DEVELOPMENT OF A MIXED WASTE MANAGEMENT FACILITY AT THE NEVADA TEST SITE: AN UPDATE

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ABSTRACT

The U.S. Department of Energy (DOE) produces some radioactive low-level wastes (LLW) which contain hazardous components as identified by Title 40 Code of Federal Regulations (CFR) Part 261. By definition, the management of those mixed wastes (MW) at the Nevada Test Site (NTS) requires compliance with U.S. Environmental Protection Agency (EPA) and state of Nevada regulations for hazardous wastes, and DOE regulations for LLW. In 1988, the DOE Nevada Operations Office (NV) began receiving MW at the NTS under interim status, as authorized by the state of Nevada. MW operations are currently limited to receipt of pondcrete and saltcrete from Rocky Flats Plant and retrievable disposal in an existing pit while operating under interim status.

Preparations for operation of a separate Mixed Waste Management Unit (MWMU) in the 1990s are underway. The 167-acre MWMU will be a part of the 732-acre Area 5 Radioactive Waste Management Site (RWMS). The MWMU is being developed in response to a DOE Office of Defense Waste and Transportation Management need to provide enhanced capabilities and facilities for safe, secure, and efficient disposal of defense-related MW in accordance with DOE, EPA, and state of Nevada requirements.

Planned activities relating to the development of the MWMU include completing National Environmental Policy Act (NEPA) requirements; responding to any notices of deficiencies (NODs) on the NTS Part B Permit application; conducting generator audits as part of the NTS MW certification program; optimizing the design and operation of the vadose zone monitoring system; developing protocols for the sampling and analysis of MW, and facility construction.

INTRODUCTION

U.S. Department of Energy activities, in support of Defense Programs, result in the generation of MW which contains both radioactive and hazardous components. In further support of Defense Programs, DOE/NV is developing a facility at NTS which can receive and dispose of a portion of the MW generated by DOE defense operations. The MWMU is being developed in response to a DOE Office of Defense Waste and Transportation Management need to provide enhanced capabilities and facilities for safe, secure, and efficient disposal of defense-related MW in accordance with DOE, EPA, and state of Nevada requirements.

This paper describes the permitting and regulatory environment, the specific application of the permit process to the NTS, and the phased development of an MWMU at the NTS.

SITE CHARACTERISTICS

The Area 5 RWMS is located on the NTS in Frenchman Flat, a basin and range province intermontane valley with no external surface drainage or surface water resources. The RWMS is located on alluvial fan material derived from the Tertiary volcanics of the Massachusetts Mountains located to the northwest. The valley fill is poorly sorted and only loosely stratified. It contains clay- to boulder-sized materials and is composed of tuff, limestone, dolomite, quartzite, granite, basalt, and other lithologic remnants in various proportions.

Annual estimated precipitation is calculated to be 5.5 in (14 cm); and the soil moisture content, to a depth of 20 ft (6 m), was found to be approximately eight percent. Potential evapotranspiration greatly exceeds the yearly precipitation. The Ash Meadows groundwater basin underlies the RWMS and is an interbasin flow system which occupies the lower portion of the Cenozoic alluvial fill and the basement Paleozoic carbonates. It is relatively independent of the topographic boundaries of Frenchman Flat. Depth to the water table at the waste site is approximately 800 ft (240 m) with the direction of flow generally south to southwest.

REGULATORY REQUIREMENTS

Mixed waste contains both radioactive and hazardous components as defined respectively by the Atomic Energy Act (AEA) and the Resource Conservation and Recovery Act (RCRA). Radioactive components of MW are regulated by DOE under the AEA. Hazardous components of MW are subject to RCRA regulations as enforced by the state of Nevada and approved by the EPA.

A. Resource Conservation and Recovery Act Requirements

The RCRA regulations govern facility development and operation, and prescribe a multitude of administrative and technical requirements. Compliance with these requirements must be demonstrated by documentation which specifically addresses each of the requirements. Regulations for permitting MW operations are contained in Title 40 CFR Part 264, "Standards for owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," and include the following: General Facility Standards, Preparedness and Prevention, Contingency Plan and Emergency Procedures, Manifest System, Recordkeeping and Reporting, Releases from Solid Waste Management Units, Closure and Post-Closure, and Landfills.

The state of Nevada adopted the RCRA regulations and is an authorized state for hazardous waste regulation. As such, the state regulations are at least as stringent as the RCRA regulations. The state of Nevada is authorized to regulate in accordance with the pre-Hazardous & Solid Waste Act Amendments (HSWA) RCRA regulations for MW. EPA Region IX is reviewing the state applications and could issue a decision in 1989.

B. DOE Requirements

The MWMU must meet all DOE regulations relating to radiation safety, environmental compliance, and waste disposal. Those requirements include disposal site performance, waste analysis, nd waste acceptance criteria. In support of those regulations, a radiological performance assessment of all activities conducted at the RWMS was conducted and is in the final review process. Based on that draft performance assessment, operation of the MWMU will meet all required radiological performance objectives. NVO-325 "Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements" contains the requirements for certifying MW for acceptance at the NTS.

C. National Environmental Policy Act Requirements

An Environmental Assessment (EA) of the impact of MW disposal operations at the Area 5 RWMS was prepared in 1988. That assessment included the results of the draft radiological performance assessment of all radioactive waste management operations at the Area 5 RWMS. Based upon the results of the EA, operations at the Area 5 RWMS, including the disposal of MW, will not have a significant environmental impact. The EA was reviewed by DOE Headquarters and may need to be expanded to address non-NTS related issues such as transportation of MW to the NTS.

APPLICATION OF THE PERMIT PROCESS SPECIFIC TO THE NTS.

Pit 3, the existing disposal unit to be used for the retrievable disposal of MW during interim status, is located in the northeast corner of the Area 5 RWMS. Its dimensions are roughly 380 ft x 1080 ft (115.8 m x 329.2 m) and 30 ft (9 m) in depth. It has previously been used as a repository for LLW. However, the present quantity of LLW disposed in Pit 3 is small in comparison to the pit dimensions, and this waste will not interfere with the retrievable disposal of MW.

Because of the extreme conditions of the NTS environment, NV has requested a permit waiver on the use of disposal unit liners, leachate collection systems, and groundwater monitoring wells as required by RCRA. In accordance with Title 40 CFR 265.90(c) and 40 CFR 264.90(b)(4), documentation of the low potential for migration of hazardous components to groundwater was developed and included in the Part B Permit application. That determination was necessary to operate under interim status without groundwater monitoring.

For permitted status operations, the interim status waiver, in conjunction with the vadose zone monitoring system, will support the waivers from groundwater monitoring wells and trench liners. The state has verbally indicated their expected concurrence with this approach; however, the EPA has not offered a position on the waiver request.

FACILITY MONITORING

A typical monitoring system utilizing groundwater monitoring wells is inappropriate at the NTS. The travel time of a contaminant, from the near

surface to the water table (calculated to take in excess of 100,000 years) precludes the use of monitoring wells as a detection system. In addition, wells could create accelerated transport pathways for the migration of waste contaminants from the near surface to the water table. For those reasons, a system has been designed for monitoring the vadose zone beneath the MW disposal units.

The methods selected as most appropriate for monitoring MW at the NTS are (1) neutron logging, (2) soil air sampling, and (3) gamma logging. MW consists of both hazardous and radioactive components. Accordingly, both components should be included in the monitoring plan. Because water movement through the unsaturated zone is the major vehicle for the transport of waste components, neutron logging will provide long-term spatial monitoring of soil moisture conditions within and beneath the disposal unit. Soil air sampling will indicate the presence and concentration of volatile hydrocarbon components, while gamma logging will identify radioactive components in the soil.

The vadose zone monitoring system has been installed in the MW dedicated portion of Pit 3 for use during interim status operations. Refinements to the vadose zone monitoring system will continue to be made during interim status in order to improve specificity and sensitivity of the system. During permitted operations, the vadose zone monitoring system will be used as an alternative to conventional groundwater monitoring.

FACILITY OPERATIONS

A. Interim Status

On November 8, 1985, DOE/NV provided the NTS RCRA Part B Permit application for the RWMS to EPA Region IX and the state of Nevada in support of developing an MWMU. On September 17, 1987, the state of Nevada Department of Conservation and Natural Resources granted DOE/NV interim status for the receipt and disposal of hazardous waste. Subsequent discussions with the state confirmed that interim status authorized the NTS to accept MW which can only be disposed in the existing LLW disposal unit, Pit 3; however, until such time as the EA is approved by DOE/HQ, the waste must be easily retrievable, hence the new term retrievable disposal. The state of Nevada has RCRA authority and has applied for authority to regulate MW. In anticipation of the state receiving MW authority, a revised Part B Permit application was submitted to the state of Nevada in October 1988.

The MWMU will be operated in four phases which coincide with the permitting process. Phases I and II (retrievable disposal and disposal under interim status, respectively) occur under interim status authorization. Phases III and IV (construction and operation of the MWMU, respectively) occur under permitted status authorization. The operations corresponding with each of these phases follow:

1. Phase I - Retrievable Disposal

   Although interim status has been granted to DOE/NV, current operations under Phase I only include the receipt and placement of

only Rocky Flats Plant (RFP) pondcrete and saltcrete into retrievable disposal in Pit 3. Disposal or complete burial will not occur until a Finding of No Significant-Impact (FONSI) is issued to satisfy National Environmental Policy Act (NEPA) requirements. NEPA requirements for retrievable disposal are covered by the DOE memorandum to file, "Temporary Storage of Rocky Flats Waste at NTS." Upon issuance of the FONSI, operations will shift from retrievable disposal to complete or final disposal (Phase II).

In accordance with NVO-325, waste generators must operate under a Waste Certification Program Plan which addresses the elements described therein. Initial approval and annual audits of generators' certification programs will be conducted jointly by DOE/NV and Reynolds Electrical & Engineering Co., Inc. (REECo) audit teams. Upon demonstration of satisfactory compliance with the audit findings and observations, a generator would be approved for a specific MW stream. Each MW stream will be subject to the audit process. In order to receive RFP pondcrete under Phase I, an audit of the RFP waste certification program was conducted at the RFP in December 1987 and follow up meetings held during 1988.

2. Phase II - Disposal Under Interim Status

Once NEPA requirements have been satisfied with the issuance of the FONSI, disposal of the RFP waste streams in Pit 3 will commence and additional selected mixed waste streams may be accepted from approved generators. Waste disposal operations will be conducted in accordance with the requirements of Title 40 CFR Part 265. Review of the Part B Permit application by the state of Nevada, and responses to any NODs, will be completed during Phase II.

B. Permitted Status

1. Phase III - Procurement and Construction

Once the state of Nevada issues the Part B Permit, MWMU construction activities will commence. Site construction activities includeO construction of the flood control dike, completion of new road work, excavation of the first disposal cell, installation of onsite utilities and fire protection systems, and installation of the vadose zone monitoring system. Disposal cells in the MWMU will be 100 ft x 300 ft x 20 ft. Average disposal life of each cell will be under five years.

Until the construction of the MWMU is complete, waste operations will continue in Pit 3. This transitional period includes state reviews of "as-builts" and verification inspections at the site. Upon approval by the state, placement of MW in the new disposal unit (Phase IV) will proceed.

2. Phase IV - Permitted Disposal

Upon completion of the MWMU, disposal of MW from approved generators will commence in accordance with the conditions of the Part B Permit. Generators' waste certification activities will be audited for conformance with the MW acceptance criteria outlined in NVO-325. No generator waste streams will be authorized for disposal until compliance with NVO-325 is demonstrated.

In addition to the waste certification program, random examination of package contents will be conducted at a Waste Examination Building (WEB) which should become operational at approximately the same time as the MWMU. Initially the WEB will only utilize real-time radiography to verify compilance with the waste acceptance criteria of NVO-325. Future waste verification activities will include intrusive sampling and analysis of package contents.

CURRENT PLANS

Mixed waste operations at the NTS are currently in the Phase I stage with waste from RFP being retrievably disposed in Pit 3 at the Area 5 RWMS. The Part B Permit has been submitted and is under review by the state of Nevada. Generator certification audits are being performed and protocols are being developed for sampling and analysis of the MW. The vadose zone monitoring system is being refined for in situ monitoring. DOE/NV anticipates moving ahead into Phase II upon receipt of the appropriate approvals.

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SUMMARY

Reynolds Electrical & Engineering Co., Inc.

- **PERMITTING AND REGULATION**
- **APPLICATION OF PERMITTING TO NTS**
- **PHASED DEVELOPMENT**

REGULATORY ASPECTS

- INTERIM STATUS GRANTED BY THE STATE OF NEVADA IN SEPTEMBER 1987
- MIXED WASTE FROM ROCKY FLATS PLANT BEING RECEIVED
- DOE/NV HAS EXCELLENT WORKING RELATIONSHIP WITH NEVADA
- STATE INPUT IS SOUGHT AT THE CONCEPTUAL AND DRAFT STAGES
- EXEMPTIONS FROM TRENCH LINERS AND GROUNDWATER MONITORING REQUESTED

CURRENT STATUS

Reynolds Electrical & Engineering Co., Inc.

- ALL DOCUMENTATION COMPLETED
- MIXED WASTE FROM ROCKY FLATS PLANT BEING RECEIVED
- ENVIRONMENTAL ASSESSMENT IS UNDER REVIEW BY DOE/HQ
- PART B PERMIT APPLICATION IS UNDER REVIEW BY STATE OF NEVADA

PERMIT WAIVERS

Reynolds Electrical & Engineering Co., Inc.

- **USE OF DISPOSAL UNIT LINERS**
- **LEACHATE COLLECTION SYSTEMS**
- **GROUNDWATER MONITORING WELLS**

INTERIM STATUS

Reynolds Electrical & Engineering Co., Inc.

PHASE I (RETRIEVABLE STORAGE)

INTERIM STATUS SEPT. 1987

REVISED PART B OCT. 1988

STORAGE OF ROCKY FLATS PONDCRETE AND SALTCRETE

PHASE II (DISPOSAL UNDER INTERIM STATUS)

NEPA SATISFIED WITH FONSI

NEW WASTE STREAMS IN CONFORMANCE WITH NVO-325

DISPOSAL PER 40 CFR 265

RESPONSE TO NOD'S

PERMITTED STATUS

Reynolds Electrical & Engineering Co., Inc.

PHASE III (PROCUREMENT AND CONSTRUCTION)

ISSUANCE OF PART B PERMIT

NEW MWMU'S CONSTRUCTED

STATE REVIEWS AND INSPECTIONS

PHASE IV (PERMITTED DISPOSAL)

DISPOSAL PER PART B PERMIT

RANDOM CHECK OF PACKAGES AT WASTE EXAMINATION BUILDING

MIXED WASTE VOLUMES AND CHARACTERISTICS

Reynolds Electrical & Engineering Co., Inc.

- **LARGE BACKLOG OF STORED MIXED WASTE**
- **100,000 CUBIC FEET ANNUAL RATE**
- **PRIMARILY SOLIDIFIED WASTE TREATMENT SLUDGES**
- **CONTACT-HANDLED**

VADOSE ZONE MONITORING SYSTEM

Reynolds Electrical & Engineering Co., Inc.

MONITORING SYSTEM

- SOIL GAS SAMPLING (VOLATILES)
- GAMMA LOGGING (RADIOACTIVITY)
- NEUTRON LOGGING (MOISTURE)
- SOIL SAMPLING

EXCELLENT SITE CHARACTERISTICS

Reynolds Electrical & Engineering Co., Inc.

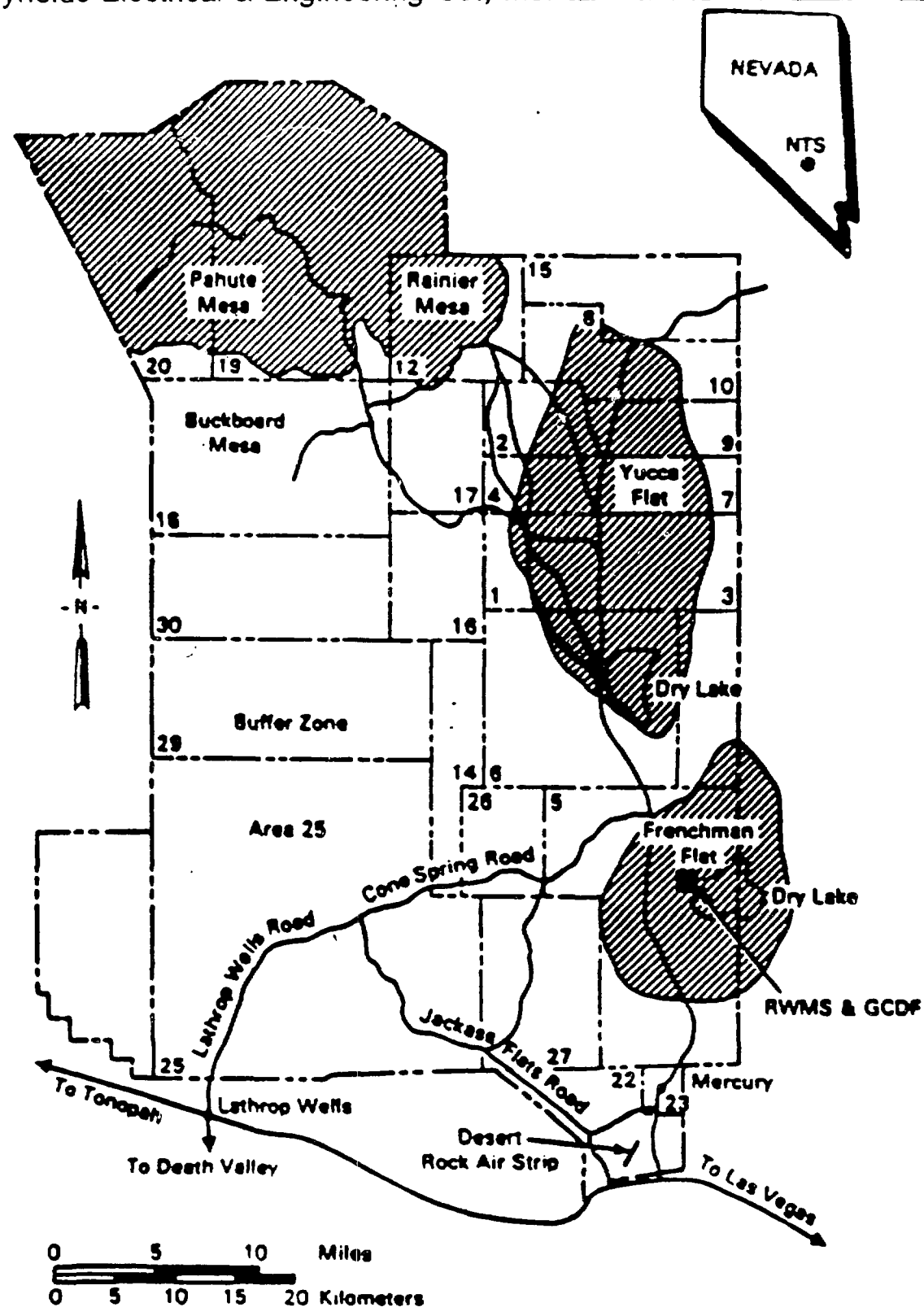
- **LOW ANNUAL PRECIPITATION**
- **HIGH ANNUAL EVAPOTRANSPIRATION**
- **800 FT DEPTH TO GROUNDWATER**
- **VERY REMOTE LOCATION**
- **CLOSED GEOLOGIC BASIN**
- **CALCULATED VADOSE ZONE TRAVEL TIME OF 100,000 YEARS**

SITE LOCATION AND CHARACTERISTICS

Reynolds Electrical & Engineering Co., Inc.

- **LOCATED IN SOUTHERN NEVADA, 75 MILES NORTH OF LAS VEGAS**

- **BUFFER ZONES INCLUDE NTS AND NAFB BOUNDARIES**
  - **LIMITED PUBLIC ACCESS**
  - **LOW POPULATION DENSITY IN SURROUNDING COMMUNITIES**


NEVADA
NTS
Pahute Mesa
Rainier Mesa
Buckboard Mesa
Yucca Flat
Dry Lake
Buffer Zone
Area 25
Frenchman Flat
Dry Lake
RWMS & GCDF
Cane Spring Road
Lathrop Wells Road
Jackass Flats Road
Mercury
Lathrop Wells
To Tonopah
To Death Valley
Desert Rock Air Strip
To Las Vegas
- N -
15
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16
1
3
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16
29
14
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26
5
25
27
22
23
0 5 10 Miles
0 5 10 15 20 Kilometers

DOCUMENTATION

Reynolds Electrical & Engineering Co., Inc.

- **EXTERNAL DOCUMENTATION**
  - **ENVIRONMENTAL ASSESSMENT**
  - **PART B PERMIT APPLICATION**
- **INTERNAL DOCUMENTATION**
  - **PERFORMANCE ASSESSMENT**
  - **SAFETY ANALYSIS REPORT**
  - **DETAILED OPERATING PROCEDURES**
  - **NTS DEFENSE WASTE ACCEPTANCE CRITERIA AND CERTIFICATION AND TRANSFER REQUIREMENTS - NVO 325**