling, Inspection, Testing, and Acceptance Plan
SSHASP	Site-Specific Health and Safety Plan
RCRSA	Roller Coaster RADSAFE Area
REOP	Real-Estate/Operations Permit
RWP	Radiological Work Permit
TTR	Tonopah Test Range

EXECUTIVE SUMMARY

This Corrective Action Plan (CAP) has been prepared for the Roller Coaster RADSAFE Area Corrective Action Unit 407 in accordance with the Federal Facility and Consent Order (Nevada Division of Environmental Protection [NDEP] et al., 1996). This CAP provides the methodology for implementing the approved Corrective Action Alternative as listed in the Corrective Action Decision Document (U.S. Department of Energy, Nevada Operations Office, 1999).

The RCRSA was used during May and June of 1963 to decontaminate vehicles, equipment, and personnel from the Clean Slate tests. The Constituents of Concern (COCs) identified during the site characterization include plutonium, uranium, and americium. No other COCs were identified

The following closure actions will be implemented under this plan:

- Remove and dispose of surface soils which are over three times background for the area. Soils identified for removal will be disposed of at an approved disposal facility. Excavated areas will be backfilled with clean borrow soil from a nearby location.
- An engineered cover will be constructed over the waste disposal pit area where subsurface COCs will remain.
- Upon completion of the closure and approval of the Closure Report by NDEP, administrative controls, use restrictions, and site postings will be used to prevent intrusive activities at the site. Barbed wire fencing will be installed along the perimeter of this unit.

Post closure monitoring will consist of site inspections to determine the condition of the engineered cover. Any identified maintenance and repair requirements will be remedied within 90 working days of discovery and documented in writing at the time of repair. Results of all inspections/repairs for a given year will be addressed in a single report submitted annually to the NDEP.

1.0 INTRODUCTION

This Corrective Action Plan (CAP) has been prepared for the Roller Coaster RADSAFE Area (RCRSA) Corrective Action Unit (CAU) 407 in accordance with the Federal Facility and Consent Order (FFACO) (Nevada Division of Environmental Protection [NDEP] et al., 1996). This CAP provides the methodology for implementing the approved Corrective Action Alternative as listed in the Corrective Action Decision Document (CADD) (U.S. Department of Energy, Nevada Operations Office [DOE/NV], 1999).

CAU 407 is located at the Tonopah Test Range (TTR), Nevada. The TTR is approximately 225 kilometers (km) (140 miles [mi]) northwest of Las Vegas, Nevada (Figure 1). The RCRSA is located on the northeast corner of the intersection of Main Road and Browne's Lake Road, which is approximately 8 km (5 mi) south of Area 3 (Figure 1). The RCRSA was used during May and June of 1963 to decontaminate vehicles, equipment, and personnel from the Clean Slate tests.

Investigation of RCRSA was conducted from June through November of 1998. Gamma spectrometry, isotopic plutonium, and isotopic uranium analytical results above the preliminary action levels were reported for both surface and subsurface soils at the site (DOE/NV, 1999). The Constituents of Concern (COCs) include plutonium, uranium, and americium. No other COCs were identified.

1.1 PURPOSE

The purpose of this CAP is to provide the methodology for closing CAU 407, RCRSA as proposed in the CADD (DOE/NV, 1999).

1.2 SCOPE

Detailed information of the site history and results of the investigation activities can be found in the Corrective Action Investigation Plan (DOE/NV, 1998). The following closure actions will be implemented under this plan:

- Remove and dispose of surface soils which are over three times background for the area. Soils identified for removal will be disposed at an approved disposal facility. Excavated areas will be backfilled with clean borrow soil located near the site.
- An engineered cover will be constructed over the waste disposal pit area where subsurface COCs will remain (Figure 2).

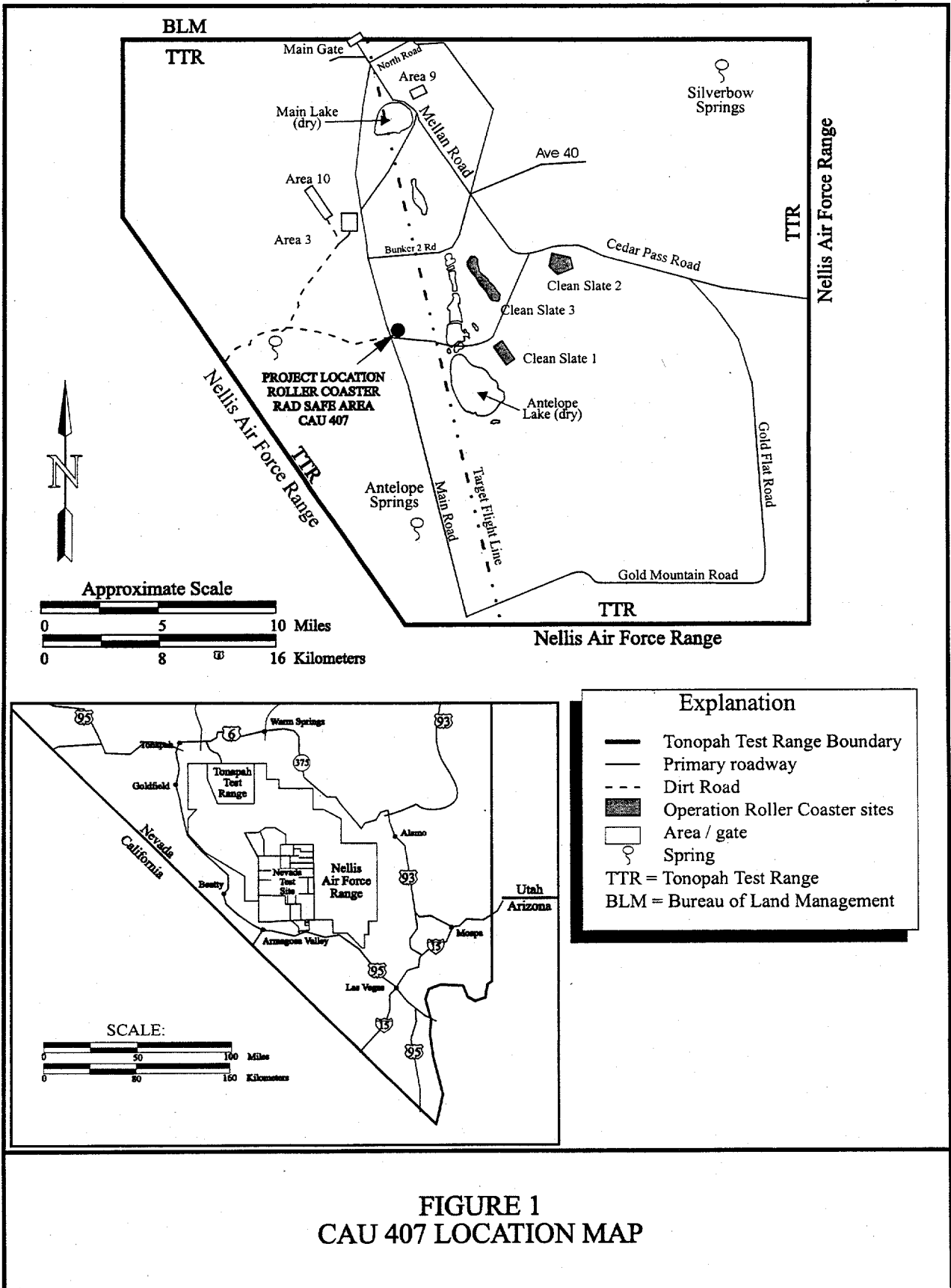


FIGURE 1
CAU 407 LOCATION MAP

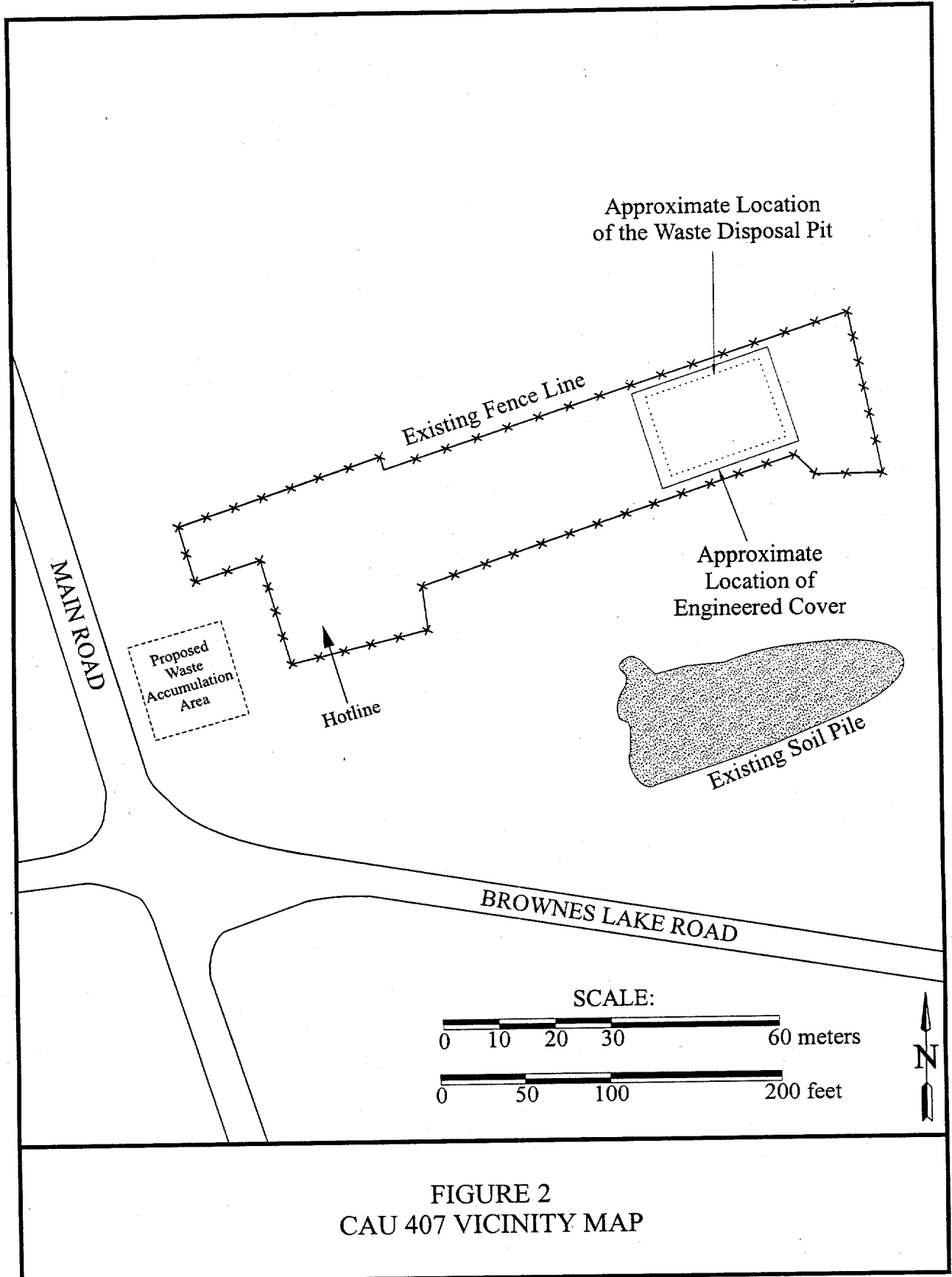


FIGURE 2
CAU 407 VICINITY MAP

- Upon completion of the engineered cover and approval of the CAP and Closure Report (CR) by NDEP, administrative controls, use restrictions, and site postings will be used to prevent intrusive activities at the site. Barbed wire fencing will be installed along the perimeter of this unit.

1.3 CORRECTIVE ACTION PLAN CONTENTS

This CAP is divided into the following sections in accordance with the approved FFACO Corrective Action Plan outline:

Section 1.0 - Introduction

Section 2.0 - Detailed Statement of Work

Section 3.0 - Schedule

Section 4.0 - Post-Closure Monitoring Plan

Section 5.0 - References

The appendices of this document have been modified from the approved FFACO outlined. The following FFACO outline appendices have not been included or revised as indicated below:

- **APPENDIX A-1 Engineering Specifications and Drawings**
This appendix is identified as Appendix A-1 Engineering Drawings and Sampling, Inspection, Testing, and Acceptance Plan.
- **APPENDIX A-2 Sampling and Analysis Plan**
This appendix is not included because no physical samples will be collected for analysis. Clean-up verification will be accomplished using field screening instrumentation which is discussed in Section 2.4.
- **APPENDIX A-3 Project Organization**
This appendix is identified as Appendix A-2.

The appendices included in this document are provided as follows:

- **APPENDIX A-1 Engineering Drawings and Sampling, Inspection, Testing, and Acceptance Plan**
- **APPENDIX A-2 Project Organization**
- **APPENDIX B Flood Study**

- APPENDIX C NDEP Closure Plan Comment Response

This plan was developed using information and guidance provided from the following documents:

Bechtel Nevada, 1999, Radioactive Waste Tracking, Handling, and Management at the NTS, OP-2151.304, Las Vegas, NV.

Bechtel Nevada, 1998, General Radiological Control Technician Field Instructions L-A14.107.H, Revision 1, Las Vegas, NV.

Fayer, M. J. and T. L. Jones, 1990, UNSAT-H Version 2.0: Unsaturated Soil Water and Heat Flow Model, Pacific Northwest Laboratory, Richland, WA. PNL-6779 UC-702.

Levitt, D. G., Sully, M. J., Dozer, B. L., and Lohrstorfer, C. F., 1999. Determining the Performance of an Arid Zone Radioactive Waste Site Through Site Characterization, Modeling and Monitoring, Proceedings of Waste Management '99 Conference, Tucson, Arizona.

Nevada Division of Environmental Protection, U.S. Department of Energy, and U.S. Department of Defense, 1996, Federal Facility Agreement and Consent Order (FFACO) of 1996.

U.S. Department of Energy, Nevada Operations Office, 1998. Corrective Action Investigation Plan for the Roller Coaster RADSAFE Area, Corrective Action Unit 407: Nevada Test Site, Nevada Rev.0, DOE/NV--503. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office, 1999. Corrective Action Decision Document for Corrective Action Unit 407: Nevada Test Site, Nevada Rev.0, DOE/NV--567. Las Vegas, NV.

U.S. Environmental Protection Agency, 1999, Title 29 Code of Federal Regulations 1910.120, Hazardous Waste Operations and Emergency Response, Washington, D.C.

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2.0 DETAILED STATEMENT OF WORK

2.1 APPROVED ALTERNATIVE IMPLEMENTATION

Based on the site characterization results (DOE/NV, 1999), the CADD recommends removal of the impacted surface soils and construction of an engineered cover over the portion of the site identified as the waste disposal pit. A detailed discussion of the closure strategy follows.

2.1.1 Preplanning and Site Preparation

The closure of RCRSA will include preplanning and site preparation before closure activities begin:

- Preparation of planning documents such as the Site-Specific Health and Safety Plan (SSHASP), and the Field Management Plan (FMP).
- Site preparation including utility clearance, work permits, and the verification of the surface hot spots.
- Identification and approval of a water source for dust suppression and other construction activities.
- Scheduling and coordination of work with Construction and Waste Management.

2.1.1.1 Site-Specific Health and Safety Plan/Hazard Analysis

A SSHASP and Hazard Assessment will be prepared. A task kick-off meeting will be held to discuss the scope of work and prepare the preliminary hazard analysis. A copy of the SSHASP will be kept on-file in the Bechtel Nevada (BN) Environmental Restoration and the BN Environmental, Safety, and Health Division Offices in Mercury, Nevada. The original document will be kept by the site supervisor at the work site. The SSHASP will be available on-site for review and signature by all workers prior to the beginning work at the site. The SSHASP will provide a detailed, job-specific plan covering protection against accidents or exposure of workers to contamination.

2.1.1.2 Field Management Plan

A FMP will be prepared for the closure activities. The plan will outline how the work will be accomplished and provide a detailed schedule for the project. In addition, it will identify the responsible parties for each aspect of the project and determine how decisions will be made. A

copy of the FMP will be placed on file at the BN Environmental Restoration offices in Mercury, Nevada, and a copy will also be available at the project field site.

2.1.1.3 National Environmental Policy Act Documentation

A National Environmental Policy Act Checklist will be completed. Information from a biologic survey will be used to report on the condition of existing trees, shrubs, grassed area, and wildlife immediately adjacent to the area which may be affected by construction activities, equipment and material storage areas, and access routes.

2.1.2 Closure Field Activities

2.1.2.1 Removal of Surface Impacted Soils

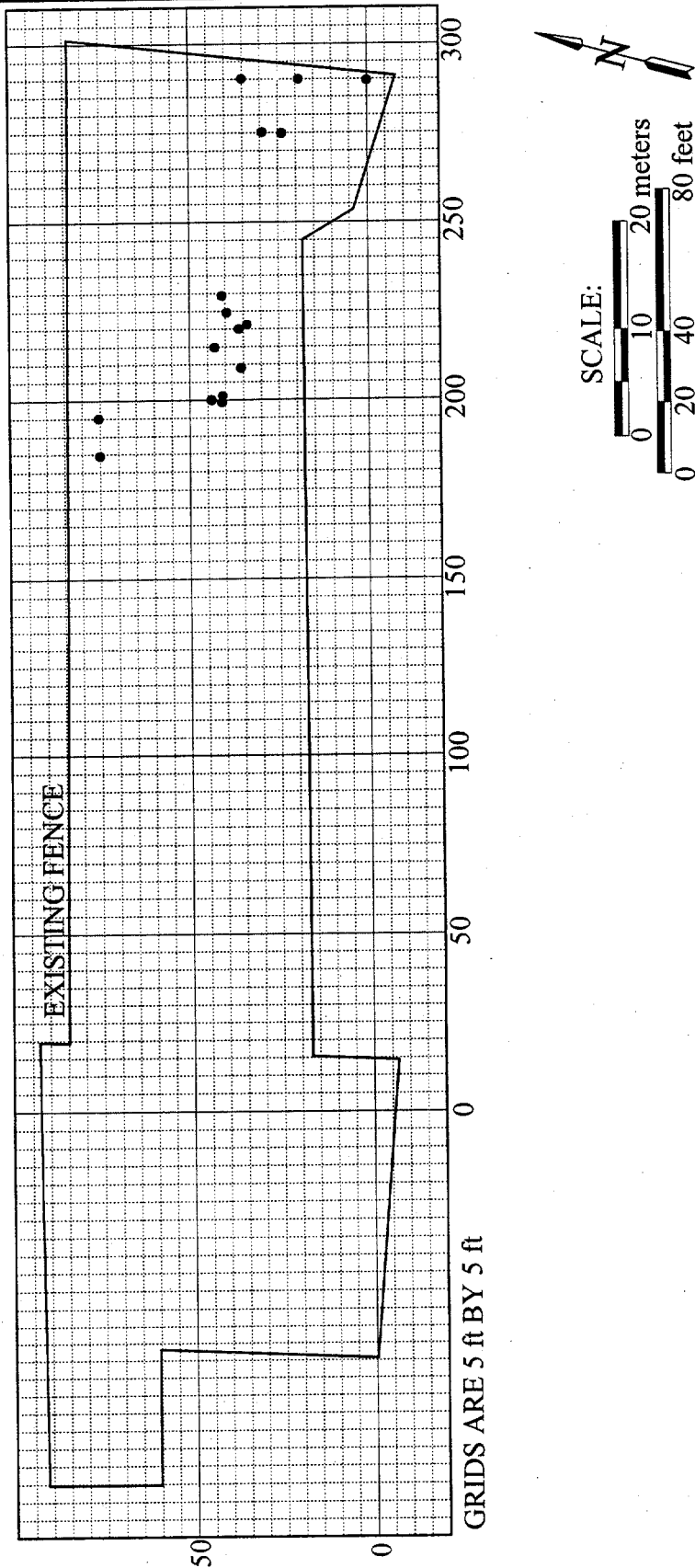
Based on the surface radiation surveys for gross radiological activity, 16 surface locations were identified with activity readings which exceeded three times background as determined by the Field Instrument for the Detection of Low Energy Radiation (FIDLER) for the area (DOE/NV, 1999) (Figure 3). These soils will be removed. Excavated soil will be managed as low level radioactive waste. Impacted soil will be placed into either 55-gallon (gal) drums or B-25 containers following BN Procedure OP-2151.304, Radioactive Waste Tracking, Handling, and Management at the NTS, (BN, 1999) and stored temporarily in a waste management area (Figure 2) to await disposal following Section 2.3 of this CAP.

2.1.2.1.1 Excavation

The surface impacted soils will be excavated to a depth of 0.15 meters (m) [0.5 feet (ft)] over an area of approximately 0.18 square meters (2 square feet) . Verification screening will be performed after this soil has been removed. Screening will be conducted following Section 2.4 of this CAP. If field screening shows that surface readings remain greater than three times background, more soil will be excavated until the hot spot has been removed to a point where surface readings are below three times background.

2.1.2.1.2 Site Restoration

Once the hot spots have been removed as previously described, the excavated areas will be refilled with clean fill material to return the site to its original grade. Disturbances in the clean-closed areas, will be revegetated using direct seeding of plants native to the area. Straw will be applied as a mulch after broadcast seeding.



Background = 3,600 counts per minute using a FIDLER detector.

FIGURE 3
 LOCATIONS OF SURFACE SOILS IDENTIFIED AS OVER THREE TIMES BACKGROUND
 FOR LOW ENERGY GAMMA AT THE CAU 407 RCRSA

2.1.2.2 Engineered Cover Construction

The engineered cover design is a 0.6 m (2 ft) thick mono-layer of clean fill which will cover the historic waste pit (Figure 2). The main purpose of this layer is to provide an additional level of protection to the hypothetical future land user from subsurface radionuclides which will remain. Although the dose assessment presented in the CAU 407 CADD (DOE/NV, 1999) indicates that surface hot spots do not require removal if a cover is constructed, the radioactive soils will be removed, as discussed in section 2.1.2.1, prior to building the cover.

The transport of COCs from the site is not considered a viable pathway according to the Nevada Administrative Code 445A.227 (2) (a-k) criteria as presented in the CAU 407 CADD (DOE/NV, 1999). Therefore, this cover design is not meant to inhibit natural infiltration. The cover, will however, be revegetated with local native plants to help restore it to natural conditions. Once established, plants will aid in recycling infiltrated precipitation through transpiration although this is not their intended purpose. Appendix A provides the detailed engineering plan for the vegetated cover design.

2.1.2.2.1 Design Criteria

Although Resource Conservation and Recovery Act landfill closure regulations are not applicable for CAU 407, the cover design will be protective of the underlying material and environment. The design criteria are based on: the precipitation run-on and runoff, consolidation, and maintenance and repair.

2.1.2.2.1.1 Run-on/Run-off

Effects from run-on can be mitigated by grading the site to facilitate drainage. Based on a flood analysis to evaluate the flood hazard from the 25-year 6-hour storm, the installation of diversion structures such as berms and/or channels to direct run-on away from the cover is not necessary. Effects from precipitation runoff will be mitigated with slope, and compaction (Appendix A).

Based on the site conditions discussed above, the necessary design criteria for minimizing precipitation run-on and runoff is to maintain a minimum slope of 2.0 percent on the cover surface.

2.1.2.2.1.2 Consolidation

The waste pit at the RCRSA has been filled in since 1963 (DOE/NV, 1999). No evidence of settlement or consolidation has appeared at the surface to date. The average dry bulk density of cores extracted from the backfilled areas at the RCRSA is 1.61 grams per cubic centimeter (g/cm^3). Values of dry bulk density typically range from 1.1 to 1.6 g/cm^3 (Jury et al., 1991). Given that the dry bulk density is on the high end of the range of bulk density for soils there is no reason to believe that further consolidation will occur.

The proposed cover will not be built to a compaction specification. The thickness of the proposed cover (0.6 m [2 ft]) is thin enough that significant consolidation after placement will not be an issue.

2.1.2.2.1.3 Maintenance and Repair

Maintenance and repair were considered in the design since a cover should be designed to minimize maintenance/repair activities. Erosion and intrusive activities can impact the cover performance and influence the need for maintenance or repairs. Erosion is controlled by the presence of established vegetation, the slope, and gradation of the cover material. Intrusive activities from animals will be discouraged by the installation of fencing. Intrusion into the cover from human activities will be discouraged by the installation of a fence and signs. Therefore, the design criteria will require the following:

- The perimeter of the cover area will be fenced to minimize damage to the cover by humans and large animals.
- The perimeter of the cover area will have signs posted indicating the site conditions and prohibited activities.
- Periodic inspection of the cover will be conducted and repair/maintenance performed as required. The details of the cover inspection plan can be found in Section 4.0.

For details regarding the design criteria for the covers, see the Sampling, Inspection, Testing, and Acceptance (SITA) Plan (Appendix A).

2.1.2.3 Establishing Vegetation

The objective of revegetation is to provide for the long-term stabilization of the RCRSA cover and other areas disturbed during the construction of the cover. Vegetation on the cover will aid

in reducing surface erosion although the primary purpose is to restore the site back to the natural surrounding conditions.

Vegetation will be established on the cover using direct seeding of local native vegetation. Prior to seeding, the cover surface will be ripped, plowed, and/or disced to a depth of approximately 0.4 m (1.3 ft). Straw will be applied to the area as a mulch after broadcast-seeding. A seed mixture of native plant species will be applied at a rate of 16.8 kilograms per hectare (15 pounds per acre) of pure live seed. A seed mixture using seed from native, shallow-rooted plant species will be applied between early October and late November. The seed planting time allows for dormancy breaking requirements to be met, and that the seed would be in the ground prior to the winter precipitation. Species in the seed mixture will include a combination of the following:

- Budsagebrush (*Artemisia spinescens*)
- Fourwing Saltbush (*Atriplex canescens*)
- Shadscale (*Atriplex confertifolia*)
- Winterfat (*Krascheninnikovia lanata*)
- Fluff Grass (*Erioneuron pulchellum*)
- Desert Globemallow (*Sphaeralcea ambigua*)
- Indian Ricegrass (*Achnatherum hymenoides*)

The objective for revegetation on the cover will be to establish vegetation similar to native undisturbed areas as quickly as possible. The goal is to establish a population of plant species equal to 25-50 percent of the native undisturbed areas.

Disturbances, other than the cover, e.g. the clean-closed areas, will be revegetated the same as the cover.

2.1.2.4 DECONTAMINATION OF EQUIPMENT

All equipment and materials used on-site will be surveyed for radiological constituents using hand-held Electras and swipe samples prior to release from the site. The decontamination rinsate that is collected will be placed in a 208-liter (L) (55-gallon [gal]) drum. Any equipment that becomes contaminated during the excavation or engineered cover grading process will be decontaminated on-site. For larger pieces of equipment that cannot be decontaminated over a

208-L (55-gal) drum, a decontamination pad will be established by lining a bermed area large enough to hold a piece of heavy equipment. The equipment will be driven onto the pad and steam cleaned. Hand-held equipment will be cleaned with a solution of Alconox™ and water, and rinsed with clean water. Rinsate will be held in the bermed area and allowed to evaporate unless it is in excess of what the bermed area can hold. Excess rinsate will be pumped into drums. Any remaining rinsate at the time of final site housekeeping will be placed in containers and disposed of following Section 2.3 of this Closure Plan. The plastic liner will be placed in containers as compactable waste and disposed of in accordance with Section 2.3.

2.2 CONSTRUCTION QUALITY ASSURANCE / QUALITY CONTROL

A SITA Plan has been prepared to identify responsibilities, acceptance and approval, and documentation and records so that the result of the construction activities are according to the design. The SITA Plan and engineering drawings can be found in Appendix A.

2.3 WASTE MANAGEMENT

Activities will generate sanitary waste and low-level radioactive waste. No hazardous wastes are anticipated to be generated since site investigation activities indicate that the only COCs are radioactive isotopes of plutonium, uranium, and americium.

Sanitary waste will include construction debris, uncontaminated personal protective equipment (PPE), and trash generated by personnel on the site. These wastes will be transported to an approved sanitary landfill at the TT R or Nevada Test Site. These wastes may be containerized in drums if the size/quantity of materials permit. Drums used at the site for waste storage/disposal will be labeled as sanitary waste. Site personnel will adhere to the principles of the BN Waste Minimization and Pollution Prevention Program. Table 1 outlines the management of various waste types that could be generated by this closure activity.

2.3.1 CONTAINER MANAGEMENT

All containers will be handled in accordance with BN Organization Procedure OP-2151.304 which covers the use and management of containers. All containers must be in good condition. If the container begins to leak, the contents must be transferred to a container that is in good condition. The containers must always be closed while stored unless waste is being added or removed. They must be handled in such a manner that will not jeopardize the integrity of the container.

TABLE 1 - MANAGEMENT OF VARIOUS WASTE TYPES TO BE PRODUCED AT RCRSA CLOSURE

MEDIA	WASTE TYPE	DECISION
Impacted Soil and Surface Debris	Low-Level Radioactive Waste	Low-level waste will be managed in accordance with the BN Procedure OP-2151.304, <u>Radioactive Waste Tracking, Handling, and Management at the NTS</u> (BN, 1999). Waste will be placed into containers, labeled, and placed in the designated waste management area. If necessary, absorbent will be added. Appropriate paperwork (Package Inventory, Waste Traveler, Packaging Certification, Radioactive Material Shipping Exception Record or Radioactive Material Shipping Record, Waste Shipment Checklist, and Certification Statement) will be completed prior to shipment for disposal.
	Levels Less Than Regulated Limits	The soil will be returned to excavation and used as backfill material.
Decontamination Rinsate and Liner	Low-Level Radioactive Waste	Waste will be managed in accordance with the BN Procedure OP-2151.304, <u>Radioactive Waste Tracking, Handling, and Management at the NTS</u> (BN, 1999). Waste will be solidified using Aqua-Set® or an equivalent approved solidification agent, placed into containers, labeled, and placed in the designated waste management area. Appropriate paperwork (Package Inventory, Waste Traveler, Packaging Certification, Radioactive Material Shipping Exception Record or Radioactive Material Shipping Record, Waste Shipment Checklist, and Certification Statement) will be completed prior to shipment for disposal.
	Levels Less Than Regulated Limits	Waste will be allowed to evaporate or solidified, if necessary, and subsequently transported to the Area 9, U10C Landfill for disposal.
PPE and Sampling Equipment	Low-Level Radioactive Waste (Based on Field-Screening Background Levels)	Waste will be managed in accordance with the BN STET OP-2151.304, <u>Radioactive Waste Tracking, Handling, and Management at the NTS</u> (BN, 1999). PPE generated in association with a hotline will also be managed in accordance with BN Local Implementation Document L-A14.107.H, <u>General Radiological Control Technician Field Instructions</u> (BN, 1998). PPE will be placed in the containers of soil to occupy any void space in the container.
	Levels Less Than Field-Screening Background Levels	Waste will be managed as sanitary waste and transported to the Area 9, U10C Landfill for disposal or alternately to the TTR sanitary landfill.

Some combination of B-25 boxes or 55-gal drums will be used during this project. Containers will not be filled above their specified weight capacity. Compactable waste will then be placed in 208-L (55-gal) drums. After a container has been filled, the container will be locked. If a container is not completely filled to capacity at the end of a work day, it will be locked and tamper-resistant tape will be placed over the container's hinge. Additional precautions include not filling 208-L (55-gal) drums more than 7/8 full and not mixing waste types.

The majority of waste produced is anticipated to be soil and debris. Secondary containment will not be required. If, however, free liquids are placed in containers, such as decontamination water, the containers will be placed on spill containment pallets.

Appropriate labels and relevant information will be marked on each container with an indelible marker and must be legible and clearly visible for inspections. Pertinent data may be written on duct tape or a blank adhesive label that is applied to the side of the container. The following information will be included:

- Waste-Tracking Label.
- Type of waste in the container (i.e., it must be marked "Radioactive Waste").
- Location waste was derived from.
- Date accumulation begins/ends.
- If sampling is required "Awaiting Analysis" sticker after sampling has been completed.

2.3.2 Site Control

A fenced waste storage area will be established outside of the work area to store material that could potentially be low-level radioactive waste. This will consist primarily of the B-25 containers and/or 208-L (55-gal) drums. Figure 2 shows the planned location for the waste management area. This location may change as field conditions dictate.

The site is currently fenced. This fencing will be maintained during site remediation activities. A hotline will be set up (Figure 2) and only properly trained personnel wearing appropriate PPE will be allowed access to the exclusion zone. All equipment and materials will be surveyed for radiation prior to removal from the exclusion zone.

2.3.3 Personnel Training

All personnel responsible for packing low-level or mixed radioactive waste will be required to read and understand BN Procedure OP-2151.304, Radioactive Waste Tracking, Handling, and Management at the NTS (BN, 1999).

Title 29 Code of Federal Regulations § 1910.120 (U.S. Environmental Protection Agency [EPA], 1999) details the occupational safety and health requirements that will be followed for personnel supporting excavation activities. All personnel will be required to read and understand the SSHASP prior to working at the site. A tailgate safety briefing will be conducted every morning and as needed as activities or circumstances change. In addition, all personnel will require 40-hour Occupational Safety and Health Administration and Radiation Worker II training.

2.3.4 Inspections

The waste containers will be visually inspected prior to demobilizing from the site and at the time of unloading at the Area 6 Decontamination Facility or designated waste facility. An inspection of the areas in which the containers are stored will be conducted at least weekly if the waste containers remain on the site for more than a week. The purpose is to identify leaking or deteriorating containers due to corrosion or other factors. Unusual circumstances must be reported immediately so that corrective measures can be taken. Completed inspection forms will be maintained in the project file.

2.3.5 Waste Minimization

For the duration of the project, site workers will adhere to the principles of the BN Waste Minimization and Pollution Prevention Program. Care will be taken to segregate waste from non-waste materials if at all possible and avoid cross contamination

2.4 CLOSURE VERIFICATION

Prior to the excavation of the "hot spots," background readings will be established for the field screening instrumentation. These instruments will be used to determine if the surface hot spots have been removed such that readings are no longer above three times the established background.

2.5 PERMITS

Required permits for this project include a Radiological Work Permit (RWP), Excavation and Trenching Permit, and Real-Estate/Operations Permit (REOP).

2.5.1 RWP

An RWP has been prepared and approved to inform workers of the specific PPE necessary to protect them while performing their tasks. The workers will be required to read the permit and acknowledge their understanding of the requirements before entry into the exclusion zone. The RWP will be maintained by the radiological control personnel at the access station. All site workers will be required to be Radiation Worker II-certified while the RWP is in effect.

2.5.2 Excavating and Penetration Permit

An approved Excavating and Trenching Permit will be obtained prior to any excavation. The permit contains a justification for the trenching operation and a checklist of pertinent organizations which must inspect the site so that the trenching will not impact utilities or harm workers. A copy of this permit will be kept at the project site by the site supervisor.

2.5.3 REOP

A REOP will be obtained prior to beginning field closure activities. This permit will establish DOE/NV authorization and control to accomplish the following:

- Establish one organization as being responsible for safety.
- Identify hazards and controls associated with field operations pertinent to the site.
- Identify the hazardous material inventory, if any, located at the site for emergency response purposes.
- Ensure DOE/NV has reviewed and approved all work conducted in association with the site.
- Identify DOE/NV's responsibility to plan and schedule activities.
- Provide a mechanism to recover applicable infrastructure support costs.

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3.0 SCHEDULE

The CAU 407 RCRSA closure schedule is outlined in Appendix III of the FFACO. The FFACO schedule requires that this plan be submitted for NDEP approval by May 26, 2000, and that the CR be submitted for NDEP approval by April 27, 2001.

The project schedule for the closure can be found in Figure 4. Flexibility has been placed in the project schedule to account for minor difficulties (weather, equipment breakdowns, etc.). DOE/NV will keep the NDEP apprised of any condition that may impact the project schedule. In the event that the project schedule requires modification, the DOE/NV will consult with NDEP personnel prior to making any changes.

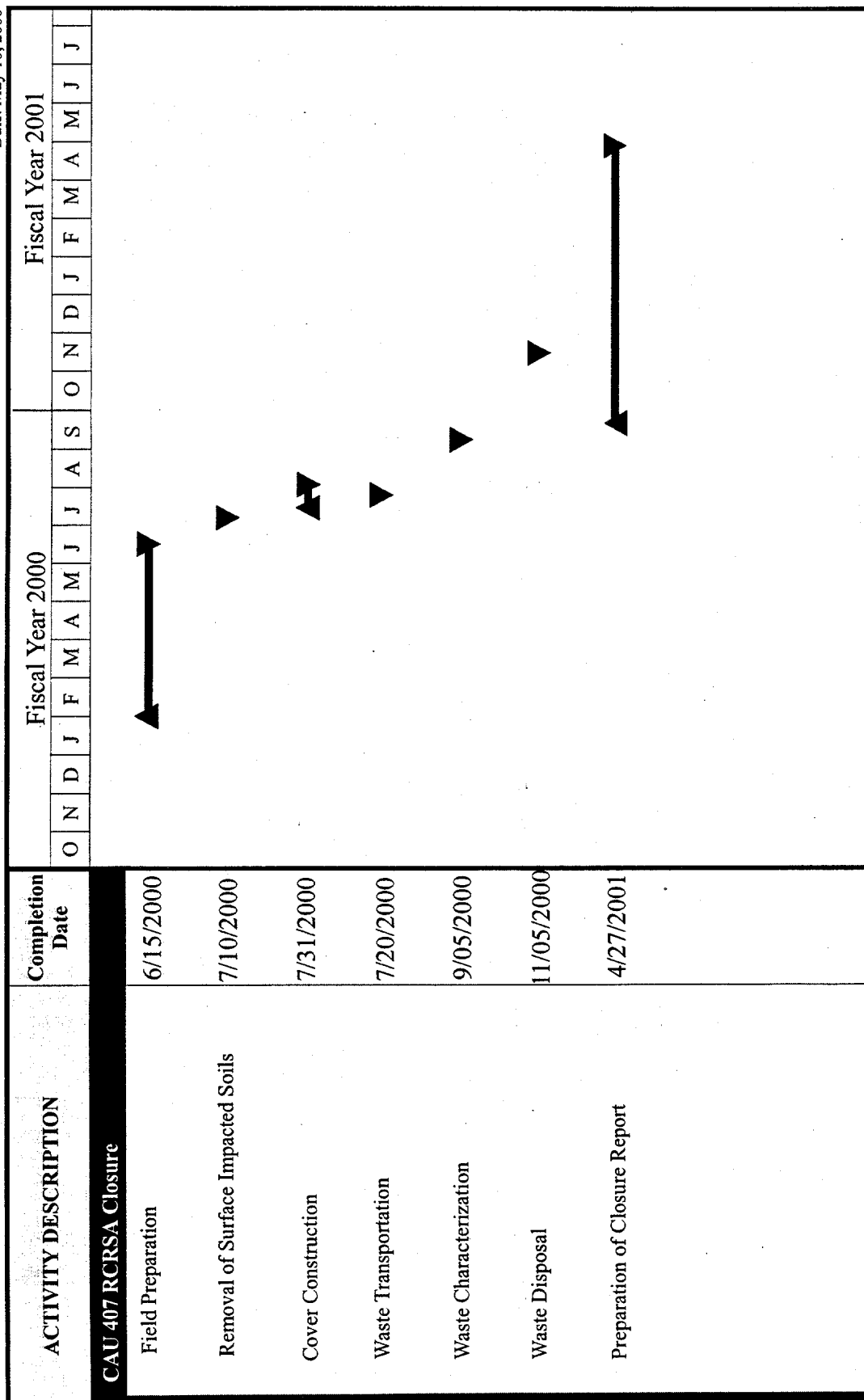


FIGURE 4
 TENTATIVE CLOSURE ACTIVITY SCHEDULE

4.0 POST-CLOSURE MONITORING PLAN

Post-closure monitoring will consist of site inspections to determine the condition of the engineered cover.

4.1 INSPECTIONS

Inspections consist of visually inspecting the cover for signs of erosion, animal burrows, cracks, water ponding, vegetation, and inspecting the fencing and postings. Inspections will be performed twice during the first six months after construction of the cover has been completed. After completion of the quarterly inspections, the cover systems will be inspected and monitored semiannually (twice per year) for the next two years. The frequency after the second year will be determined by NDEP, based on the results of the previous inspections. Any identified maintenance and repair requirements will be remedied within 90 working days of discovery and documented in writing at the time of repair.

4.2 REPORTING

Results of all inspections in a given year will be addressed in a single annual report. The annual report will include the following information:

- Discussion of observations.
- Inspection checklist and maintenance record.
- Conclusions and recommendations.

A copy of each annual report will be submitted to the NDEP. A copy of the inspection checklist will be provided in the final CAP.

4.3 MAINTENANCE AND REPAIR

Following the a field inspection, cover maintenance/repair will be performed if necessary. Maintenance/repair activities will be included in the annual report submitted to the NDEP.

4.4 LAND RESTRICTIONS

The future use of any land related to the RCRSA is restricted from any activity that may alter or modify the containment control as approved by the state and identified in the RCRSA CR unless appropriate concurrence is obtained in advance.

The CAU Land Use Restriction form will be completed. This form includes the CAU number and site description, post-closure monitoring requirements, and survey coordinates of the unit boundaries. The information on the completed form will be added to the DOE/NV Facility Information Management System and the Central Data Repository. The original CAU Land Use Restriction form is then filed within the CAU 407 project file.

5.0 REFERENCES

BN, see Bechtel Nevada.

Bechtel Nevada, 1999. Radioactive Waste Tracking, Handling, and Management at the NTS, OP-2151.304, Las Vegas, NV.

Bechtel Nevada, 1998. General Radiological Control Technician Field Instructions L-A14.107.H, Revision 1, Las Vegas, NV.

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

EPA, see U.S. Environmental Protection Agency

Fayer, M. J. and T. L. Jones, 1990. UNSAT-H Version 2.0: Unsaturated Soil Water and Heat Flow Model. Pacific Northwest Laboratory, Richland, WA. PNL-6779 UC-702.

Jury, W. A., W. R. Gardner, W. A., 1991. Soil Physics fifth edition. John Wiley & Sons, Inc. New York.

Levitt, D. G., Sully, M. J., Dozer, B. L., and Lohrstorfer, C.F., 1999. Determining the Performance of an Arid Zone Radioactive Waste Site Through Site Characterization, Modeling and Monitoring. Proceedings of Waste Management '99 Conference, Tucson, AZ.

NDEP, see Nevada Division of Environmental Protection

Nevada Administrative Code, 1998. NAC 445A, Water Controls. Carson City, NV.

Nevada Division of Environmental Protection, U.S. Department of Energy, and U.S. Department of Defense. 1996. Federal Facility Agreement and Consent Order (FFACO) of 1996.

U.S. Department of Energy, Nevada Operations Office, 1998. Corrective Action Investigation Plan for the Roller Coaster RADSAFE Area, Corrective Action Unit 407: Nevada Test Site, Nevada Rev.0, DOE/NV--503. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office, 1999. Corrective Action Decision Document for Corrective Action Unit 407: Nevada Test Site, Nevada Rev.0, DOE/NV--567. Las Vegas, NV.

5.0 REFERENCES (Continued)

U.S. Environmental Protection Agency, 1999. Title 29 Code of Federal Regulations 1910.120, "Hazardous Waste Operations and Emergency Response," Washington, D.C.

APPENDIX A-1
ENGINEERING DRAWINGS AND
SAMPLING, INSPECTION, TESTING, AND ACCEPTANCE PLAN

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Bechtel Nevada

Page 1 of 1

ENGINEERING

TRANSMITTAL NO.: DDD2170D-00-414

M/S NLV085

DOCUMENT DRAWING DISTRIBUTION

DATE: 05/09/00

SUBJECT TTR CAU 407 REMEDIATION, ROLLER COASTER RADSAFE AREA

PROJECT NO: 00022.A54

ID NO.: C7C013BB

DOCUMENT DRAWING NO.	REV.	DESCRIPTION/TITLE
CQAP-00022A54-0002	0	Sampling, Inspection, Testing, and Acceptance Plan: Roller Coaster Radsafe Area Corrective Actions
SP-00022A54-C0006	0	CONSTRUCTION SPECIFICATION for CAU 407 Remediation (insert 1 copy in CQAP-00022A54-0002) NOTE: 1 copy of all drawings listed below to be inserted into CQAP-00022A54-0002 (B folded)
00022-054-133-T1	0	TITLE SHEET
00022-054-133-C1	0	VICINITY MAP
00022-054-133-C2	0	SITE PLAN
00022-054-133-C3	0	GRADING PLAN & SECTIONS
00022-054-133-C4	0	DETAILS

COMMENTS:

- 1) TITLE III SUBMITTAL
- 2) ARC to retain all originals.
- 3) Further Distribution will be made by the Task Manager under separate memo.

ACTION

- ☐ Review and Comment
- ☐ For Approval
- ☒ Construction
- ☐ Information
- ☒ See Comments

ORIGINATOR N. D. Jackson/K.M. Schechter

nj

BECHTEL NEVADA	DOE	OTHERS
W/O M.K. Blake, NLV085 W/O J.H Blumer, NLV 085 W/25 D.L. Gustafson, NTS 306 (19 hole punched) W/O N.D. Jackson, NLV085 W/O S.J. Nacht, NTS 306 W/O K.M. Schechter, NLV085 W/O J.A. Sorola, NLV 085 W/O Correspondence Control, NLV008 W/O Document Control, NLV049 W/O DDD Log, NLV085 W/1 Project Files, NLV085 (B folded) W/orig ARC, NTS140		

10/25



CORRECTIVE ACTION UNIT 407
TONOPAH TEST RANGE, NEVADA

SAMPLING, INSPECTION, TESTING,
AND ACCEPTANCE PLAN:
ROLLER COASTER RADSAFE AREA
CORRECTIVE ACTIONS

Document No: CQAP-00022A54-0002, Rev 0
MAY 2000

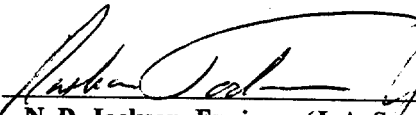
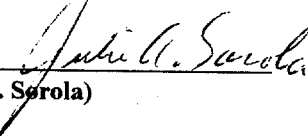
U.S. Department of Energy
Nevada Operations Office

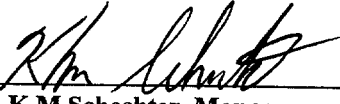
Prepared by Bechtel Nevada

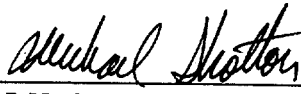
**CORRECTIVE ACTION UNIT 407
TONOPAH TEST RANGE, NEVADA**

**SAMPLING, INSPECTION, TESTING, AND ACCEPTANCE PLAN:
ROLLER COASTER RADSAFE AREA
CORRECTIVE ACTIONS**

BECHTEL NEVADA

Prepared by:   Date: 5/8/00
N. D. Jackson, Engineer (J. A. Sorola)
Facilities Engineering

Approved by:  Date: 5/9/00
K.M. Schechter, Manager
Design Engineering

Approved by:  Date: 5-9-00
for S. J. Nacht, Project Engineer
Environmental Restoration

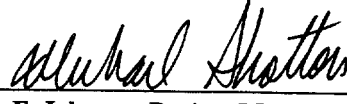
Approved by:  Date: 5-9-00
for W. F. Johnson, Project Manager
Environmental Restoration

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SECTION II - SITA Plan Tables and Guides

SECTION III - Engineering Drawings

SECTION IV - Construction Specifications

SECTION I

PLAN NARRATIVE

SECTION I

Plan Narrative

1.0 BACKGROUND

1.1 Project Site/Task

The Corrective Action Unit (CAU) 407, Tonopah Test Range, Nevada has a singular Corrective Action Site (CAS) TA-23-001-TARC. Work associated with the remediation of this CAU and its associated CAS is as follows:

- Thirteen (13) surface locations determined to have elevated levels of radioactive constituents will be partially excavated and covered. (contaminated soils removed);
- The existing Waste Disposal Pit (covered) will be permanently closed, fenced and posted.

1.2 Project-Specific Design Criteria

The project-specific design criteria have been summarized in the *Engineering Plan for CAU 407 TTR, Nevada*. The four basic closure cap performance/technical objectives criteria are to:

- Function with minimum maintenance
- Promote drainage and minimize erosion or abrasion of the cover

1.3 Sampling, Inspection, Testing, and Acceptance (SITA) Plan Outline

This SITA Plan was developed in accordance with the Environmental Protection Agency (EPA) Technical Guidance Document, *Quality Assurance and Quality Control for Waste Containment Facilities*. " Application of the guidelines are listed below and are addressed in detail later in this project document.

- Organization and Personnel
- Inspection and Observation
- Sampling and Testing
- Acceptance and Approvals
- Documentation and Records
- References

2.0 ORGANIZATION AND PERSONNEL

2.1 Functional Organizations

The organizations actively involved in regulating, designing, and constructing functions during the CAU 407 TTR, Roller Coaster Radsafe Area remediation project are listed below:

- U.S. Department of Energy (DOE) Owner
- State of Nevada (NDEP) Regulating agency (Nevada Division of Environmental Protection)
- Bechtel Nevada (BN) Environmental Restoration, Engineering, Construction, and Support Services
- Other (Subcontract[s]) Material Testing Laboratory (MTL) services

The relationships, roles, and responsibilities of the principal organizations are depicted in the Project Functional Organization Chart (Figure 2.1).

CAU 407 ROLLER COASTER RADSAFE AREA -- Project Functional Organization Chart

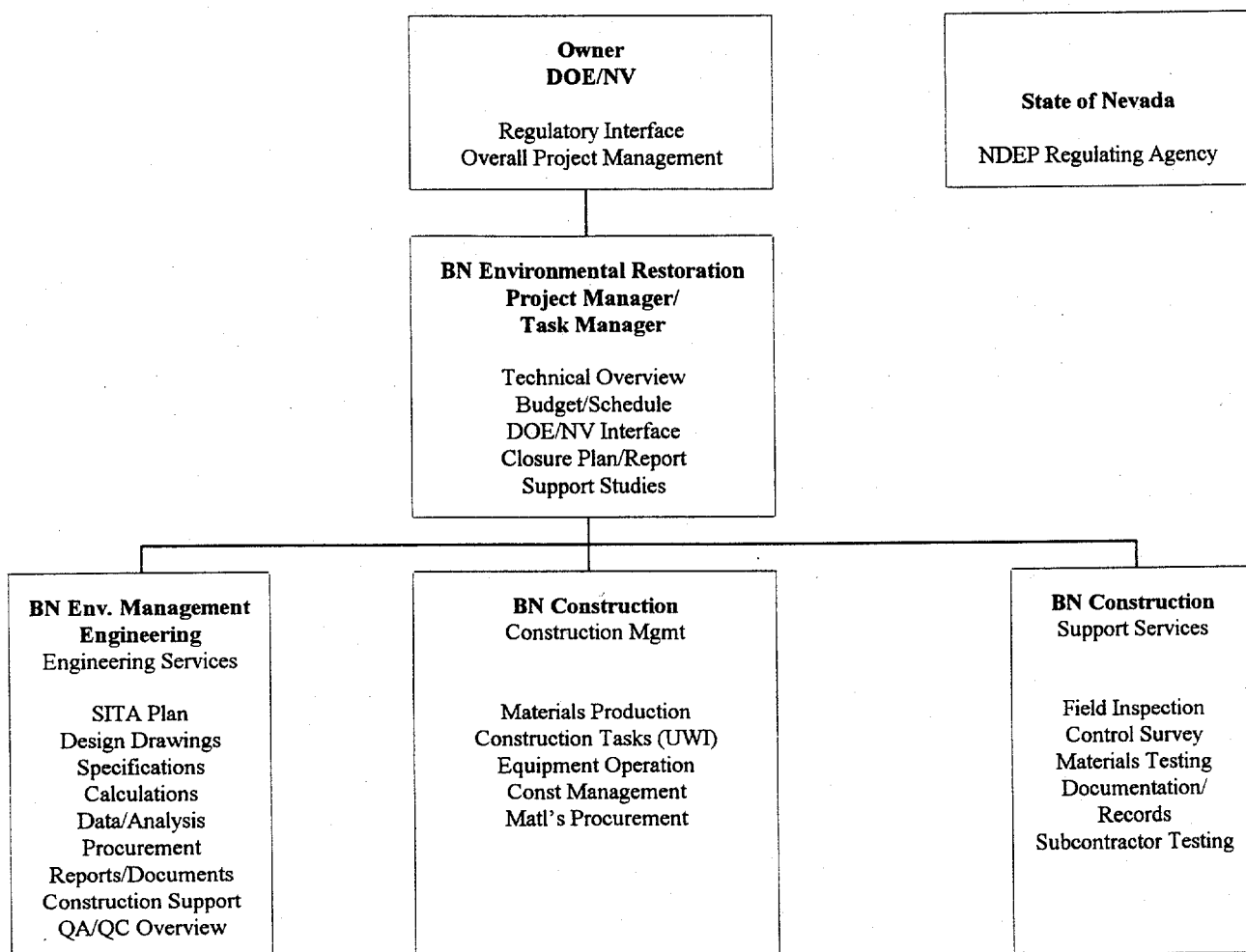


Figure 2.1

2.2 Key Personnel

Key personnel for this project are listed below; however, personnel are subject to change and it is suggested that the BN/ER Project Manager be contacted for further information.

ER Project Manager	W. F. Johnson
Project Engineer	S. J. Nacht*
Task Manager	D. L. Gustafson*
Senior Engineer	J. A. Sorola*
Engineer	N. D. Jackson*
Senior Engineer Assistant	G. G. Hudak*
Geotechnical Engineer	E. A. Strassburger*
Technical Lead	T.M. Fitzmaurice*
ER Construction Manager	J.G. Nelson*
Field Coordinator	P.F. Brown
Construction Superintendent	J. S. Pennington*
Construction Engineer	J. A. Joines*
Survey Supervisor	S. J. Ellison*
Materials Testing Supervisor	C. D. Herrington

* *SITA Delegates* (see below)

2.3 SITA Delegate System

To ensure optimum productivity during construction, the SITA delegate system was developed. The SITA delegate selection and assignments are delegated by the Project Manager. Using this method permits numerous construction tasks to be achieved with a minimum number of personnel required to be on site at any given time.

3.0 INSPECTION AND OBSERVATION

3.1 Inspection and Observation Procedures

The itemized SITA Plan Tables and Guides section contains specific guidance for inspection and acceptance operations for this project (see Section II). A completed copy of the SITA Plan Tables will become a part of the closure report at project completion.

Inspection and observation personnel (SITA delegates) will be responsible for Title III (construction) acceptance functions, and shall provide acceptance/rejection and inspection/observation activities in conjunction with procedures shown in the SITA Plan Tables and Guides. Acceptance shall be in accordance with current design requirements specified in the technical documents (design drawings/specifications) contained herein (see Sections III and IV).

The SITA delegate's observations will be used to verify that the materials, equipment, and methods of construction meet all design criteria and plans, and are documented, as a minimum, in the project daily log book and daily report(s).

The SITA Tables contain a column listing mandatory construction task HPs. These task HPs must be addressed and the task approved by the responsible SITA delegate(s) prior to continuing with the construction sequence.

4.0 SAMPLING AND TESTING

4.1 Sampling and Testing Procedures - Not Applicable

5.0 ACCEPTANCE AND APPROVALS

5.1 Acceptance and Approvals Procedures

The procedure(s) for acceptance and/or approvals for various construction tasks, as specified in the SITA Plan Tables, drawings, and specifications, have been addressed in Section 3.0 above.

- 5.1.1 The ultimate BN authorization authority is the authorized representative (AR) for the project. This assignment is filled by the Project Manager (with guidance by other key personnel).
- 5.1.2 The AR is supported by a team of technically qualified environmental personnel, as specified in Part 2.2, *Key Personnel*. This team of key personnel is identified as the *SITA Delegates*, and either individually or collectively, will perform acceptance and/or approvals, as the requirement arises. The titles Project Manager Delegate and SITA Delegate are synonymous.
- 5.1.3 As previously discussed, the construction tasks requiring acceptance and/or approvals include, but are not limited to, the following:
 - Material test results
 - Adherence to specifications
 - Compliance with drawings
 - Deviations to plans/procedures
 - Survey field data
 - Alterations for performance improvements
 - SITA Plan Tables task HPs
- 5.1.4 Acceptance and/or approvals of construction tasks controlled by HPs, or proposed alteration of any task specified in the engineering technical documents contained within this SITA Plan, must have the concurrence of an Engineering SITA delegate. Refer to Part 2.2, *Key Personnel* list, for names of engineering delegates.
- 5.1.5 Acceptance and/or approvals of construction and non-construction tasks controlled by a "Check Point" (CP) only requires verification by a SITA Delegate, followed by notification to other delegates when convenient, with no work stoppage or other delays.

6.0 DOCUMENTATION AND RECORDS

6.1 Overview

The document types which will be generated or referenced as part of this SITA Plan by the various organizations involved in this project include:

- Project Corrective Action Plan (CAP) and Closure Report (CR)
- Conference reports
- Project schedule(s)
- Materials field sampling/testing tables and guides (Section II)
- Design drawings and their revisions (Section III)
- Construction specifications and their revisions (Section IV)
- Design calculations and material test data (Section V)
- Project-specific daily log book (maintained by the Technical Lead)
- Project-specific Construction Work Plan*
- Project-specific inspection plan*
- Daily construction/site activity summary reports/memos (maintained by the Technical Lead)
- Inspection or observation document(s) (provided by SITA delegates)
- Material/test data sheets (sampling and testing)
- In-field survey data sheets
- Design interim change (Design Change Notice, Field Change Notice)
- Deficiency documents (correctable deficiency log/nonconformance reports)
- Final inspection/survey as-built drawings

* Supervisory personnel review/concurrence with this SITA Plan prior to start of construction/inspection activities will waive the requirement for separate documents. SITA delegates will also have reviewed and understand their responsibilities before performing any Title III construction tasks.

In addition, other miscellaneous documents, i.e., memos, sketches, audits, etc., will become a part of the project records file.

6.2 Project Files

The project files will be located at the job site and will include a controlled copy of each of the following:

- Approved SITA Plan
- Project drawings and specifications— “as-builts”
- Inspection/observations
- Project-specific daily log
- Survey data

The project files will be maintained by the Field Coordinator and/or Technical Lead. After construction, the project files will be located in the BN/ER project files. Original as-built

drawings will be retained at the Archives Records Center (ARC) in Mercury, NTS. Any copies required in the future can be provided by the ARC in hard copy or electronic form.

6.3 Photography

Preparing and maintaining a photographic log of all note-worthy construction activities, including sampling/testing activities, is the responsibility of the Technical Lead. Photographs will be clearly marked as to photographer identity, date, time, and brief description of each activity, and will be kept in a separate log as part of the central file.

6.4 Closure Report

A final construction/project CR will be prepared and will contain or reference the following:

- Copy of the signed-off (approved) SITA Plan Tables
- Summary documentation of design and construction activities
- Daily logs, intermediate reports, and other related documentation to support in-situ (as constructed) conditions
- Copies of as-built drawings and sketches
- Photographs of the completed project site (if requested/required by DOE/NDEP)

7.0 REFERENCES

American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards. 1999.

B-A20/96.01, *Bechtel Nevada Performance Assurance Management Plan*. April 24, 1997.

Engineering Plan for Corrective Action Unit 407 TONOPAH TEST RANGE, Nevada. Revision 2. November 1999. BN.

Environmental Protection Agency Technical Guidance Document, *Quality Assurance and Quality Control for Waste Containment Facilities*. EPA/600/R-93/182. September 1993.

U.S. Department of Energy, *Corrective Action Plan for CAU 407 RCRSA*

U.S. Department of Energy Order 451.1A, *National Environmental Policy Act Compliance Program*, DOE 1997.

U.S. Department of Energy Order 430.1, *Life-Cycle Asset Management*. 1999.

U.S. Department of Energy Order 5700.6C, *Quality Assurance*. 1991.

SECTION II

SITA PLAN TABLES AND GUIDE

SITA PLAN TABLES AND GUIDES INDEX

TABLES

I Roller Coaster Radsafe Area -- Preclosure Tasks

II Roller Coaster Radsafe Area, Waste Disposal Pit -- Closure Tasks

GUIDES - Not Applicable

SECTION II
REVISION : 0
DATE: 05/09/00
SITA Plan Table I**Site: Roller Coaster Radsafe Area -- Preclosure Tasks**

General instructions for using the SITA Plan Tables and guides:

1. For sampling/testing activities specified herein, use the appropriate SITA Guide Sheet.
2. All sampling/testing locations will be random and shown on the appropriate SITA Guide Sheet.
3. Acceptance and/or approval will be made by one (or more) of the SITA delegates (see Section I, Part 2.2 and Part 5.0 for guidance)
4. All HPs must be initiated by the responsible SITA delegate prior to continuance to the next phase of construction.

Construction Phase	SITA Task	SITA Method(s)	Sample/Test Quantity/Frequency	Sample/Location/Requirement		Task Acceptance (Check One)		Task Check Point (CP)
				Stockpile/Source	Per Lift Typical	Yes	No	
General Information	GENERAL INSPECTIONS/OBSERVATIONS -- See Specification Sections 01050 and 01400							
	General project support	Visual, plus basic measurements, include survey/material data where applicable	100% during construction	yes	yes			
	Lift/layer thickness	Grade check lift thickness, as required	As required per lift/layer (see check points)	N/A	yes			
	As-built topographic survey	Survey check: thickness, elevations, slopes, as required	As required per construction phase (see hold points)	N/A	yes			
1	RADIOLOGICALLY IMPACTED SOIL EXCAVATION (13 LOCATIONS) -- See Specification Section 02222							
	Removal of contaminated soil.	Locate and remove surface contamination as described on the drawings.	None	yes	N/A			CP

Construction Phase	SITA Task	SITA Method(s)	Sample/Test Quantity/Frequency		Sample/Location/Requirement		Task Acceptance (Check One)		Task Check Point (CP)
			Other Instructions		Stockpile/Source	Per Lift Typical	Yes	No	
	Disposal	Material to be placed in a B25 box and shipped to the Area 3 RWMS for Disposal.	After excavation completion		N/A	N/A			HP

SECTION IIREVISION: 0DATE: 05/09/00**SITA Plan Table II****Site: Roller Coaster Radsafe Area: Waste Disposal Pit -- Closure Tasks**

General instructions for using the SITA Plan Table and Guides:

1. For sampling/testing activities specified herein, use the appropriate SITA Guide Sheet.
2. All sampling/testing locations will be random and shown on the appropriate SITA Guide Sheet.
3. Acceptance and/or approval will be made by one (or more) of the SITA delegates (see Section I, Part 2.2 and Part 5.0 for guidance)
4. All HPs must be initiated by the responsible SITA delegate prior to continuance to the next phase of construction.

Construction Phase	SITA Task	SITA Method(s)	Sample/Test Quantity/Frequency	Sample/Location/ Requirement		Task Acceptance (Check One)		Task Check Point (CP)
			Other Instructions	Stockpile/ Source	Per Lift Typical	Yes	No	Task Hold Point (HP)
General Information	GENERAL INSPECTIONS/OBSERVATIONS -- See Specification Sections 01050 and 01400							
	General project support	Visual, plus basic measurements, include survey/material data where applicable	100% during construction	yes	yes			
	Lift/layer thickness	Grade check lift thickness, as required	As required per lift/layer (see check points)	N/A	yes			
	As-built topographic survey	Survey check: thickness, elevation, slope, as required	As required per construction phase completion (see hold points)	N/A	yes			
1	NATIVE MATERIAL FILL PLACEMENT -- See Specification Section 02223 and SITA Guide No. 4							
	As-built grade check	Grade check: thickness, elevations, slopes, as required	After each lift placement completion	N/A	Yes			CP

Construction Phase	SITA Task	SITA Method(s)	Sample/Test Quantity/Frequency	Sample/Location/Requirement		Task Acceptance (Check One)		Task Check Point (CP)
				Stockpile/Source	Per Lift Typical	Yes	No	
	As-built grade check	Grade check: thickness, elevations, slopes, as required	Other Instructions After each lift placement completion	N/A	Yes			CP
	As-built topographic survey	Survey check: thickness, elevations, slopes, as required	After layer placement completion	N/A	Yes			HP
2	FENCING, AND SIGNAGE PLACEMENT -- See Specification Sections 02831 and 03001							
	Fencing	Installation	Completion	N/A	N/A			CP
	Signage	Installation	Completion	N/A	N/A			CP
	Survey	Cap surface - final topographic survey -- as-built drawings	Final	N/A	N/A			HP
3	VEGETATIVE LAYER PROCEDURE (Placed Stabilization Layer Material)							
	Prepare Cover Only	Site Prep: Prior to Placement of any Vegetation disc/plow cover surface.	None	N/A	N/A			HP
4	RCRSA CMP CLOSURE CAP CONSTRUCTION COMPLETION -- See Specification Sections 01700 and 01720							
	Site tour confirmation	Establish with DOE/PM (and notify NDEP) closure acceptance tour date/time	None	N/A	N/A			HP
	Site tour	Closure acceptance/Sign-off	Final	N/A	N/A			HP

SECTION III

ENGINEERING DRAWINGS

UNITED STATES DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA

TONOPAH TEST RANGE (TTR) CAU 407 ROLLER COASTER RAD SAFE AREA

AREA 54

INDEX

DRAWING NUMBER	DRAWING TITLE	STANDARD NUMBER	DESCRIPTION
00022-04-133-1	TITLE SHEET	SID 11 SMT 1 SID 12 SMT 1	STANDARD INDEX GENERAL NOTES: DRAFTING SYMBOLS & ABB. STANDARDS NOTES, LEGEND & SYMBOLS ABBREVIATIONS
00022-04-133-2	VICINITY MAP	SID C100 SMT 1	
00022-04-133-3	SITE PLAN	SID C101 SMT 1	
00022-04-133-4	DRAWING PLAN & SECTIONS		

CIVIL

00022-04-133-1
00022-04-133-2
00022-04-133-3
00022-04-133-4

VICINITY MAP
SITE PLAN
DRAWING PLAN & SECTIONS

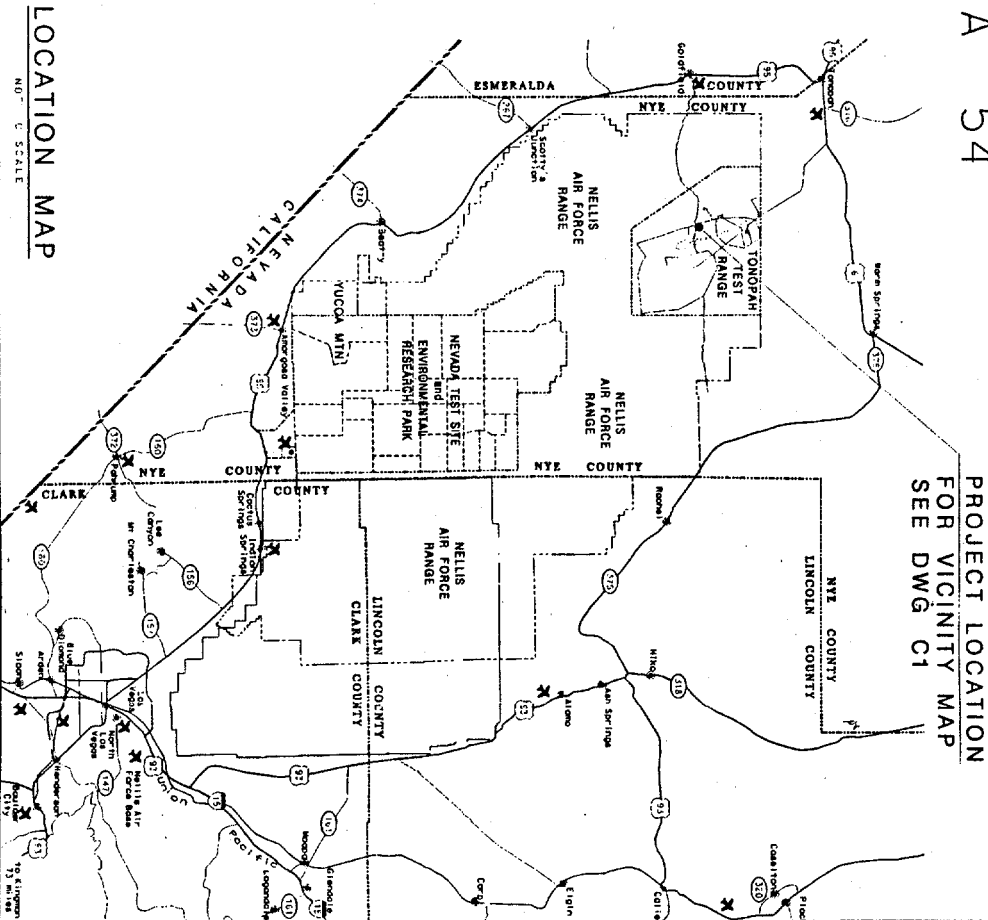
STANDARD INDEX
GENERAL NOTES: DRAFTING
SYMBOLS & ABB. STANDARDS
NOTES, LEGEND & SYMBOLS
ABBREVIATIONS

SCOPE OF WORK

THE SCOPE OF WORK FOR THIS PROJECT INCLUDES LIMITED EXCAVATION OF
MATERIALS FROM THE CAU 407 REMEDIATION AND DESIGN OF
A ROLLER COASTER RAD SAFE AREA FOR THE TONOPAH TEST RANGE
AREA (INVEST).
AREA EVALUATION FOR RESIDUAL SOIL CONTAMINATION SHALL BE PERFORMED BY
THE CONTRACTOR IN ACCORDANCE WITH DE/AN 5460.11 AND THE CONTRACTOR'S
STANDARD OPERATING PROCEDURES PRIOR TO COMMENCING CONSTRUCTION
ACTIVITIES.

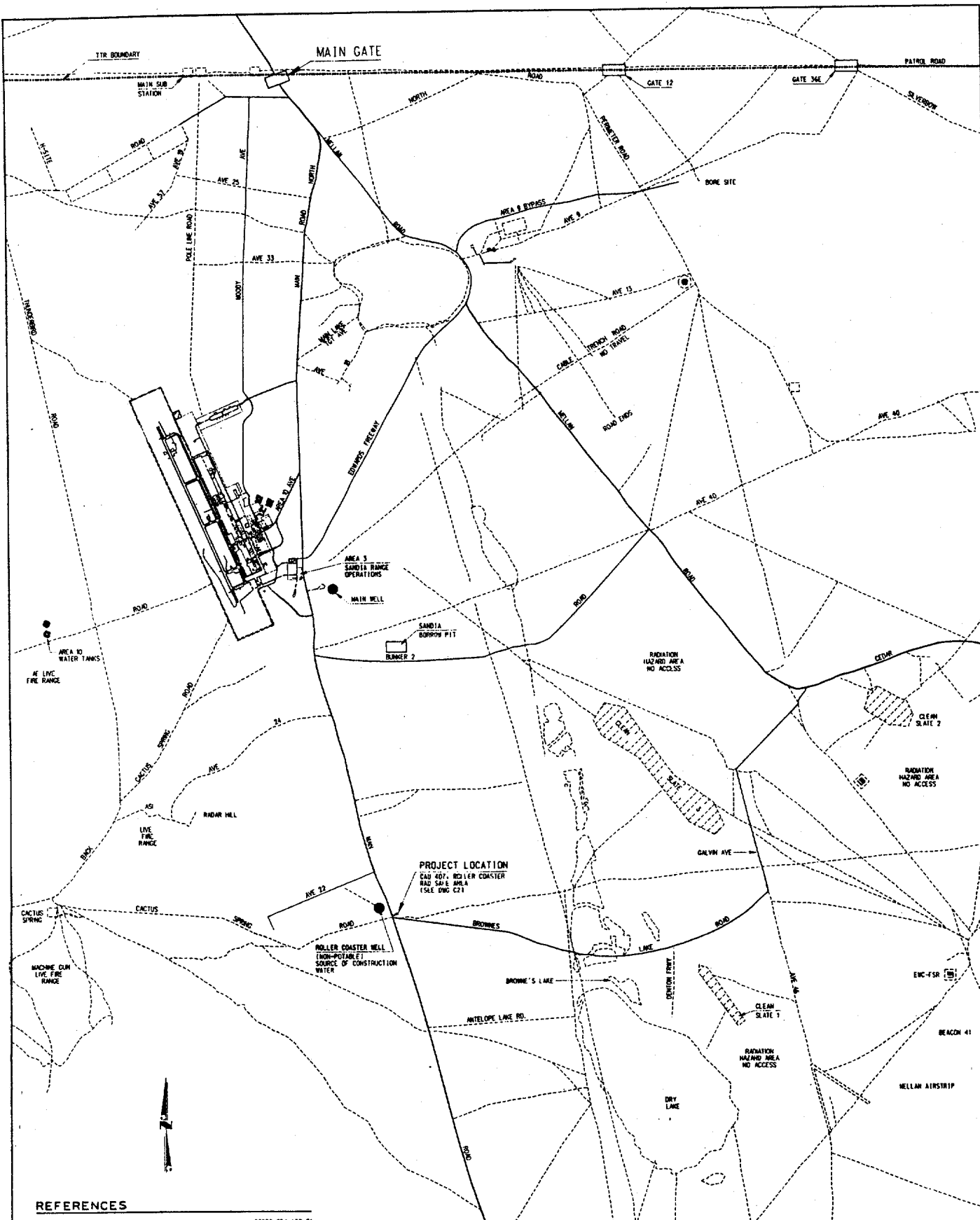
PROJECT NOTES

ALL CONSTRUCTION DOCUMENTATION, SPECIAL FEATURES, MATERIALS, TESTS AND
DETAILS SHALL CONFORM TO CONSTRUCTION SPECIFICATIONS FOR CAU 407-2000 AND
THE APPROVED CORRECTIVE ACTION PLAN FOR STANDARDS REFERENCED ON THIS
PROJECT. SEE THE RSN DESIGN DRAWING STANDARDS.



PROJECT LOCATION
FOR VICINITY MAP
SEE DWG C1

U.S. DEPARTMENT OF ENERGY		TONOPAH TEST RANGE — AREA 54		CAU 407 REMEDIATION		ROLLER COASTER RAD SAFE AREA		TITLE SHEET	
Bechtel Nevada		PROJECT NUMBER: 00022-04-133-1		DATE: 5/9/00		ISSUED FOR CONSTRUCTION 05/11/00		PROJECT NUMBER: 00022-04-133-1	
PROJECT NAME: CAU 407 REMEDIATION		PROJECT NUMBER: 00022-04-133-1		DATE: 5/9/00		ISSUED FOR CONSTRUCTION 05/11/00		PROJECT NUMBER: 00022-04-133-1	



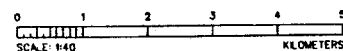
REFERENCES

TITLE SHEET 00022-054-133-11
SITE PLAN 00022-054-133-02

VICINITY MAP

SCALE 1:140,000

GRAPHIC SCALE



U.S. DEPARTMENT OF ENERGY BECHTEL NEVADA	TONOPAH TEST RANGE AREA 54 CAU 407 REMEDIATION ROLLER COASTER RAD SAFE AREA VICINITY MAP		DATE: 5/1/00 BY: [Signature] REV: 1/1 PROJECT: CAU 407 REMEDIATION PROJECT NO: 00022-054 PROJECT CODE: N/A PROJECT NAME: CYCLOTRON	ISSUED FOR CONSTRUCTION 05/11/00 BY: [Signature] DATE: 5/11/00	0 1 2 3 4 5 SCALE: 1:140,000 KILOMETERS
	0 1 2 3 4 5 SCALE: 1:140,000 KILOMETERS				
	0 1 2 3 4 5 SCALE: 1:140,000 KILOMETERS				
	0 1 2 3 4 5 SCALE: 1:140,000 KILOMETERS				

EXISTING CHANNEL

RAIN

CACTUS SPRING ROAD

BROWNES LAKE ROAD

PROPOSED WASTE ACCUMULATION AREA

APPROXIMATE LIMITS
WASTE DISPOSAL PIT
(COVERED)

APPROXIMATE LIMITS
EXISTING DISPOSAL PIT
(COVERED)

EXISTING CONCRETE PAD
3" DIA EXPOSED
STEEL PIPE

EXISTING SOIL
STOCKPILE

EXISTING FENCE
TO BE REMOVED

PROJECT NOTES

GENERAL

1. BASIS FOR HORIZONTAL CONTROL IS THE NORTH AMERICAN DATUM 1983, STATE PLANE, NEVADA ZONE 12N, ZONE 12N, ZONE 12N.
2. BASIS FOR VERTICAL CONTROL IS THE NORTH AMERICAN VERTICAL DATUM OF 1929, METERS.
3. SOURCE OF CONSTRUCTION WATER WILL BE THE COLLIER COASTER RAIL LOCATED NORTHWEST OF THE PROJECT SITE. SEE VICINITY MAP, DRAWING C1.
4. BORROW SOILS FOR BACKFILLING AND CONSTRUCTION OF THE CLOSURE CAP SHALL BE OBTAINED FROM THE SOIL STOCKPILE AT THE PROJECT SITE.

DEMOLITION

1. EXISTING WIRE FENCING TO BE REMOVED. METAL FENCE MATERIALS WHERE POSSIBLE TO REUSE FOR NEW FENCE. FOR NEW FENCE LOCATION SEE DRAWING C1.
2. DURING CONSTRUCTION MAINTAIN BARRIERS TO LIMIT EXPOSURE TO CONTAMINANTS.

CONTAMINATED SOILS REMOVAL

1. FIELD SURVEY FOR CONTAMINATION MUST BE PERFORMED TO LOCATE CONTAMINATED SPOT LOCATIONS TO BE EXCAVATED.
2. EXCAVATION OF MAJOR POTENTIALLY IMPACTED SOILS SHALL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION SECTION 0222.
3. EXCAVATIONS SHALL BE FIELD SCREENED FOR RADIATION AFTER REMOVAL.
4. EXCAVATIONS SHALL BE BACKFILLED WITH CLEAN NATIVE MATERIAL. BACKFILL SHALL BE GRADED TO MAINTAIN POSITIVE DRAINAGE.

CLOSURE CAP

1. NATIVE MATERIAL. BACKFILL SHALL MEET THE REQUIREMENTS OF SPECIFICATION SECTION 0222.

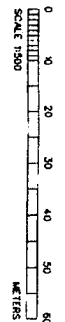
LEGEND

- EXISTING FENCE
- NEW FENCE
- EXISTING INDEX CONTAIN
- PROPOSED INDEX CONTAIN
- DIRT ROAD
- PAVED ROAD
- EXISTING FLOODLINE

REFERENCES

- TITLE SHEET 00022-004-133-1
- VICINITY MAP 00022-004-133-2
- CONSTRUCTION SPECIFICATION FOR CAU 407 00022-004-133-3
- ROLLER COASTER RADIATION AREA 00022-004-133-4

GRAPHIC SCALE



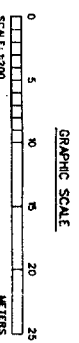
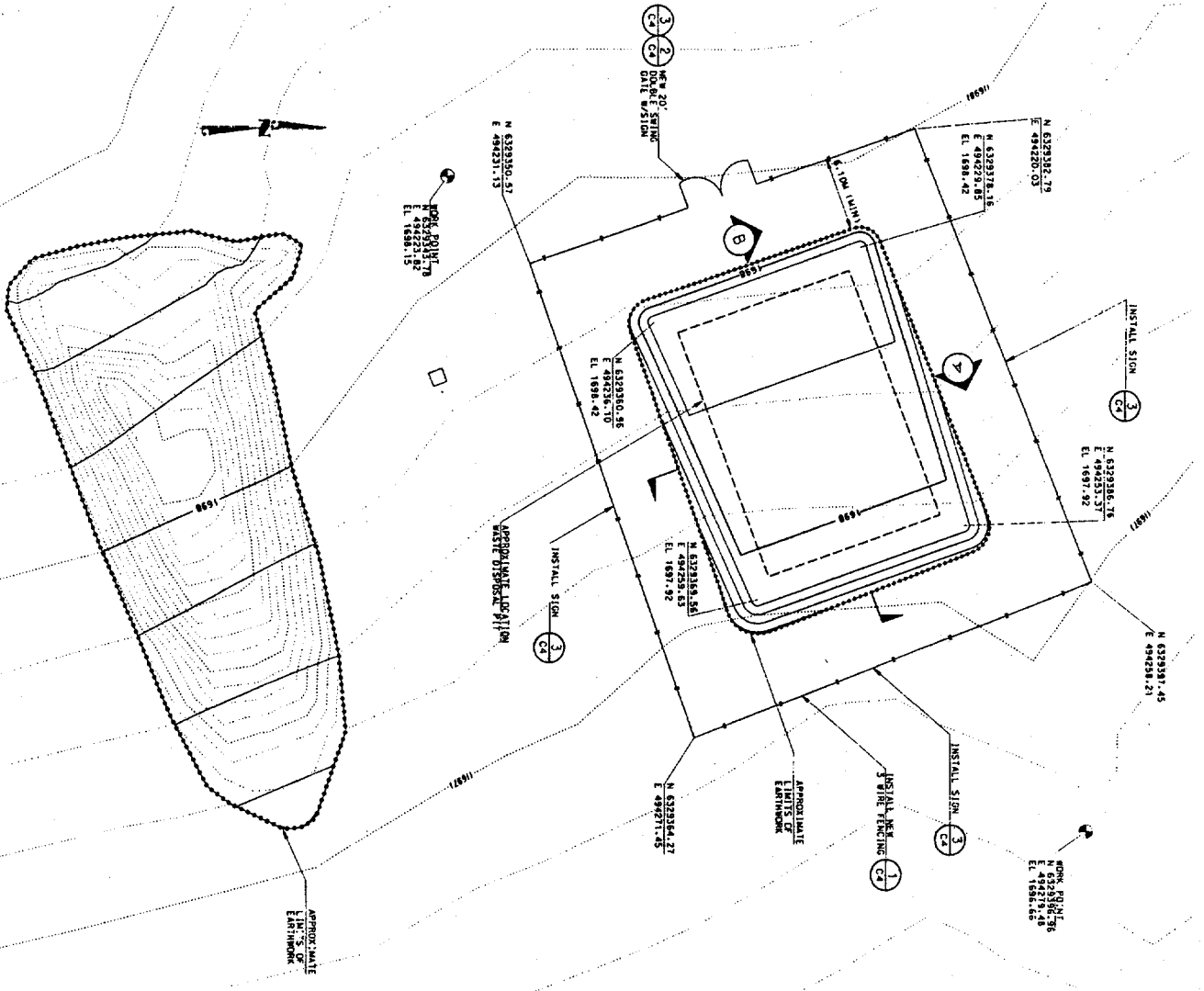
SITE PLAN

SCALE 1:1500

		TONOPAH TEST RANGE		AREA 54	
CAU 407 REMEDIATION		ROLLER COASTER RAD SAFE AREA		SITE PLAN	
PROJECT NO. 00022-004-133-02	SHEET NO. 02	DATE 5/19/00	DRAWN BY J. G. G.	CHECKED BY J. G. G.	ISSUED FOR CONSTRUCTION 05/11/00

GRADING PLAN

SCALE: 1:1200



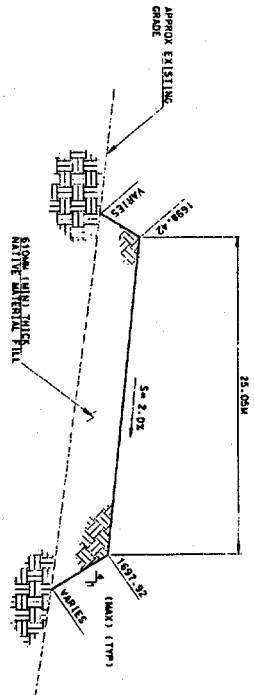
REFERENCES
 TITLE SHEET
 DETAILS
 00027-054-13-10
 00027-054-13-04

ESTIMATED QUANTITIES

DESCRIPTION	QUANTITY	UNIT
GRAVEL FILL	14.55	MCYD

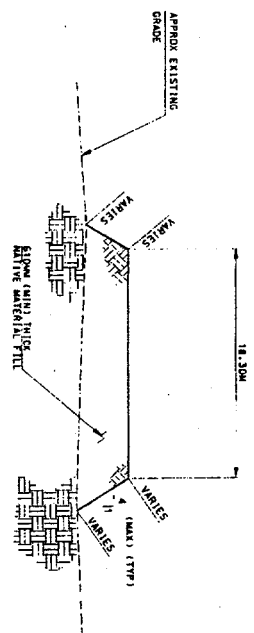
SECTION

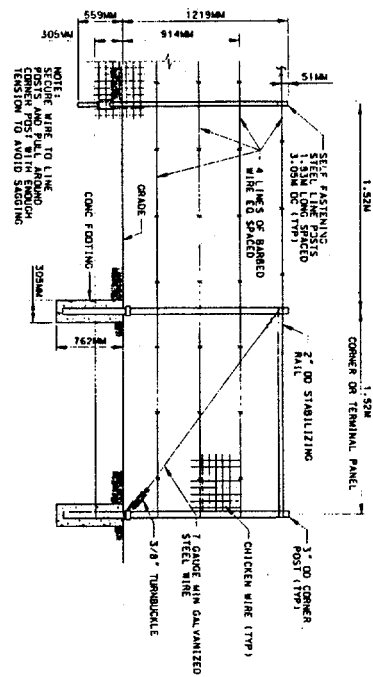
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SECTION

SCALE: 1:1000

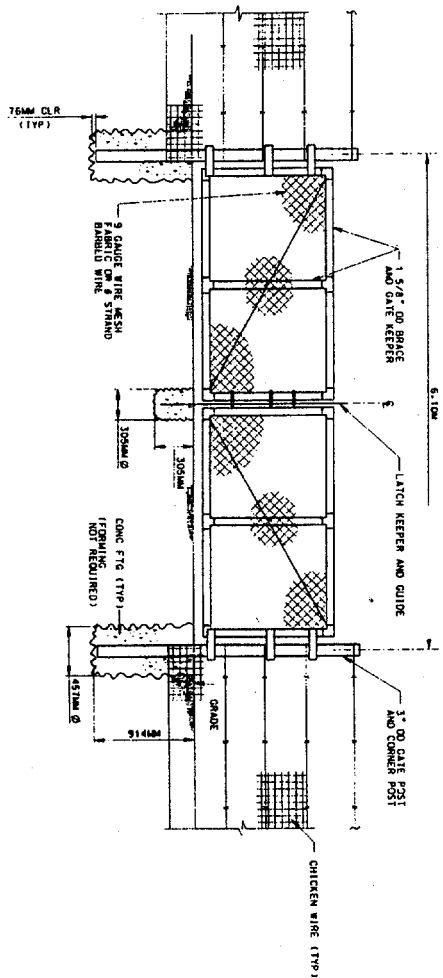




3 WIRE FENCE

NOT TO SCALE

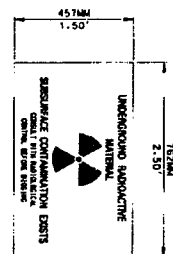
1



GATE DETAIL

NOT TO SCALE

2



SIGN DETAIL

NOT TO SCALE

3

SIGN NOTES

1. THIS DETAIL APPLIES TO SIGNS ON FENCE ONLY.
2. SIGN SHALL BE YELLOW WITH BLACK LETTERING AND RADIATION WARNING SYMBOL.
3. MINIMUM LETTER/WORD HEIGHT SHALL BE:
WARNING TEXT = 38MM
CONTACT TEXT = 19MM
4. SIGN STOCK THICKNESS SHALL BE 16 GAUGE/0.0635 OR GREATER.
5. SIGNS SHALL BE LOCATED CENTERED ON ALL SIDES OF FENCE AND GATE.

FENCE NOTES

1. FENCING SHALL MEET THE REQUIREMENTS OF SPECIFICATION SECTION 02031.
2. ALL FENCING COMPONENT DIMENSIONS SHOWN ARE NOMINAL. SEE NOTE 1.

REFERENCES

TITLE SHEET
SECTION 02031 & SECTION 02032
CONSTRUCTION SPECIFICATION FOR CAU 407
ROLLER COASTER RAD SAFE AREA, SECTION 02031
00022-061-13-11
00022-061-13-12
00022-061-13-13
00022-061-13-14
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00022-061-14-00

SECTION IV

CONSTRUCTION SPECIFICATION

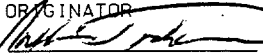
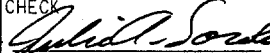
CONSTRUCTION SPECIFICATIONS FOR CAU 407 REMEDIATION ROLLER COASTER RAD-SAFE AREA CLOSURE

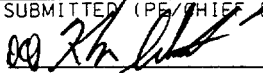
			/	/	/	/
0		ISSUED FOR CONSTRUCTION 05/11/00	/	/	/	/
NO.	DATE	REVISIONS	ORIG	SAFETY	QA	USER
			CHECK	ENVIR	PE/ENGR	DOE

U.S. DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE

LAS VEGAS, NEVADA

ORIGINATOR 	CHECK 	SAFETY <i>N/A</i>	ENVIRONMENTAL <i>N/A</i>	QA <i>N/A</i>
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SUBMITTED (PE/CHIEF ENGINEER)  5/9/00	USER	APPROVAL BLOCK DEPT OF ENERGY PROJ ENGR DATE
BECHTEL NEVADA		

Bechtel Nevada

P.O. BOX 3936 NORTH LAS VEGAS, NV 89036

P. A. NO.
N/A

ACTIVITY CODE
C7C013BB

PROJ. NO.
00022A54

SPECIFICATION NUMBER
SP-00022A54-C0006.0

SHEET _____ OF _____

**CONSTRUCTION SPECIFICATIONS
FOR
CAU 407 REMEDIATION
ROLLER COASTER RADSAFE AREA CLOSURE**

PREPARED BY:

BECHTEL NEVADA

MAY, 2000

CONSTRUCTION SPECIFICATIONS
FOR
CAU 417 REMEDIATION
UC1-CMP CLOSURE

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<u>DIVISION 1</u>	<u>GENERAL</u>
01050	Field Surveying
<u>DIVISION 2</u>	<u>SITE WORK</u>
02110	Site Clearing
02222	Excavation
02223	Native Material Fill
02831	Fences
<u>DIVISION 3</u>	<u>CONCRETE</u>
03001	Plain Concrete
<u>DIVISION 4</u>	<u>NOT USED</u>
<u>DIVISION 5</u>	<u>NOT USED</u>
<u>DIVISION 6</u>	<u>NOT USED</u>
<u>DIVISION 7</u>	<u>NOT USED</u>
<u>DIVISION 8</u>	<u>NOT USED</u>
<u>DIVISION 9</u>	<u>NOT USED</u>
<u>DIVISION 10</u>	<u>NOT USED</u>
<u>DIVISION 11</u>	<u>NOT USED</u>
<u>DIVISION 12</u>	<u>NOT USED</u>
<u>DIVISION 13</u>	<u>NOT USED</u>
<u>DIVISION 14</u>	<u>NOT USED</u>
<u>DIVISION 15</u>	<u>NOT USED</u>
<u>DIVISION 16</u>	<u>NOT USED</u>

SECTION 01050FIELD SURVEYING

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1.04	Quality Assurance	1
PART 2 PRODUCTS		1
2.01	Project Record Documents	1

SECTION 01050

FIELD SURVEYING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Field Engineering Services
- B. Surveys for acceptance and final construction as-built

1.02 RELATED WORK

Not used

1.03 REFERENCES

Not used

1.04 QUALITY ASSURANCE

- A. Surveyor: The field survey data will be reviewed by a registered Land Surveyor.

PART 2 PRODUCTS

2.01 PROJECT RECORD DOCUMENTS

- A. Survey shall maintain and complete, accurate field log-book of project established controls and survey work as project progresses through final as-built.
- B. Location and thickness information shall be recorded on lift diagram.
 - 1. Record approximate overall dimensions of lift, thickness of lift, approximate locations of thickness measurements.
 - 2. Record coordinate locations of grade stakes set for thickness measurements (if required) and target/final elevations at each grade stake location.
- C. All survey requirements and documentation shall be performed as indicated in the approved Sampling, Inspection, Testing, and Acceptance (SITA) Plan.

D. Submit survey information showing dimensions, coordinate locations, and elevations for the final surface of the closure as shown on the engineering drawings and/or sketches.

1. Data shall be submitted to the SITA Engineering Delegate.
2. Data shall be submitted in ASCII file format and contain sufficient data points to create digital terrain models of each closure component to facilitate as-built of the Project Drawings.

END OF SECTION

SECTION 02110SITE CLEARING

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3.01	Preparation	1
3.02	Protection	1
3.03	Clearing	1
3.04	Removal	2

SECTION 02110
SITE CLEARING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Removal of surface debris
- B. Removal of plants and grass
- C. Removal of root systems

1.02 RELATED WORK

- A. Section 02222 - Excavation

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that existing plant life and features designated to remain are tagged or identified.

3.02 PROTECTION

- A. Protect bench marks and existing work from damage or displacement.
- B. Notify the Construction Superintendent immediately when existing utility lines, or other man-made objects whether or not shown on the Drawings, are encountered or damaged. See Section 02222 for goldaking guidance.
- C. Apply water as necessary to control dust and maintain air quality in conformance with applicable local, state, and federal regulations.

3.03 CLEARING

- A. Clear areas required for access to site and execution of work.

- B. Remove shrubs and grass within marked areas. Remove main root balls and root systems, to a depth of 18 inches (457 mm).
- C. Remove rocks and boulders larger than 6 inches (152 mm) in diameter, as directed by the Construction Superintendent.

3.04 REMOVAL

- A. Remove debris, rocks, and extracted plant life from site.
- B. Relocate all debris to a site as directed by the Construction Superintendent.
- C. Burning of waste materials on the site will not be permitted.

END OF SECTION

SECTION 02222EXCAVATION

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PART 3 EXECUTION		2
3.01	Preparation	2
3.02	Excavation	2
3.03	Compaction	3

SECTION 02222

EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Excavation of radiologically impacted soils.
- B. Excavation of soil stockpile.

1.02 RELATED WORK

- A. Section 01050 - Field Surveying
- B. Section 02223 - Native Material Fill

1.03 REFERENCES

- A. Code of Federal Regulations (CFR) 29 CFR:

OSHA 1926 Safety and Health Regulations for
 Construction

1.04 QUALITY ASSURANCE

Inspections/Observations shall be performed to verify compliance with Parts 3.02 and 3.03 of this specification in accordance with the approved Sampling, Inspection, Testing, and Acceptance (SITA) Plan.

1.05 PROTECTION

- A. Notify the Construction Superintendent of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- B. The exact location and depth of burial of unidentified utilities or man made objects (if any encountered) shall be confirmed/documented (goldaking) by the Construction Superintendent and provided to the Site Supervisor.

PART 2 PRODUCTS

2.01 MATERIALS

A. Radiologically Impacted Soils

1. Excavated contaminated soils shall be containerized and shipped to the Area 3 RWMS at the NTS for disposal, per the SITA plan.

B. Soil Stockpile (Native Material Backfill)

1. Excavated native material shall be obtained from locations shown on the drawings.
2. Native material from excavations shall be stockpiled until required, or transported directly for cover construction.

2.02 EQUIPMENT

- #### A.
- Equipment shall meet the applicable requirements of OSHA 1926

PART 3 EXECUTION

3.01 PREPARATION

- #### A.
- Identify required lines, levels, contours, and datum. See Section 01050.
- #### B.
- Check, as required, and mark any unidentified buried utilities/manmade objects before any excavation work begins. Utilize any existing goldaking documents to minimize additional efforts.

3.02 EXCAVATION

A. Radiologically Impacted Soils

1. Survey shall locate contaminated soils to be removed.
2. Excavations shall be approximately 2.0' (610 mm) square and 6" (152 mm) deep.
3. Field screen areas for radiation after soil removal.

B. Soil Stockpile (Native Material Backfill)

1. Verify that excavation grade slope banks do not exceed OSHA 1926 requirements.
2. Remove all lumped subgrade soil and rocks over 6 inches (152 mm) in diameter.
3. Perform excavations such that adequate drainage is maintained.
4. Use the excavations to obtain required native material fill.
 - a. Dispose of overburden and other spoil materials as directed by the Construction Superintendent.
 - b. Trim the side slopes neatly after the excavation is completed.
5. Stockpile excavated material in an area designated by the Construction Superintendent.
6. Stockpile excavated borrow material to a height not exceeding 15 feet (4.57 m).

3.03 COMPACTION

- A. Radiologically Impacted Soils
 1. No compaction required.
- B. Soil Stockpile (Native Material Backfill)
 1. No compaction required.

END OF SECTION

SECTION 02223NATIVE MATERIAL FILL

TABLE OF CONTENTS

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3.01	Inspection	2
3.02	Equipment	2
3.03	Placement	2
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SECTION 02223

NATIVE MATERIAL FILL

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Native Material Fill

1.02 RELATED WORK

- A. Section 02222 - Excavation

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM D2487-98 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

- B. Code of Federal Regulations (CFR) 29 CFR:

OSHA 1926 Safety and Health Regulations for Construction

1.04 QUALITY ASSURANCE

- A. Inspection/Observation Personnel shall be as stated in the approved Sampling, Inspection, testing, and Acceptance (SITA) Plan.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill material shall be excavated native material obtained from excavations as shown on the drawings.

1. Native Material Fill: Material shall be a well graded, natural soil containing not more than 50 percent fines, with rocks larger than 6 inches, brush, roots, and all debris removed. Well graded shall be per ASTM D2487, where the sieve opening passing 60 percent of the material is 4 or more times greater than the size passing 10 percent of the material.

2.02 EQUIPMENT

- A. Equipment shall meet the applicable requirements of OSHA 1926

PART 3 EXECUTION

3.01 INSPECTION

- A. Documentation shall be in accordance with the approved SITA Plan.
- B. Verify that areas to be backfilled are free of debris, water, and rocks larger than 6 inches.
- C. Verify that all items under Part 3.04 are complete after placement of each lift of fill material.

3.02 EQUIPMENT

- A. Fill materials shall be placed with standard earth moving equipment.

3.03 PLACEMENT

- A. Native Material Fill:
 - 1. Layer material shall be placed in continuous 6 inch (152 mm) minimum, 12 inch (305 mm) maximum completed lifts.
 - 2. After all Native Material Fill lifts have been placed and all lift thickness requirements have been accepted, approved, and documented, the following shall be performed:
 - a. The entire surface of the Native Material Fill shall be graded to achieve a uniform slope as shown on the drawings.

3.04 FIELD QUALITY CONTROL

A. GRADE CONTROL

- 1. Final grade slope will be as indicated on the drawings and the tolerance shall be minus 0% to plus 1.5%.

B. THICKNESS CONTROL

1. Lift thickness shall be verified and documented per Section II of the approved SITA Plan, and specification section 01050.

C. INSPECTION

1. Inspection/observations shall be performed and documented as indicated in Section II of the approved SITA Plan.

END OF SECTION

SECTION 02831FENCES

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1.03	References	1
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PART 2 PRODUCTS		1
2.01	Barbed Wire Fence	1
2.02	Concrete	2
PART 3 EXECUTION		2
3.01	General	2
3.02	Barbed Wire Fence	2
3.03	Signs	3

SECTION 02831

FENCES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Barbed wire fencing
- B. Gates

1.02 RELATED WORK

- A. Section 03001 - Plain Concrete

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM A121-92 Standard Specification for Zinc-Coat
Rev A (Galvanized) Steel barbed wire

ASTM A123-89 Standard Specification for Zinc (Hot-Dip
Rev A Galvanized) Coatings on Iron and Steel
Products

- B. Federal Specifications (FS):

FS RR-F-183 Fence Posts, Gates, and Accessories

FS RR-F-221 Fencing Wire (Barbed Wire, Woven Wire,
and Netting) Fence Posts and Accessories

1.04 QUALITY ASSURANCE

NOT USED

PART 2 PRODUCTS

2.01 BARBED WIRE FENCE

- A. Wire: furnish barbed wire consisting of two twisted strands of 12 1/2 gauge wire, with 4 point barbs spaced not more than 5 inches (127 mm) apart conforming to FS RR-F-221.
- B. Posts: furnish drive-type and corner/end-type posts for barbed wire fencing of the length shown on the Drawings.
- C. Coatings: galvanized coating is standard for barbed wire, gate assemblies, and corner/end posts. Galvanized coating for drive-type (intermediate) posts is preferred.

- D. Fencing components size, shape, and dimensions vary by manufacturer. Nominal information is indicated on the drawings, and the selected vendor may provide alternate sizes, shapes, and dimensions of fencing components.

2.02 CONCRETE

- A. Furnish an approved, pre-mixed concrete having a compressive strength of 2,000 psi (14 MPa) at 28 days as specified in Section 03001. Testing is not required.

PART 3 EXECUTION

3.01 GENERAL

A. Grading

1. The ground along the fence line shall be graded such that the vertical clearance between bottom of lower fence strand and ground will not be less than 6 inches (153 mm) unless otherwise shown on the Drawings or approved by the Construction Supervisor.

B. Excavation

1. Excavation for posts and other concrete-embedded items shall be of the dimensions indicated on the Drawings.
2. Waste material from excavation shall be spread where directed.
3. Post holes to receive concrete shall be thoroughly cleared of loose material.

C. Footings

1. Footing dimensions for corners and end (terminal) posts shall be as shown on the project/standard drawings.
2. Finish concrete footings by neatly shaping at the finish grade line to provide shedding of water away from the posts.

3.02 BARBED WIRE FENCE

A. Erection

1. Assemble and erect fences as specified and in accordance with detailed instructions furnished by the fencing manufacturer.

B. Fence posts

1. Drive posts shall be spaced as shown on the Drawings and driven to the depth required to provide the fence height indicated.
2. Corner and end posts shall be installed as shown on the drawings and/or manufacturers instructions.
3. Cut posts, if required, to achieve fence height specified on the drawings.

C. Barbed wire

1. Barbed wire shall be spaced as indicated to provide the number of strands shown on the Drawings.
2. Barbed wire shall be fastened as required by the types of posts used in the fence assembly.
3. Chicken wire shall be attached to the outside of the barbed wire fence. Wire shall extend 3 feet (914mm) above grade and be embedded a minimum of 1 foot (305mm) below grade.

D. Gates

1. Gates shall be of the design indicated on the Drawings, or as approved by the manufacturer.
2. Gate security hinges shall have tight, nonremovable pins; latches shall be provided with means for padlocking.

3.03 SIGNS

- A. All signs to be installed on the fence shall be at the locations shown on the drawings.
- B. Signage Size, type, and color of letters shall be as shown on the drawings.

END OF SECTION

TABLE OF CONTENTS

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1.04	Quality Control	1
PART 2 PRODUCTS		1
2.01	Concrete Materials	1
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PART 3 EXECUTION		2
3.01	Placing Concrete	2
3.02	Finishing	2
3.03	Curing (Survey Location Monuments Only)	2
3.04	Concrete Inspection	3

SECTION 03001

PLAIN CONCRETE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Concrete for Fence Footings
- B. Concrete for Survey Location Monuments

1.02 RELATED WORK

- A. Section 02831 Fences

1.03 REFERENCES

- A. American Concrete Institute (ACI):

ACI 301-89 Structural Concrete for Buildings

ACI 305R-91 Hot Weather Concreting

ACI 306R-88 Cold Weather Concreting

- B. American Society for Testing and Materials (ASTM):

ASTM C33-93 Standard Specification for Concrete Aggregates

ASTM C94-92 Standard Specification for Ready-Mixed Concrete

ASTM C150-92 Standard Specification for Portland Cement

1.04 QUALITY CONTROL

- A. Perform work in accordance with ACI 301.
- B. Hot weather concreting shall be in accordance with ACI 305R-91. Cold weather concreting shall be in accordance with ACI 306R-88.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. Use one brand and type of pre-mixed concrete throughout project unless otherwise shown on the Drawings.
- B. Cement (used in pre-mixed concrete) - conforming to ASTM C150, Type II, No color required.

2.02 CONCRETE MIX

- A. Provide an approved, Pre-mixed concrete having a compressive strength of 2,000 psi (14 MPa) in 28 days unless otherwise shown on the Drawings. Testing is not required.

PART 3 EXECUTION

3.01 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.
- B. Verify that fence posts are in place and kept vertical.

3.02 FINISHING

A. Concrete finishes

1. Dusting of finish surfaces with dry materials will not be permitted.
2. Additions of water to finish surfaces will not be permitted.
3. Survey location monument finishing
 - a. Screed and float concrete with straight edges to bring surface to required level with no coarse aggregate visible.
 - b. Float concrete while still soft to a true, even plane.
 - c. Trowel surfaces to required finish after surface moisture has disappeared, leaving no coarse aggregate visible.
4. Fence post footing finishing
 - a. Slope top surface to drain away from fence post.

3.03 CURING (SURVEY LOCATION MONUMENTS ONLY)

A. Protect from moisture loss all concrete surfaces not covered by forms.

1. Begin curing immediately after finishing.
2. Cure for not less than seven days.
3. Shade concrete surfaces from direct sun during the curing period.
4. Keep surfaces free of any traffic (foot or vehicle) during the curing period.

B. Curing shall be accomplished by the following method.

1. Curing Compound

3.04 CONCRETE INSPECTION

- A. Inspect all concrete surfaces immediately after pouring concrete.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable and must be replaced.
- C. Modify or replace concrete not conforming to required levels and lines, details, and elevations.
- D. Repair or replace concrete not properly placed or not of the specified type.

END OF SECTION

APPENDIX A-2

PROJECT ORGANIZATION

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The following are the DOE/NV project contacts:

Runore C. Wycoff
Director
Environmental Restoration Division
U.S. Department of Energy, Nevada Operations Office
P.O. box 98518
Las Vegas, NV 89193-8518
(702) 295-0250

Janet L. Appenzeller-Wing
Project Manager
Industrial Sites Project
U.S. Department of Energy, Nevada Operations Office
P.O. box 98518
Las Vegas, NV 89193-8518
(702) 295-0461

The identification of the project Health and Safety Officer and the Quality Assurance Officer can be found in the appropriate DOE plan. However, personnel are subject to change and it is suggested that the Project Manager be contacted for further information. The Task Manager will be identified in the FFACO Biweekly Activity Report prior to the start of field activities.

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APPENDIX B

FLOOD STUDY

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SUBJECT TONOPAH TEST RANGE (TTR) CAU 407

PROJECT NO: 00022.A54

ID NO.: C7C013BB

DOCUMENT DRAWING NO.	REV.	DESCRIPTION/TITLE
A/C-00022.A54-C-146	0	HYDROLOGIC/HYDRAULIC ANALYSIS, CAU407 ROLLER COASTER RADSAFE AREA, TONOPAH TEST RANGE

COMMENTS:

- 1) Original analysis to be returned to the project file at NLV085.
- 2) One copy was hand delivered to Gary Hudak for reproduction and distribution to Dennis Gustafson.

ACTION

- ☐ Review and Comment
- ☐ For Approval
- ☐ Construction
- ☒ Information
- ☒ See Comments

ORIGINATOR J. M. Dixon/H. S. Bensinger

JMD:HSB:mlb

BECHTEL NEVADA	DOE	OTHERS
W/O M. K. Blake, NLV085 W/O H. S. Bensinger, NLV022 W/1 J. M. Dixon, NLV081 W/O D. L. Gustafson, NTS306 W/1 T. M. Fitzmaurice, NTS306 W/O K. M. Schechter, NLV085 W/1 J. A. Sorola, NLV085 W/1 V. Yucel, NLV081 W/O Correspondence Control, NLV008 W/O Document Control, NLV049 W/O DDD Log, NLV085 W/1 Project Files, NLV085 (Original) W/1 ARC, NTS140		

ANALYSIS / CALCULATION (A/C) COVER SHEET

Project Title: CAU 407 – Roller Coaster Radsafe Area, Tonopah Test Range		Project/Tracking No.: 00022.A54	Analysis/Calculation No.: A/C – 00022.A54-C-146
Subject: Hydrologic/Hydraulic Analysis			
Analysis / Calculation Status Designation: ☐ Preliminary ☒ Final ☐ Superseded			
Computer Program / Title	Mainframe / PC	Program No.	Version / Release No.
HEC-1 Flood Hydrograph Package	PC		4.1 / 1998
Microsoft Excel	PC		SR-2 / 1997
FlowMaster	PC		V5.3
CulvertMaster	PC		v1.0

1.0 INTRODUCTION

The goal of this analysis is to evaluate potential flood hazards at the Corrective Action Unit 407 from a 25-yr, 6-hr storm. The site location is near the northeast corner of the intersection of Main Road and Browne's Lake Road. Approximately, 360 ft north of the facility lies an existing 20-ft wide channel, which passes under Main Road through two 3-ft culverts. Accumulated runoff from the contributing 1.2 mi² watershed is directed away from the facility through ditches that run along Main and Browne's Lake Roads to the south and the 20-ft channel to the north.

Discharges were determined using the HEC-1 rainfall-runoff model. The predicted discharge was then used to evaluate the v-ditches on either side of the Main Road, the two 3-ft culverts under Main Road, and the 20-ft channel north of the facility.

2.0 CONCLUSIONS

Expected flood flows from a 25-yr, 6-hr storm are not expected to impact the facility. Runoff from RC2 (see Attachment 1) flows to the v-ditch west of main road (NW V-Ditch) where it is adequately conveyed to the two 3-ft culverts north of the facility. The combined peak flow from RC1 and RC2 was 28 cfs. This flow was simulated in the 20-ft channel north of the facility (W-E Channel) with approximately 2-ft of freeboard. The 20-ft channel flows under Main Road via two existing 3-ft corrugated metal pipe culverts. These culverts will convey the flood flow with a headwater elevation approximately 2 ft below road elevation under unsubmerged flow conditions.

Record of Revisions

Revision No.	Reason for Revision	Date	Prepared	Checked	Approval
0	Initial Issue	3/27/00	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

ANALYSIS / CALCULATION (A/C) SHEET

Project: CAU 407 – Roller Coaster Radsafe Area, Tonopah Test Range		Analysis/Calculation No.: A/C – 00022.A54-C-146	
Subject: Hydrologic/Hydraulic Analysis			
Date 3/27/00		Prepared by: JMD	Checked by: WJ

Table of Contents

<u>Section</u>	<u>Page Number</u>
1.0 INTRODUCTION	1
2.0 CONCLUSIONS	1
TABLE OF CONTENTS.....	2
3.0 REFERENCES	3
4.0 ASSUMPTIONS.....	3
5.0 CALCULATION INPUT	3
6.0 ANALYSIS.....	3
7.0 CALCULATIONS.....	4
WATERSHED BOUNDARY SKETCH.....	5
APPENDIX (HEC-1 OUTPUT).....	20

ANALYSIS / CALCULATION (A/C) SHEET

Project: CAU 407 – Roller Coaster Radsafe Area, Tonopah Test Range		Analysis/Calculation No.: A/C – 00022.A54-C-146	
Subject: Hydrologic/Hydraulic Analysis			
Date 3/27/00		Prepared by: JmD	Checked by: VJ

3.0 REFERENCES

1. Clark County Regional Flood Control District (CCRFGD) Hydrologic Criteria and Drainage Design Manual, 1999 Edition.
2. Miller, J.F., R.H. Frederick and R.J. Tracy, 1973. Precipitation-frequency atlas of the Western United States, Vol. VII-Nevada, National Oceanic and Atmospheric Administration, Silver Spring, MD.
3. Soil Conservation Service (SCS). SCS National Engineering Handbook, Section 4, Hydrology. U.S. Department of Agriculture, paginated by section, March 1985.

4.0 ASSUMPTIONS

1. The time distribution of the 25-yr, 6-hr design precipitation depth (1.3 in.) was based on a technique described in Miller *et al.* (1973).
2. Runoff was estimated using the SCS curve number and Unit Hydrograph methods (SCS, 1985). The curve number used for this analysis was conservatively estimated at 75 which corresponds to a value describing hydrologic soil group B (medium runoff potential) of poor to fair vegetative ground cover (<70% ground cover).
3. Basin slopes were taken as representative averages throughout each subbasin.
4. Average cross-sections of the v-ditch (NW V-Ditch) northwest of the facility and the 20-ft channel (W-E Channel) just north of the facility were based on a digitized surface created from survey information.

5.0 CALCULATION INPUT

1. Basin Area
2. Basin lag time
4. Curve Number
5. Storm precipitation depth and storm distribution
5. V-Ditch and channel station and elevation (average cross-sections)

6.0 ANALYSIS

The 1.2 mi² watershed was divided into two subbasins, RC1 and RC2, to best represent surface drainage characteristics of the study area, see Attachment 1. Runoff was estimated using the HEC-1 rainfall-runoff model. Runoff from RC2 was simulated in NW V-Ditch (ditch northwest of the facility), which drains into the two 3-ft culverts under Main Road. Total flow (28 cfs) from RC1 and RC2 was then simulated in W-E Channel (20-ft channel draining from west to east about 360-ft north of the facility. From the channel, the flood flow was simulated through the two 3-ft culverts. Details of all simulations, including model input is contained in Section 7, "Calculations."

ANALYSIS / CALCULATION (A/C) SHEET

Project: CAU 407 – Roller Coaster Radsafe Area, Tonopah Test Range		Analysis/Calculation No.: A/C – 00022.A54-C-146	
Subject: Hydrologic/Hydraulic Analysis			
Date 3/27/00		Prepared by: JMD	Checked by: VY

Note: The HEC-1 model was run in English units, while all FlowMaster® and CulvertMaster® simulations were performed using SI units. SI units were used because the digitized surface model used to obtain channel data was in metric units.

7.0 CALCULATIONS

Calculation details are included in the following pages.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55 > 59	72 > 75	81	86
	Good	49	68	79	84

¹Average runoff condition, and $I_a = 0.2S$.

²Poor: < 30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: > 70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

BN-0905 (08/99)

Bechtel Nevada

Analysis Calc. #: ALC-00022.ASH-C-146

Prepared By: JMD

Checked By: UJ

Rev.#: 0 Page 6 of 25

Revision	Date

Project: CAU 407- Roller Coaster Radsafe Area, Tonopah Test Range		Analysis/Calculation No.: A/C-00022.A54-C-146
Subject: Hydrologic / Hydraulic Analysis		Sheet Revision: 0
Date 3/7/00	Prepared JMD	Checked NY

Site Location: $37^{\circ}43' N$
 $116^{\circ}44' E$

* Basin areas were determined using "PLANIX" Tamaya Digital Planimeter with USGS 7.5 min. Topographic Quadrangles * $1":2000'$

Subbasin	Scaled Area (in ²)	[Ft ²]	[mi ²]
RC1	5.5	2.2×10^7	<u>.79</u>
RC2	2.9	1.16×10^7	<u>.42</u>

* A range of runoff curve numbers will be evaluated assuming Poor/Fair conditions. Values for Hydrologic Soil groups A, B, C (see attached Table 602 from CCRFCD, 1999)

* Basin Lag times are calculated from Eqns. (601) and (602) (CCRFCD, 1999) for areas less than 1 mi^2 .

where: $T_{lag} = 0.6 t_c$ (612)

$$t_c = t_i + t_t \quad (601)$$

$$t_i = \frac{1.8(1.1-K)L_o^{1/2}}{\sqrt[3]{S}} \quad (602)$$

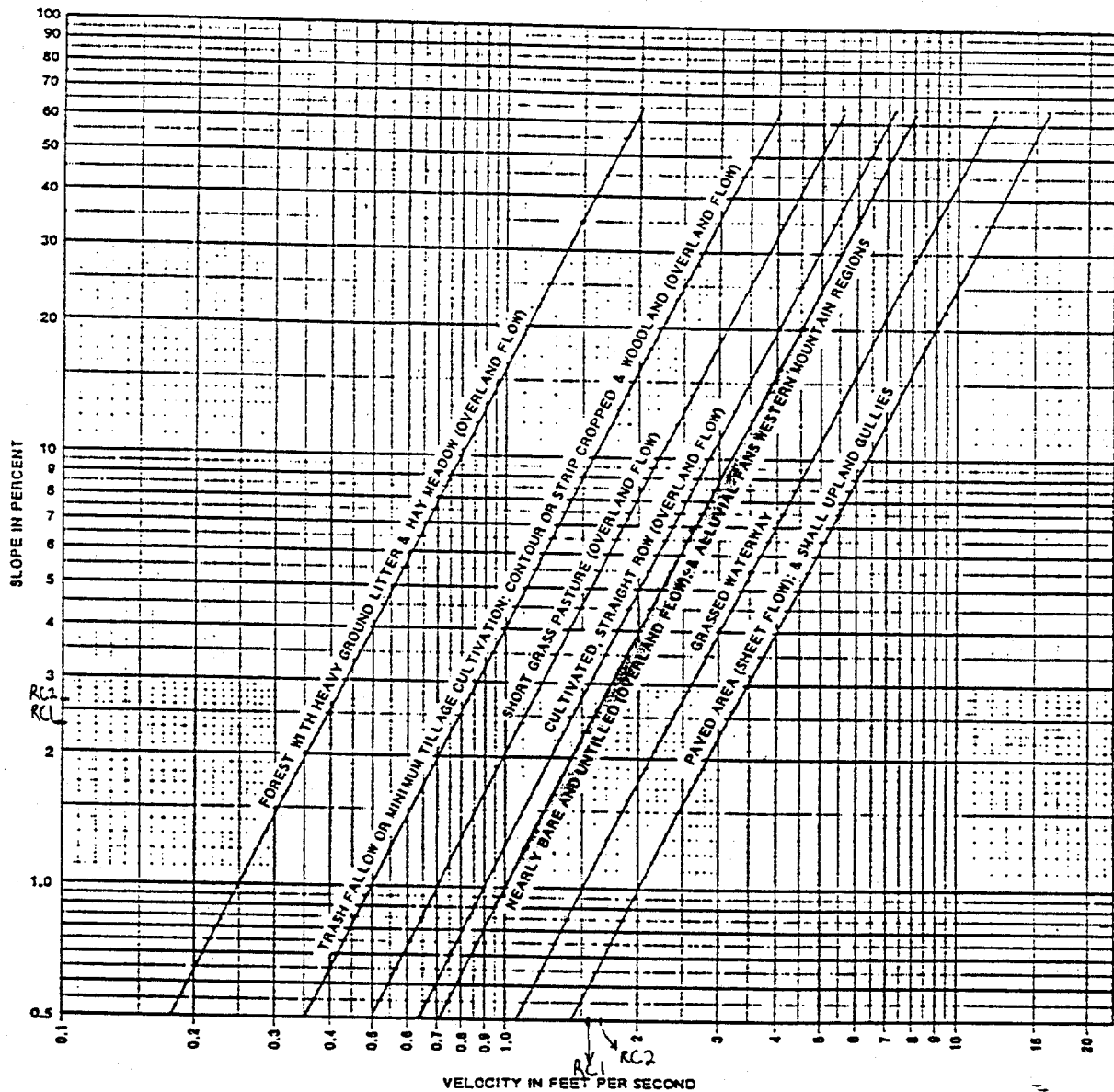
$$K = 0.0132(CN) - .39 \quad (603)$$

$$t_t = \frac{L}{V}$$

(from Fig. 602, CCRFCD, 1999)

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TRAVEL TIME VELOCITY



BN-0905 (08/99)

Bechtel Nevada

Analysis Calc. #: A/C-00022.A54-C-146

Prepared By: JMD

Checked By: VJ

Rev.#: 0 Page 8 of 25

Revision	Date

**WRC
ENGINEERING**

REFERENCE: SCS National Engineering Handbook
Section 4, Hydrology, March, 1985

FIGURE 602

Lag Time (< 1 sq. mi.)

CN = 59											
Sub-Basin Data		Initial/Overland Flow			Travel Time (t _t)			Time of Concentration		Lag Time	
Designation	Area (mi ²)	² K	³ Length (ft)	Slope %	t _t (min)	Length (ft)	Channel Slope %	V (ft/sec)	t _t (min)	t _c	L (hr)
RC1	0.79	0.39	500	5.0	16.7	7000	2.3	1.6	72.9	89.7	0.90
RC2	0.42	0.39	500	5.6	16.1	8500	2.6	1.7	83.3	99.4	0.99
CN = 67											
Sub-Basin Data		Initial/Overland Flow			Travel Time (t _t)			Time of Concentration		Lag Time	
Designation	Area (mi ²)	² K	³ Length (ft)	Slope %	t _t (min)	Length (ft)	Channel Slope %	V (ft/sec)	t _t (min)	t _c	L (hr)
RC1	0.79	0.49	500	5.0	14.3	7000	2.3	1.6	72.9	87.2	0.87
RC2	0.42	0.49	500	5.6	13.7	8500	2.6	1.7	83.3	97.0	0.97
CN = 75											
Sub-Basin Data		Initial/Overland Flow			Travel Time (t _t)			Time of Concentration		Lag Time	
Designation	Area (mi ²)	² K	³ Length (ft)	Slope %	t _t (min)	Length (ft)	Channel Slope %	V (ft/sec)	t _t (min)	t _c	L (hr)
RC1	0.79	0.60	500	5.0	11.8	7000	2.3	1.6	72.9	84.7	0.85
RC2	0.42	0.60	500	5.6	11.3	8500	2.6	1.7	83.3	94.6	0.95

¹Originally developed by the Federal Aviation Administration

²Flow resistance coefficient from Equation 603, CCRFCD 1999

³Maximum allowable flow length is 500 ft., CCRFCD 1999

Analysis Calc. #: ALC-00022.A51-C-146

Prepared By: JMD

Checked By: Vy

Rev.#: 0 Page 10 of 25

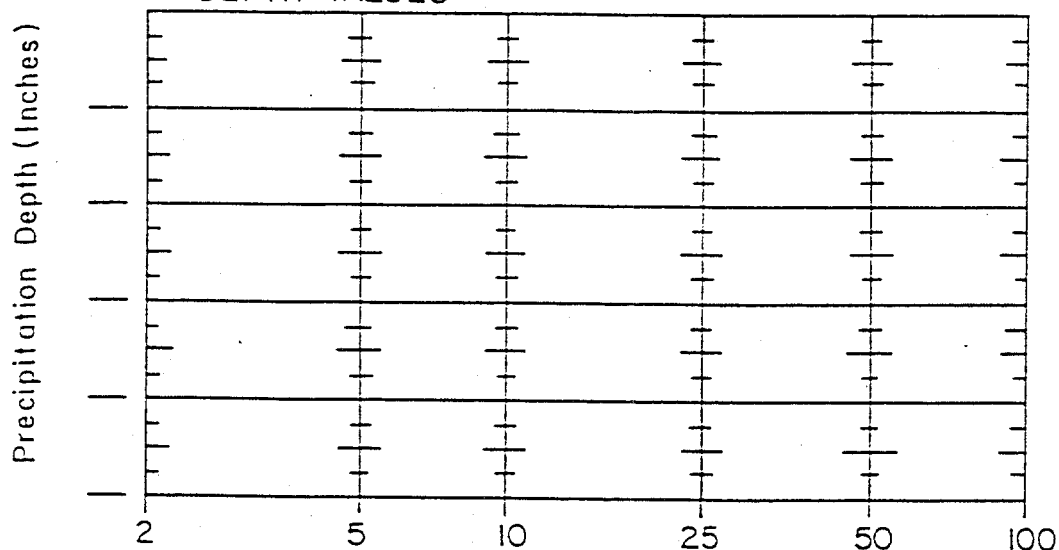
Derivation of 25-yr 6-hr storm data from NOAA Atlas II for Nevada

Table 12		Depth
x1	2-yr 6-hr depth	0.7
x2	2-yr 24-hr depth	1
x3	100-yr 6-hr depth	1.6
x4	100-yr 24-hr depth	2.2
Y2		0.4
Y100		1.2
25yr 6hr		1.3
25-yr 1 hr	Form 3, CCRFCD	0.85
25-yr 2-hr and 3-hr values		
2-hr		0.98
3-hr		1.09
Table 13		
5-min		0.25
10-min		0.38
15-min		0.48
30-min		0.67

*Precipitation adjustment ratios based on CCRFCD, 1999

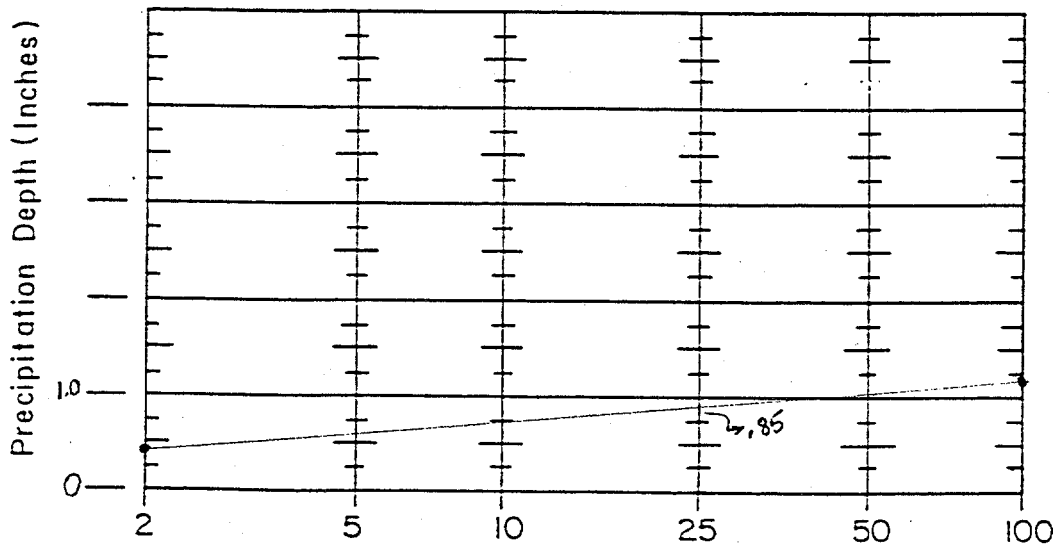
PRECIPITATION DEPTH VERSUS RETURN PERIOD

A. PLOT OF 6-HOUR AND 24-HOUR PRECIPITATION
DEPTH VALUES



Return Period in Years, Partial - Duration Series

B. PLOT OF 1-HOUR PRECIPITATION DEPTH VALUES



Return Period in Years, Partial - Duration Series

BN-0005 (03/89) **Bechtel Nevada**

Analysis Calc. #: A/C-00022, A54-C-146

Prepared By: JMD

Checked By: UJ

Rev #: 0 Page 11 of 25

Revision	Date

REFERENCE:

NOAA ATLAS 2, VOLUME VII NEVADA, 1973

STANDARD FORM 3

HEC-1 Results

Analysis Calc. #: AK-00022.A54-C-146Prepared By: JMDChecked By: VyRev.#: 0 Page 12 of 25

		English	
Curve Number	59	67	75
Total Flow, cfs	0	4	28
RC2 Flow, cfs	0	1	10

		Metric	
Curve Number	59	67	75
Total Flow, cms	0.0	0.1	0.8
RC2 Flow, cms	0.0	0.0	0.3

Ditches West of Facility

BN-0905 (08/99)

Bechtel Nevada

Analysis Calc. #: A/C-00022.A54-C-4

Prepared By: JMD

Checked By: UJ

Rev.#: 0 Page 13 of 25

NW (west side of Main Rd.) SLOPE = .026 m/m

Station	Left Bank (H:V)	Right Bank (H:V)	Minimum Ht. (m)
0+00	7.9	19.3	0.2
0+75	11.9	22.5	0.09
1+50	7.3	11.3	0.23
2+25	7.7	6.2	0.95
Average	8.7	14.8	0.37

NW V-Ditch			
	Left	Bottom	Right
Station*	100	103.20	108.65
Elevation*	100	99.63	100.00

NE (east side of Main Rd.) SLOPE = .026 m/m

Station	Left Bank (H:V)	Right Bank (H:V)	Minimum Ht. (m)
0+00	18.9	7.2	0.3
0+75	64.6	7.2	0.05
1+50	7.2	7.1	0.44
2+25	7.6	6.5	0.53
Average	24.6	7.0	0.33

NE V-Ditch			
	Left	Bottom	Right
Station*	100	108.11	110.42
Elevation*	100	99.67	100.00

*Arbitrary starting stations and elevations

NW 75
Worksheet for Irregular Channel

Project Description	
Project File	g:\dgn\00022a54\hydrolog\nwvditch.fm2
Worksheet	NW V-Ditch, CN 75
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

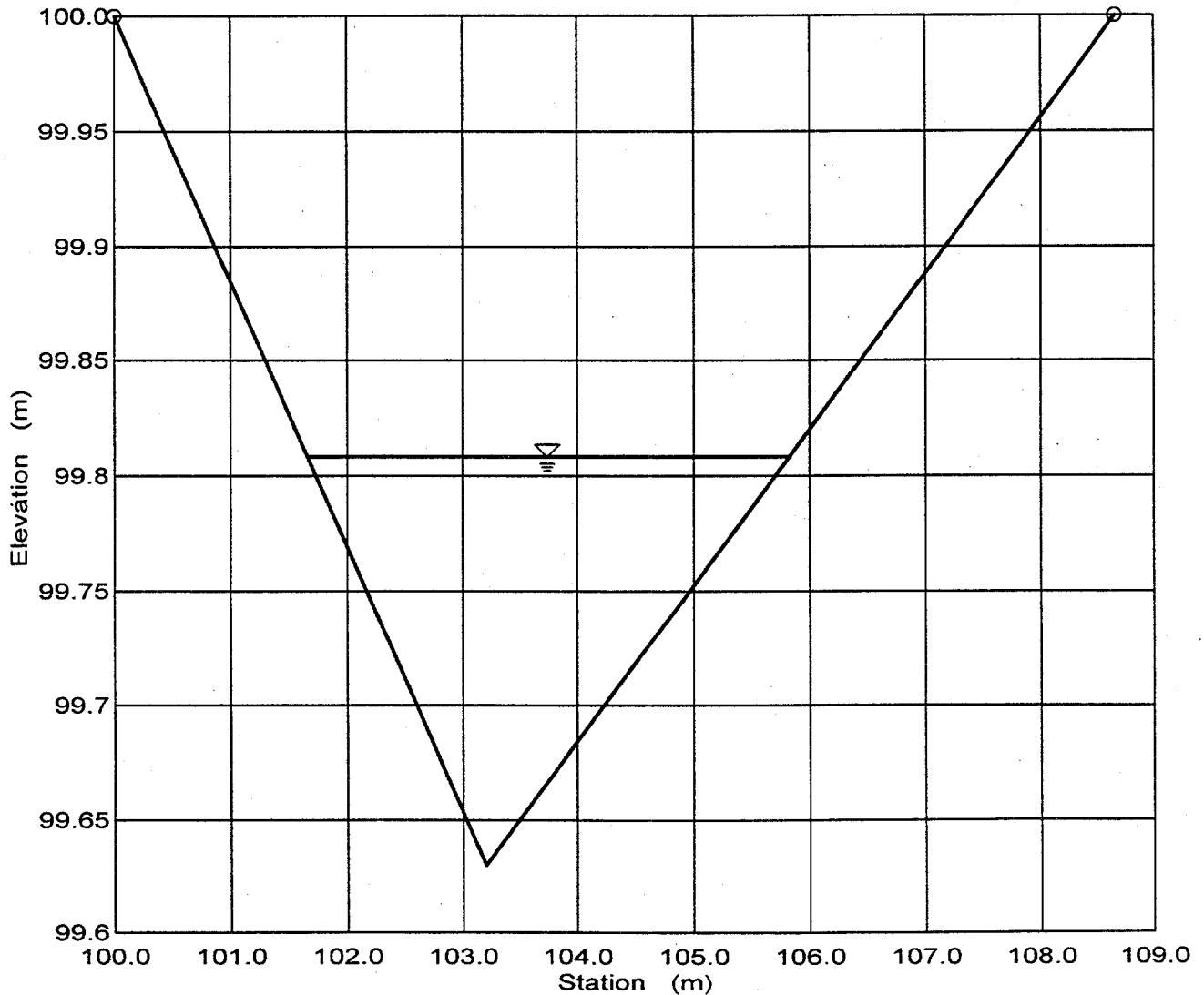
Input Data				
Channel Slope	0.026000 m/m			
Elevation range: 99.6 m to 100.0 m.				
Station (m)	Elevation (m)	Start Station	End Station	Roughness
100.00	100.00	100.00	108.65	0.040
103.20	99.63			
108.65	100.00			
Discharge	0.30	m³/s		

Results		
Wtd. Mannings Coefficient	0.040	
Water Surface Elevation	99.81	m
Flow Area	0.37	m ²
Wetted Perimeter	4.19	m
Top Width	4.18	m
Height	0.18	m
Critical Depth	99.80	m
Critical Slope	0.036005	m/m
Velocity	0.80	m/s
Velocity Head	0.03	m
Specific Energy	99.84	m
Froude Number	0.86	
Flow is subcritical.		

NW, CN 75
Cross Section for Irregular Channel

Project Description	
Project File	g:\dgn\00022a54\hydrolog\nwvditch.fm2
Worksheet	NW V-Ditch, CN 75
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.040
Channel Slope	0.026000 m/m
Water Surface Elevation	99.81 m
Discharge	0.30 m ³ /s



W-E Channel

Analysis Calc. #: AL-00022.A54-C-146Prepared By: JMDChecked By: VYRev.#: 0 Page 16 of 25**Upstream of Culvert**

SLOPE = .026 m/m

Station	Left Bank (H:V)	Bottom Width (m)	Right Bank (H:V)	Height. (m)
0+00	-	-	-	-
0+10	14	4.3	8.4	0.89
0+20	12.7	4.7	9.5	0.77
0+30	9.7	5.2	3.2	0.74
0+40	9.7	6.9	7.3	0.69
0+50	9.7	7.4	5.1	0.67
0+60	9.7	7.4	5.1	0.66
0+64.86	-	-	-	-
Average	10.9	6.0	6.4	0.74

	Top Left	Bottom Left	Bottom Right	Top Right
Station*	100	91.96	85.97	81.24
Elevation*	100	99.26	99.26	100

Downstream of Culvert

SLOPE = .026 m/m

Station	Left Bank (H:V)	Bottom Width (m)	Right Bank (H:V)	Height. (m)
0+00	2.4	8.3	7.8	1.4
0+20	1.8	21	3.1	1.5
0+40	8.6	16.1	3.4	1.5
0+60	9.9	6.6	3.1	1.5
0+80	6.7	6.2	3.8	1.2
1+20	5.4	7.6	3.1	0.9
1+40	↓		↓	
1+60		Past Facility		
1+80	↓		↓	
Average	5.8	11.0	4.1	1.3

	Top Left	Bottom Left	Bottom Right	Top Right
Station*	100	92.27	81.30	75.90
Elevation*	100	98.67	98.67	100

*Arbitrary starting stations and elevations

CN 75 Worksheet for Irregular Channel

Project Description

Project File	g:\dgn\00022a54\hydrolog\w-echanl.fm2
Worksheet	W-E Upstream Channel, CN 75
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.026000 m/m

Elevation range: 99.26 m to 100.00 m.

Station (m)	Elevation (m)	Start Station	End Station	Roughness
100.00	100.00	100.00	81.24	0.040
91.96	99.26			
85.97	99.26			
81.24	100.00			

Discharge 0.80 m³/s

Results

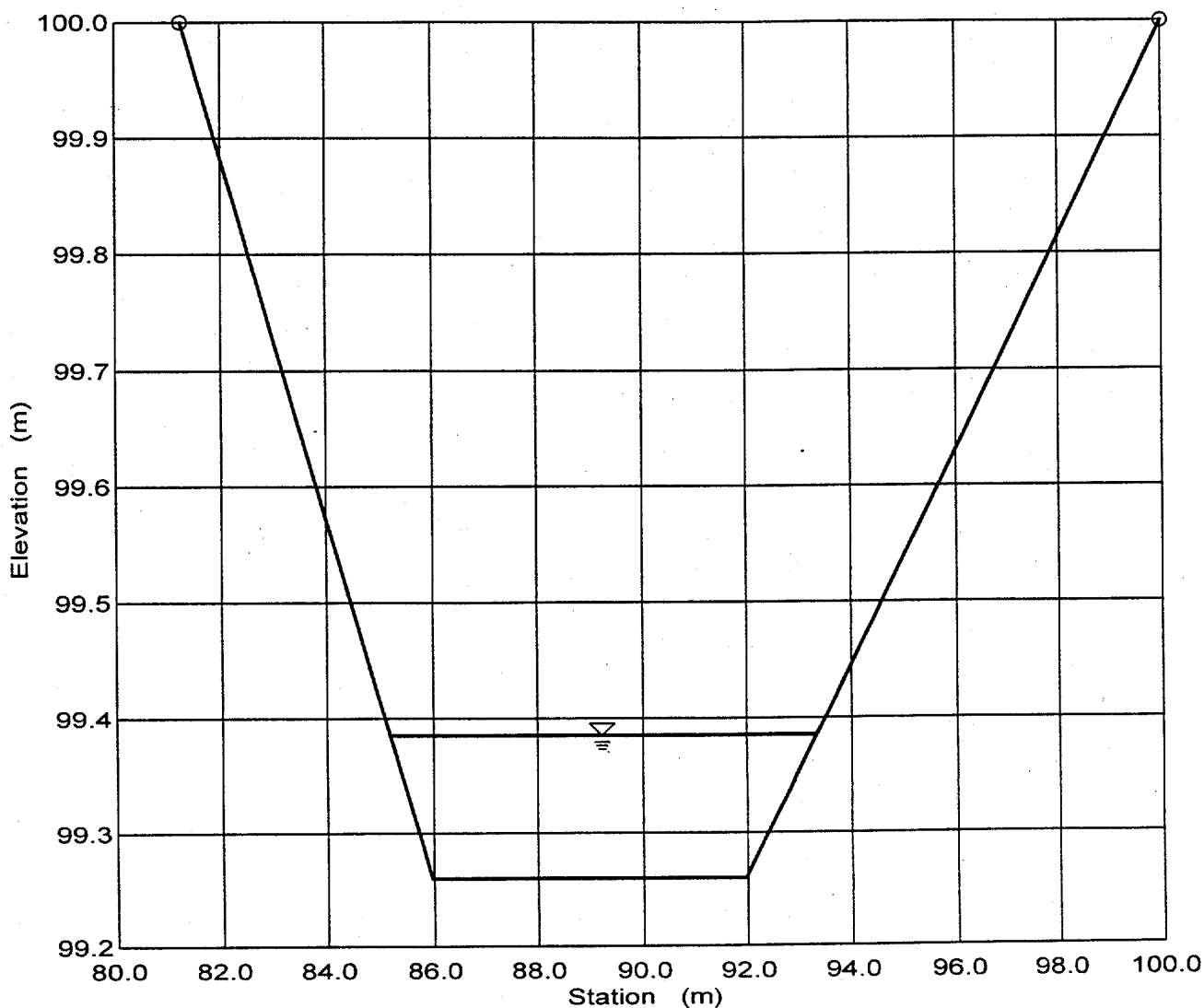
Wtd. Mannings Coefficient	0.040	
Water Surface Elevation	99.38	m
Flow Area	0.88	m ²
Wetted Perimeter	8.15	m
Top Width	8.13	m
Height	0.12	m
Critical Depth	99.38	m
Critical Slope	0.033790	m/m
Velocity	0.91	m/s
Velocity Head	0.04	m
Specific Energy	99.43	m
Froude Number	0.89	
Flow is subcritical.		

CN 75

Cross Section for Irregular Channel

Project Description	
Project File	g:\dgn\00022a54\hydrolog\w-echanl.fm2
Worksheet	W-E Upstream Channel, CN 75
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.040
Channel Slope	0.026000 m/m
Water Surface Elevation	99.38 m
Discharge	0.80 m ³ /s



Culvert Calculator Report

CN 75

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	1,700.100 m	Headwater Depth/ Height	0.68 < 3ft ✓
Computed Headwater Elevation	1,699.524 m	Discharge	0.8000 m³/s
Inlet Control HW Elev	1,699.418 m	Tailwater Elevation	1,699.200 m
Outlet Control HW Elev	1,699.524 m	Control Type	Entrance Control
Grades			
Upstream Invert	1,698.900 m	Downstream Invert	1,698.300 m
Length	12.270 m	Constructed Slope	0.048900 m/m
Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	0.900 m
Slope Type	Steep	Normal Depth	0.260 m
Flow Regime	N/A	Critical Depth	0.365 m
Velocity Downstream	0.611 m/s	Critical Slope	0.013587 m/m
Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.914 m
Section Size	900 mm	Rise	0.914 m
Number Sections	2		
Outlet Control Properties			
Outlet Control HW Elev	1,699.524 m	Upstream Velocity Head	0.136 m
Ke	0.90	Entrance Loss	0.123 m
Inlet Control Properties			
Inlet Control HW Elev	1,699.418 m	Flow Control	Unsubmerged
Inlet Type	Projecting	Area Full	1.31 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

ANALYSIS / CALCULATION (A/C) SHEET

Project: CAU 407 – Roller Coaster Radsafe Area, Tonopah Test Range		Analysis/Calculation No.: A/C – 00022.A54-C-146	
Subject: Hydrologic/Hydraulic Analysis			
Date 3/27/00		Prepared by:	Checked by:

**APPENDIX
(HEC-1 Output)**

```

*****
*
FLOOD HYDROGRAPH PACKAGE (HEC-1) *
JUN 1998
VERSION 4.1

RUN DATE 10MAR00 TIME 12:58:47

*****

*
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

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X X XXXXXXXX XXXXX X
X X X X X XX
X X X X X
XXXXXXX XXXX X XXXXX X
X X X X X
X X X X X X
X X XXXXXXXX XXXXX XXX

```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,

DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION

KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT PAGE 1

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1	ID AREA 54 (TTR) CAU 407 FLOOD ASSESSMENT
2	ID DELINEATED WATERSHED FROM 7.5 MIN USGS QUAD SHEETS
3	ID CURVE NUMBER 75
4	ID 5 MINUTE INTERVAL IN ITCARD
5	ID 25-YR, 6-HR STORM
6	ID SYNTHETIC STORM VALUES FROM NOAA ATLAS 2 VOL VII
7	ID NO DEPTH AREA REDUCTION
8	ID NO TRANSMISSION LOSSES
	*DIAGRAM
9	IT 1 0 0 288
10	IO 3
11	IN 5
12	KK RC1
13	PH .25 .48 .85 .98 1.09 1.3
14	KM BASIN RUNOFF CALCULATION FOR RC1
15	BA 0.79
16	LS 75
17	UD 0.85
	*
18	KK RC2
19	KM BASIN RUNOFF CALCULATION FOR RC2
20	BA 0.42
21	LS 75
22	UD 0.95
	*
23	KK CPRC
24	KM COMBINE FLOW FROM RC1 WITH FLOW FROM RC2 AT CULVERT
25	HC 2
26	ZZ

SCHEMATIC DIAGRAM OF STREAM NETWORK

BN-0805 (08/99) **Bechtel Nevada**

Analysis Calc. #: A/G-00022.A54-6-14

Prepared By: JMD

Checked By: Uy

Rev.#: 0 Page 21 of 25

INPUT
 LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
 NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
 12 RC1
 18 RC2
 23 CPRC.....

BN-0905 (08/98) **Bechtel Nevada**
 Analysis Calc. #: AK-00022 AS4-L-146
 Prepared By: J.M.D
 Checked By: ly
 Rev.#: 0 Page 22 of 25

***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
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*   JUN 1998                        * * HYDROLOGIC ENGINEERING CENTER *
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AREA 54 (TTR) CAU 407 FLOOD ASSESSMENT
 DELINEATED WATERSHED FROM 7.5 MIN USGS QUAD SHEETS
 CURVE NUMBER 75
 5 MINUTE INTERVAL IN ITCARD
 25-YR, 6-HR STORM
 SYNTHETIC STORM VALUES FROM NOAA ATLAS 2 VOL VII
 NO DEPTH AREA REDUCTION
 NO TRANSMISSION LOSSES

10 IO OUTPUT CONTROL VARIABLES
 IPRNT 3 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

 IT HYDROGRAPH TIME DATA
 NMIN 1 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 288 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 1 0 ENDING DATE
 NDTIME 0447 ENDING TIME
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .02 HOURS
 TOTAL TIME BASE 4.78 HOURS

ENGLISH UNITS
 DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, ELEVATION FEET
 FLOW CUBIC FEET PER SECOND
 STORAGE VOLUME ACRE-Feet
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

```

*****
*                                     *
12 KK * RC1 *
*                                     *
*****
    BASIN RUNOFF CALCULATION FOR RC1
  
```

SUBBASIN RUNOFF DATA

BN-0905 (08/99)

Bechtel NevadaAnalysis Calc. #: A/C-00022A54-C-146Prepared By: JMDChecked By: UYRev.#: 0 Page 23 of 25

15 BA SUBBASIN CHARACTERISTICS
TAREA .79 SUBBASIN AREA

PRECIPITATION DATA

13 PH DEPTHS FOR 0-PERCENT HYPOTHETICAL STORM

..... HYDRO-35 TP-40 TP-49
5-MIN 15-MIN 60-MIN 2-HR 3-HR 6-HR 12-HR 24-HR 2-DAY 4-DAY 7-DAY 10-DAY
.25 .48 .85 .98 1.09 1.30 .00 .00 .00 .00 .00 .00

STORM AREA = .79

16 LS SCS LOSS RATE
STRTL .67 INITIAL ABSTRACTION
CRVNR 75.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

17 UD SCS DIMENSIONLESS UNITGRAPH
TLAG .85 LAG

VALUE EXCEEDS TABLE IN LOGLOG .01667 .01667 6.00000

UNIT HYDROGRAPH
257 END-OF-PERIOD ORDINATES

3.	5.	8.	10.	13.	18.	25.	31.	37.	43.
50.	58.	65.	73.	81.	90.	101.	111.	121.	132.
143.	157.	171.	185.	199.	213.	229.	246.	262.	279.
295.	309.	322.	336.	350.	364.	374.	383.	393.	402.
412.	418.	423.	428.	433.	438.	441.	442.	442.	443.
444.	444.	443.	442.	442.	441.	438.	433.	428.	423.
418.	412.	406.	400.	394.	388.	382.	375.	368.	361.
354.	347.	339.	330.	322.	313.	304.	295.	284.	274.
263.	253.	244.	235.	227.	218.	209.	202.	196.	190.
184.	178.	172.	167.	161.	156.	151.	146.	142.	137.
133.	129.	124.	121.	118.	115.	112.	109.	106.	102.
99.	96.	93.	90.	88.	85.	82.	80.	77.	75.
72.	69.	67.	65.	63.	61.	59.	58.	56.	54.
53.	51.	49.	47.	46.	45.	44.	42.	41.	40.
38.	37.	36.	34.	33.	33.	32.	31.	30.	29.
28.	27.	26.	25.	24.	23.	23.	22.	22.	21.
20.	20.	19.	18.	18.	17.	17.	16.	16.	15.
15.	14.	14.	13.	13.	13.	12.	12.	12.	11.
11.	11.	10.	10.	9.	9.	9.	9.	8.	8.
8.	8.	7.	7.	7.	7.	6.	6.	6.	6.
6.	6.	5.	5.	5.	5.	5.	5.	5.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	0.	0.	0.	0.	0.	0.	0.	0.	0.

HYDROGRAPH AT STATION RC1

TOTAL RAINFALL = 1.22, TOTAL LOSS = 1.14, TOTAL EXCESS = .08

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

6-HR 24-HR 72-HR 4.78-HR

(CFS) (HR)

(CFS)

19. 3.68 6. 6. 6. 6.

(INCHES) .056 .056 .056 .056

(AC-FT) 2. 2. 2. 2.

CUMULATIVE AREA = .79 SQ MI

BN-0905 (08/99)

Bechtel Nevada

Analysis Calc. #: A/C-00022.A54-C-146

Prepared By: JMD

Checked By: VY

Rev.#: 0 Page 24 of 25

18 KK * RC2 *

BASIN RUNOFF CALCULATION FOR RC2

SUBBASIN RUNOFF DATA

20 BA SUBBASIN CHARACTERISTICS
TAREA .42 SUBBASIN AREA

PRECIPITATION DATA

13 PH DEPTHS FOR 0-PERCENT HYPOTHETICAL STORM
..... HYDRO-35 TP-40 TP-49
5-MIN 15-MIN 60-MIN 2-HR 3-HR 6-HR 12-HR 24-HR 2-DAY 4-DAY 7-DAY 10-DAY
.25 .48 .85 .98 1.09 1.30 .00 .00 .00 .00 .00 .00

STORM AREA = .42

21 LS SCS LOSS RATE
STRTL .67 INITIAL ABSTRACTION
CRVNBR 75.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

22 UD SCS DIMENSIONLESS UNITGRAPH
TLAG .95 LAG

VALUE EXCEEDS TABLE IN LOGLOG .01667 .01667 6.00000

UNIT HYDROGRAPH 287 END-OF-PERIOD ORDINATES

1.	2.	3.	4.	6.	7.	10.	12.	15.	17.
20.	23.	26.	29.	33.	36.	39.	44.	48.	52.
57.	61.	66.	72.	77.	83.	89.	95.	101.	108.
115.	122.	129.	136.	143.	149.	154.	160.	166.	172.
177.	181.	185.	189.	193.	197.	199.	201.	204.	206.
208.	210.	210.	210.	211.	211.	212.	212.	211.	211.
210.	210.	210.	208.	206.	204.	201.	199.	197.	194.
192.	189.	187.	184.	181.	178.	175.	172.	170.	167.
163.	160.	156.	152.	149.	145.	141.	136.	132.	127.
123.	119.	115.	111.	108.	104.	100.	97.	94.	92.
89.	86.	84.	81.	79.	77.	75.	73.	70.	68.
67.	65.	63.	61.	59.	58.	57.	55.	54.	53.
51.	50.	49.	47.	46.	44.	43.	42.	41.	40.
39.	38.	37.	36.	34.	33.	32.	31.	30.	30.
29.	28.	27.	27.	26.	25.	24.	24.	23.	22.
22.	21.	21.	20.	20.	19.	19.	18.	17.	17.
16.	16.	15.	15.	15.	14.	14.	13.	13.	13.
12.	12.	12.	11.	11.	11.	10.	10.	10.	10.
9.	9.	9.	8.	8.	8.	8.	8.	7.	7.
7.	7.	7.	6.	6.	6.	6.	6.	6.	5.
5.	5.	5.	5.	5.	5.	4.	4.	4.	4.
4.	4.	4.	4.	4.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

HYDROGRAPH AT STATION RC2

TOTAL RAINFALL = 1.23, TOTAL LOSS = 1.15, TOTAL EXCESS = .08

BN-0905 (08/99) **Bechtel Nevada**
Analysis Calc. #: A/C-00022.254-C-
Prepared By: JMD
Checked By: Ug
Rev.#: 0 Page 25 of 2

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	4.78-HR
10.	3.82	3.	3.	3.	3.
	(INCHES)	.053	.053	.053	.053
	(AC-FT)	1.	1.	1.	1.

CUMULATIVE AREA = .42 SQ MI

* *
23 KK * CPRC *
* *

COMBINE FLOW FROM RC1 WITH FLOW FROM RC2 AT CULVERT

25 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** *** *** *** ***

HYDROGRAPH AT STATION CPRC

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	4.78-HR
28.	3.72	9.	9.	9.	9.
	(INCHES)	.055	.055	.055	.055
	(AC-FT)	4.	4.	4.	4.

CUMULATIVE AREA = 1.21 SQ MI

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK TIME OF AVERAGE FLOW FOR MAXIMUM PERIOD				BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
		FLOW	PEAK	PERIOD				
				6-HOUR	24-HOUR			
HYDROGRAPH AT								
	RC1	19.	3.68	6.	6.	6.	.79	
HYDROGRAPH AT								
	RC2	10.	3.82	3.	3.	3.	.42	
2 COMBINED AT								
	CPRC	28.	3.72	9.	9.	9.	1.21	

*** NORMAL END OF HEC-1 ***

APPENDIX C
NDEP CLOSURE PLAN COMMENT RESPONSE

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DOCUMENT REVIEW SHEET

1. Document Title/Number: CORRECTIVE ACTION PLAN FOR CORRECTIVE ACTION UNIT 407: ROLLER COASTER
 RADSAFE AREA, TONOPAH TEST RANGE, NEVADA

2. Document Date: May 2000

3. Revision Number: 0

4. Originator/Organization: Bechtel Nevada Environmental Restoration

5. Responsible: Thomas Fitzmaurice

6. Date Comments Due:

7. Review Criteria:

6. Reviewer/Organization: Nevada Department of Environmental Protection

10. Comment Number/ Location	11. Type ^a	12. Comment	13. Comment Response	14. Accept
1. Appendix A	M	Appendix A is missing engineering specifications and/or drawings (Appendix A1); a sampling and analysis plan (Appendix A2); and Project Organization (Appendix A3). These requirements were agreed to in the template for the CAP which was approved on 8/21/98.	Appendix A was sent out under a different cover letter. Subsequent telephone communication with NDEP indicated that the engineering specifications were received and a confirmation letter was issued to DOE. Appendix A was renamed Appendix A-1 and is included in the final CAP. Appendix A-3 has been added to the final CAP. Appendix A-2 has been omitted because no physical samples will be collected for analysis.	Yes

10. Comment Number/ Location	11. Type ^a	12. Comment	13. Comment Response	14. Accept
2. Appendix A.	M	“...The SITA Plan and engineering drawings can be found in Appendix A...” Appendix A was empty.	See response to comment 1.	Yes

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