NUREG/CR-2852

Transportation of Radioactive Material in Nevada

September 1980 - September 1981

State of Nevada
Department of Human Resources

Prepared for
U.S. Nuclear Regulatory Commission
and
U.S. Department of Transportation

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ABSTRACT

This report describes a study conducted by the State of Nevada between September 1980 and September 1981, concerning the transportation of radioactive materials. Data is presented on the surveillance of airport terminals, inspection of shipments of radioactive waste to the state disposal site, and on the transportation of radioactive materials to the largest user in the state, the Nevada Test Site. It was noted in the metropolitan areas that taxicabs were used in the delivery of medical isotopes. The major recommendations resulting from the study were: future state surveillance should include hazardous materials, the U.S. Department of Transportation should tell the state the results of its enforcement, and the U.S. Nuclear Regulatory Commission should inspect its licensees packaging of radioactive waste.

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TRANSPORTATION OF RADIOACTIVE MATERIALS IN NEVADA

A. Introduction

The State of Nevada entered into an agreement with the United States Nuclear Regulatory Commission and the United States Department of Transportation to perform a one year surveillance study of radioactive materials being transported into, within, or through the State. The period of surveillance was from September 1980 to September 1981.

The principal objectives of the program for surveillance of transportation of radioactive material were:

1. To determine major routings of shipments throughout the State.

2. To determine whether those persons involved in the transportation of radioactive material were exposed to significant amounts of radiation.

3. To determine whether packaging and transport of radioactive material was conducted in compliance with the Federal and State regulations.

4. To attempt to determine the volume of shipments of radioactive materials and their major radionuclides.

B. Methodology

The staff of the Radiological Health Section of the Nevada Division of Health were the principal investigators for the State under this contract.

First, a telephone survey was made of State licensees to determine the types of radioisotope ordered per year and whether they shipped any radioactive material.

From this survey the following information was obtained:

1. Licensees obtained their shipments of radioactive materials from vendors out-of-state.

2. Licensees rarely shipped any radioactive material to any one. The exception being three radiographers who routinely returned decayed sources to their suppliers.

3. That most shipments received by licensees (other than the licensee operating the State disposal site) were medical radionuclides, and these came by air through the Reno or Las Vegas air terminal.

Additional information was obtained from U.S. Ecology and the U.S. Department of Energy concerning shipments of radioactive waste. From these sources it was learned that:

1. Only one State licensee was shipping any radioactive waste to the State disposal site and that was the University of Nevada.

2. The State radioactive waste disposal site received the greatest majority of shipments of waste from the midwestern and eastern parts of the United States.

3. The Nevada Test Site received radioactive waste from its prime contractors and numerous shipments of radionuclides used for radiography, well logging or research and development onsite. In addition, the NTS also shipped radionuclides to various contractors offsite and to national laboratories for analysis.

Motorfreight carriers were contacted regarding shipments of radioactive materials. The only carrier that indicated it had frequent shipments was Delta Truck Lines, Las Vegas. They said that shipments of radioactive waste came through their terminal bound for the State disposal site.

Federal Express and United Parcel were investigated and it was learned that Federal Express trucks delivered some radioactive shipments, but that United Parcel could only deliver shipments with no higher external radiation levels than allowed for packages labeled DOT White I.

Amtrak, Greyhound and Continental carriers were also contacted. Representatives of these carriers stated that they were not allowed to carry radioactive materials.

Based on the above information, it was decided to place major surveillance on the shipments received at the State radioactive waste disposal site and the air terminals in Las Vegas and Reno.

C. Implementation

Meetings were held with the air terminal authorities to explain the surveillance program. From the airline representatives attending those meetings, the names of airlines that transported radioactive material were obtained. These carriers are noted in Table I.

Dosimeters were placed in those airline freight terminals where shipments of radioactive materials were received. The dosimeters were placed where the employees normally stored the shipments awaiting pickup. If there was no special storage area for the shipments, the dosimeters were placed on a wall in the general receiving area.

Once each month, the dosimeters were changed. At that time the inspector determined whether there were any radioactive shipments on site. If shipments were present, the inspector used a Geiger-Mueller survey

instrument or an ion chamber survey instrument to determine the external radiation level on the package. He also took a swipe sample from the package surface. In addition, he checked to see whether the package was damaged, properly labeled and the shipping papers were in order.

Particular emphasis was placed on monitoring radioactive waste shipments to the State disposal site near Beatty, Nevada. An inspector was onsite fulltime during the period of surveillance and all shipments were inspected against DOT and State regulations and the conditions of the site operator's license.

DOE management of the Nevada Test Site agreed to furnish the Radiological Health Section with information on the shipments of radioactive material to and from the site. This was done in a spirit of cooperation as the State has no jurisdiction over the Federal site.

D. Inspection Results

The monthly inspections at the airport terminals, and at the one truck terminal, were conducted during the daytime and rarely were there any radioactive shipments found on hand. The shipments which went through the air terminal were short-lived radionuclides used in nuclear medical procedures. They arrived at the terminals during the night and were delivered to hospitals very early in the morning.

An examination of shipping papers at one of the air carriers revealed that Yellow Taxicab had been used to transport a shipment from Mallinckrodt, labeled Yellow III, to a local hospital. Further investigation revealed that Mallinckrodt, New England Nuclear, Squibb and other suppliers had contracted with Yellow Cab companies in Reno and Las Vegas to deliver their shipments of radiopharmaceuticals in those cities.

Early morning surveillance on a Saturday disclosed that a Yellow Cab driver did pick up packages of radioactive material labeled Yellow III and drive off with same in an unplacarded taxicab. This matter was referred to the U.S. Department of Transportation for enforcement action.

The managers of Yellow Cab companies in both Reno and Las Vegas were contacted and they appeared to be unaware of DOT regulations regarding placarding. These managers were asked to give the following minimal instructions to their drivers who transported radioactive materials:

1. A minimum number of instructed drivers will be permitted to deliver packages containing radioactive materials.

2. Packages of radioactive materials that appear to be damaged or leaking will not be accepted by drivers for delivery.

3. Packages of radioactive materials will be locked in the trunk of the cab during delivery.

4. Drivers will not accept any passengers when carrying radioactive material.

5. Drivers carrying radioactive material will report any accidents with their vehicle to the Radiological Health Section.

6. If the package of radioactive material cannot be delivered, it must be returned to the airline freight office.

An inspection was made of the only State license that shipped radioactive waste to the Beatty site, the University of Nevada at Reno. They had a shipment of thirty 30-gallon drums ready for transport. The shipment consisted of tritium and carbon 14 in scintillation vials and laboratory waste contaminated with phosporus 32. All drum's lids were properly secured, and the drums labeled correctly as White I.

The State regulation requiring inspection by a third party of all radioactive waste to the State disposal site went into effect April 1, 1981. A company called the Nevada Inspection Services, Inc. (NIS), had entered a contract to perform the third party inspection function. Any person desiring a permit to dispose of radioactive material in the State disposal site has to agree to contract with NIS for inspections of their waste disposal procedures and packaging operations. An initial inspection is made of the applicant by NIS to examine packaging procedures, facilities, training program and qualifications of personnel. Unannounced inspections of the permit holder may be made up to four times per year.

Many previous site users apparently did not choose to pay the fees charged by NIS. Very few permits were renewed on April 1, 1981, and consequently, the volume of radioactive waste going into the State site was reduced by a factor of 10.

An inspection was made of a truckload of radioactive waste from Lawrence Livermore National Laboratory upon its arrival at the DOE Nevada Test Site. Only prime contractors of DOE can dispose of waste at that Federal site. The shipment was found to be in compliance with all Federal regulations.

E. Summary of Data Obtained and Analysis

1. Dosimetry Data: A summary of the dosimetry data, by quarters, of the monthly film badge reading is presented in Table I. The dosimetry data was obtained mainly from placement of dosimeters in airline freight terminals. In a few cases, dosimeters were placed on delivery truck and taxicab drivers, and on air freight handlers.

   In those terminals that had a special area to store radioactive shipments, the dosimeters were placed in that area. Where no special area had been designated to store radioactive materials, the dosimeters were placed on the walls of the rooms where all air freight was stored. The doses shown for the dosimeters include background radiation. The highest levels of radiation noted were at the United Airlines freight office in Reno. Here

the dosimeters were located in the storage area for radioactive materials. Because of the high levels found, dosimeters were placed on the freight handlers at United for a quarter period. Their exposure for that period was shown to be less than 10 millirems. Taxi drivers and a Federal Express driver were monitored. Their exposures were minimal.

The dosimeters at TWA in Las Vegas were noted as higher than usual for two quarters. According to information obtained from the company, no increase in the number of shipments or shippers of radioactive material occurred. There was no explanation of the increase in dosimeter readings. One shipment of exposed dosimeters was apparently further exposed to radiation while being returned to the vendor. This was evident as all dosimeter doses were above background levels instead of a few as was the normal case.

The number of shipments through each air terminal was not obtained.

2. Summary of Inspections and Violations in Radioactive Waste Shipments: The State inspector at the Beatty commercial radioactive waste disposal site inspected all shipments received during the period of this study for conformance with Federal and State regulations and the conditions of the site operator's license.

The inspection included radiation surveys of the exterior of the truck and the interior of the cab. Shipping papers and placards on the vehicle were examined. Upon unloading the cargo, shipping containers were individually examined for integrity, labeling, external radiation levels, and radioactive contamination. Empty trucks were surveyed before release to insure their surfaces were not contaminated with radioactive material above DOT limits. The radiation detection instruments used to conduct these surveys were the same as those used to survey packages in air terminals: Eberline GM Model 250; Ludlum Model 12 with pancake probe; Ludlum Model 14C with pancake probe and Victoreen 440 ion chamber. Wipe tests were analyzed with gas flow Ludlum Model 2200 or 2500 scalers. Table II is a summary of the inspections made at the State site.

The compliance action taken by the State on shipments of radioactive waste received at the State site varied with the State regulations in effect at the time the items of noncompliance were noted.

In June of 1980, permits were required before persons could ship waste to the site. When items of noncompliance were considered serious, the permit was suspended. Further, when free-standing liquid was found in the waste containers, the entire shipment was often refused. Later, enforcement measures included requiring the shipper to develop a quality assurance program to prevent recurrence of the item of noncompliance. The incidents were also referred to DOT and NRC or an Agreement State (dependent on shipper's location)

for further enforcement actions. The shipper was told that they must request the NRC or Agreement State to make the quality assurance program a part of their license. Further, the shipper was told that they had to request the NRC or Agreement State to conduct an inspection of their waste packaging operation and to send the Nevada Radiological Health Section a copy of that report before the permit could be re-instated.

When the third party inspection system was instituted, the shipper was required to have an inspection by that organization of all shipments shipped during the period the permit was suspended. In June of 1981, administrative penalties were assessed under a new statute passed by the Nevada legislature.

In those cases referred to NRC for enforcement, the State was eventually notified of the results of the enforcement action. The State did not receive such information on the referrals to DOT for enforcement action.

The use of the third party inspection system and the decrease in the number of shipments of radioactive waste to the site both served to decrease the number of shipments found in violation of the regulations. Table III gives specifics on shipment violations during the contract period and includes actions taken by the Radiological Health Section.

3. Shipments of Radioactive Waste to the DOE Nevada Test Site: The U.S. Department of Energy office in Las Vegas furnished the Radiological Health Section with information concerning the amount of low-level radioactive waste received at the Nevada Test Site from their prime contractors for burial. The main contractors shipping to that site are: Lawrence Livermore Laboratory, Mound Laboratories and Rocky Flats. In the last six months the amount of low-level radioactive waste going into NTS has been about four times the volume of waste going into the State disposal site. The waste from LLL is mostly transuranic. It often contains curie quantities of Am-241, Cm-244 and Pu-239. The waste from Mound Laboratories is tritium and to-date they have sent about 6,000,000 curies to NTS for burial. The waste from Rocky Flats is soil contaminated with five isotopes of plutonium in very low concentrations on the order of 10^{-4} curies for an entire shipment. The Radiological Health Section randomly inspects radioactive waste shipments at the Nevada Test Site through the cooperation of DOE. On one occasion the Section was notified when a truckload of waste would arrive at that site and the State inspector was present to inspect that particular shipment during unloading operations. The volume of radioactive waste arriving at the Nevada Test Site during the contract period is noted in Table IV.

4. Shipments of Radioactive Material To and From the Nevada Test Site: In addition to the low-level radioactive waste shipments to the Nevada Test Site for burial, there is also a considerable number

of shipments of radioactive materials going to and from the contractors that have work forces on the site.

DOE officials provided the Radiological Health Section information on the transport of these shipments. The shipments contained radioactive materials used in research, nondestructive testing or in well logging. Birdwell, a contractor, is doing well logging at NTS. They have been using I-131, cesium 137 sources, and americium-beryllium neutron sources. Iridium 192 sources are used onsite to perform industrial radiography. Once or twice a month a 300-millicurie molybdenum 99 generator is shipped to the site for research purposes. Several laboratories and engineering firms that have contracts with DOE send radioisotopes to NTS for special analysis. From this data, the average number of shipments of radioactive materials to and from NTS was 23 per month, which contained an average total activity of 146 curies.

In Table V, summary information is given concerning the types and quantities of radioactive materials (other than radioactive waste) going to and from the Nevada Test Site.

F. Conclusions and Recommendations

1. The dosimeters placed in the terminals were usually located in areas where radioactive material packages were stored pending distribution to local consignees. In some cases, dosimeters were placed on the walls of the room where all types of shipments were handled and stored. The dosimeters did, in a few instances, show indications of radiation exposure above background. In the case of United Airlines' terminal in Reno, the dosimeter readings were of such magnitude as to indicate possible exposure of personnel. Dosimeters were then given to United personnel who handled radioactive material shipments. Their exposure was not above background levels. It is concluded from this that while area monitoring may indicate the presence of radioactive material shipments, such indication has no direct relation to potential exposure of terminal personnel. It is recommended for future transportation surveillance studies that area monitoring be discontinued and that monitoring of all terminal personnel who handle radioactive material packages be conducted until results indicate there is no need for this practice. It is further recommended that future transportation studies in this State include surveillance of all hazardous waste.

2. Only one transportation company was found that had given their workers any safety training regarding handling of shipments of hazardous materials. Workers interviewed did not appear to be more concerned about shipments of hazardous materials than any other shipment, and they handled all shipments in the same way. Not one poster, "Rules for Handling Radioactive Materials Packages," a joint publication of DOT and NRC, was seen in any terminal. It was concluded that most workers in terminals or

transportation companies did not receive any special instructions for handling of radioactive material packages. The Section on Radiological Health recommended to the taxicab companies that their drivers should be instructed in the safe handling and transport of radioactive material packages. As a precautionary measure it is recommended that all persons who handle shipments of hazardous materials should receive instructions for protection of themselves and the public from potential adverse health effects that may arise from damaged hazardous material shipments.

3. The number of violations of regulations found in shipments of radioactive waste arriving at the State disposal site during the term of this contract fell from 22 in the first quarter to one in the last quarter.

   We conclude that the third party inspection system and the application of administrative penalties in the form of monetary fines were at least partly responsible for the decrease in violations of regulations by shippers. Also, as mentioned previously, there was a decrease in the number of shipments.

   The majority of the site users are either utility companies with power reactors or are associated with some aspect of the fuel cycle. Thus, most site users are NRC licensees. In Table III it can be calculated that 91 percent of those companies mentioned who sent shipments of radioactive waste that had violations of regulations were NRC licensees. From this data it can be concluded that NRC licensees are not always following their quality control procedures with respect to packaging of radioactive waste. It is recommended that the U.S. Nuclear Regulatory Commission routinely inspect the packaging of radioactive waste by its licensees when that operation is being conducted.

   In Table III it will be noted that in almost all cases of violations of regulations part of the action taken was to refer the incident to NRC and DOT for further enforcement action. Referrals to NRC were made through the Region V office in Walnut Creek, California, and the Office of State Programs in Bethesda, Maryland. Referrals to DOT were made through the DOT inspector assigned to the Nevada area. In nearly all cases the Radiological Health Section received official notification of NRC's enforcement action. No such official notification was received from DOT. It is recommended that the U.S. Department of Transportation advise the State of the final disposition of enforcement actions in those cases of violations of DOT regulations which were referred to the Department by the State.

4. Information received from DOE concerning shipments of radioactive waste and radioactive materials to the Nevada Test Site, and information concerning the number of shipments of low-level radioactive waste to the State site at Beatty, Nevada, confirmed

that Highway 95 between Las Vegas and Beatty, which serves both the State disposal site and the Nevada Test Site, carries the greatest number of shipments of radioactive material in the State.

It is concluded from the above information that the chance of a motor vehicle accident happening in this State which would involve radioactive materials would most likely occur on Highway 95 between Las Vegas and Beatty. In view of the fact that motor vehicle accidents are often caused by mechanical defects in vehicles or violations of State driving regulations, it is recommended that the State Department of Motor Vehicles become more involved in the surveillance of transportation of radioactive materials.

Since the draft final report for this study, the State Department of Motor Vehicles has adopted the regulations of the U.S. Department of Transportation and signed an agreement with that Federal agency to enforce those regulations in the State of Nevada.

APPENDIX A

TABLE I

Summary by Quarters of Monthly Dosimetry Data

Location of Dosimeter	12/20/80-03/19/81	03/20/81-06/19/81	06/20/81-09/19/81
Las Vegas:			
Western Air Freight (West Wall)	30	60	90
Western Air Freight (East Wall)	30	60	100
Republic Air Freight (East End of Cargo Rack)	30	120	M
TWA Air Freight (On Post, East End of Area)	30	410	240
TWA Air Freight (Cage Area)	20	60	10
Federal Express (Wall)	20	70	10
Delta Truck Terminal (Wall)	20	60	NR
Reno:			
Republic Air Freight (Storage Shelf)	M	70	NR
Republic Air Freight (Storage Shelf)	M	20	NR
Federal Express Driver	M	30	M
Yellow Cab Driver	M	30	M
Federal Express (Storage Area)	20	40	M
Federal Express (Storage Area)	M	30	M
Yellow Cab Driver	10	30	M
United Air Freight (Storage Area)	110	620	39
United Air Freight (Storage Area)	430	1130	40
United Air Freight (Storage Area)	560	880	20
United Air Freight Personnel	--	--	M
United Air Freight Personnel	--	--	M

M = Exposure less than 10 mR.
NR = No report; dosimeter not used.

TABLE II

SUMMARY OF INSPECTIONS OF RADIOACTIVE
WASTE SHIPMENTS TO STATE DISPOSAL SITE

Number of shipments inspected	287
Number of shipments with one or more violations	38
Percentage of shipments having violations	13.2

Types of Violations	No.
49CFR173.392(c)(1)—strong, tight container	23
49CFR173.393(n)(2)—packaging impaired	5
49CFR173.393(b)—no security seals	7
49CFR173.392(c)(9)—no instructions for sole use	2
49CFR173.393(j)(2)—exceeded external radiation level	2
49CFR173.393(n)(3)—locking rings loose	2
49CFR173.393(i)—transport index over 10	2
49CFR172.504(2)—not placarded properly	2
49CFR173.392(c)(8)—not marked LSA	1
49CFR177.842(a)—T.I. for load over 50	1
49CFR177.842(b)—packages too close to driver	1
49CFR172.403(f)—only one label on package	1
49CFR172.556(a)—no yellow color on placard	1
Free-standing liquids in containers a violation of the site license	3

TABLE NO. III

VIOLATIONS OF REGULATIONS BY SHIPPERS OF RADIOACTIVE WASTE

DATE OF INSPECT	SHIPPER	BROKER	CARRIER	LOCATION OF INSPECTION	TYPE OF RAM	TYPE OF PACKAGE	VIOLATIONS OF DOT AND STATE REGS FOUND	ACTIONS TAKEN
10/9/80	Kerr-McGee Crescent, OK	None	Tri-State	Beatty, NV	RM Fissle, N.O.S.	LSA	173.392(c)(1)	Shipment refused, permit suspended. Referred to NRC & DOT for enforcement.
10/10/80	Univ. of Utah Salt Lake City, UT	None	Ringby Truck Line	Beatty, NV	RAM LSA N.O.S. RAM N.O.S.	LSA & Yellow II	(2) 173.392 (c)(1) (2) Article 2.3 St.of NV Regs. Free standing liquid prohibited by license condition.	Shipment refused, permit suspended. Referred to NRC & DOT for enforcement.
11/3/80	General Electric Wilmington, N.C.	Chem Nuclear	Tri-State	Beatty, NV	RAM LSA N.O.S.	LSA	(2) 173.392 (c)(1) (2) Article 2.3 St.of NV Regs. Box leaking liquid prohibited by license condition.	Permit suspended. Required quality assurancy program. Referred to NRC & DOT for enforcement.
11/3/80	Battelle-Columbus Laboratories Columbus, Ohio	None	Tri-State	Beatty, NV	RAM LSA N.O.S.	LSA	(1) 173.392 (c)(1) (1) Article 2.3 St.of NV Regs.	Permit suspended. Required quality assurance program. Referred to NRC & DOT for enforcement.
11/5/80	Philadelphia Electric Co. Phila, PA	None	Tri-State	Beatty, NV	RAM LSA N.O.S.	LSA	(2) 173.392 (c)(1) (2) Article 2.3 St.of NV Regs. (5) 173.392 (c)(8)	Permit suspended. Required quality assurance program. Referred to NRC & DOT for enforcement.
11/6/80	Nuclear Diagnostic Labs Peekskill, NY	None	Nuclear Diagnostic Laboratories	Beatty, NV	RAM N.O.S.	White I	(1) 173.392 (c)(1) (1) Article 2.3 St.of NV Regs.	Permit suspended. Required quality assurance program. Referred to NRC & DOT for enforcement.

TABLE NO. III

VIOLATIONS OF REGULATIONS BY SHIPPERS OF RADIOACTIVE WASTE

DATE OF INSPECT	SHIPPER	BROKER	CARRIER	LOCATION OF INSPECTION	TYPE OF RAM	TYPE OF PACKAGE	VIOLATIONS OF DOT AND STATE REGS FOUND	ACTIONS TAKEN
11/17/80	Minnesota Mining & Mfg. Co. St. Paul, MN	None	Tri-State	Beatty, NV	RAM N.O.S.	White I Yellow II Yellow III	(3) 173.292 (c)(1) (3) Article 2.3 St.of NV Regs.	Permit suspended. Required quality assurance program. Referred to NRC & DOT for enforcement.
12/11/80	Western Zirconium Co. Ogden, UT	None	Tri-State	Beatty, NV	RAM-LSA N.O.S.	LSA	(1) 173.292 (c)(1) (1) Article 2.3 St.of NV Regs.	Permit suspended. Required quality assurance program. Referred to NRC & DOT for enforcement.
12/18/80	U.S. Bureau of Mines Denver, CO	None	Tri-State	Beatty, NV	RAM-LSA N.O.S.	LSA	(1) 173.292 (c)(1) (1) 172.504(a) (2) Article 2.3 St.of NV Regs.	Permit suspended. Required quality assurance program. Referred to NRC & DOT for enforcement.
12/22/80	Rockwell Energy Systems Group Frankford Arsenal, PA	Chem Nuclear	Tri-State	Beatty, NV	RAM-LSA N.O.S.	LSA	(1) 173.292 (c)(1) (1) Article 2.3 St.of NV Regs.	Permit suspended for shipper and broker. Required quality assurance program. Referred to NRC & DOT for enforcement.
12/30/80	Jersey Central Power & Light Forked River, NJ	None	Tri-State	Beatty, NV	RAM-LSA N.O.S.	LSA	(2) 173.292 (c)(1) (2) Article 2.3 St.of NV Regs.	Permit suspended for shipper. Required quality assurance program. Referred to NRC & DOT for enforcement.

TABLE NO. III

Date of Inspection	Shipper	Broker	Carrier	Location of Inspection	Type of RAM	Type of Package	Violations Found	Actions Taken
1-9-81	Allied Chemical Metropolis, Ill.	None	Tri-State	U.S. Ecology Beatty, Nev.	Waste	LSA	173.393(n)(2) 173.392(c)(1)	Suspended permit. Referred to NRC & DOT for enforcemen
1-19-81	Nebraska Public Power Dist. Brownville, Neb.	None	Tri-State	U.S. Ecology Beatty, Nev.	Waste	LSA	173.392(c)(1)	Suspended permit. Referred to NRC & DOT for enforcement
1-26-81	Vermont Yankee Nuc. Power Co. Rutland, Vt.	None	Tri-State	U.S. Ecology Beatty, Nev.	Waste	LSA	173.392(c)(1) 173.392(c)(8)	Suspended permit. Referred to NRC & DOT for enforcement
2-5-81	Exxon Nuclear Company Richland, Wash.	None	Tri-State	U.S. Ecology Beatty, Nev.	Waste	LSA	Article 2.1 of Nev. Regs. 173.392(c)(9)	Required to get permit, and to submit quality assurance program. DOT violation referred to DOT for enforcement.
2-23-81	Indiana & Michigan Elec. Co. Fort Wayne, Ind.	None	Home Transportation	U.S. Ecology Beatty, Nev.	Waste	LSA	173.392(c)(1)	Suspended permit. Referred to NRC & DOT for enforcemen
3-11-81	American Cyanamid Co. Hannibal, MO.	None	Tri-State	U.S. Ecology Beatty, Nev.	Waste	LSA	173.392(c)(1) 173.393(n)(2)	Suspended permit. Referred to NRC & DOT for enforcemen
3-12-81	Exxon Nuclear Company Richland, Wash.	None	Tri-State	U.S. Ecology Beatty, Nev.	Waste	LSA	173.392(c)(1) 173.393(n)(2)	Suspended permit. Referred to NRC & DOT for enforcemen
3-13-81	General Atomic Co. San Diego, Calif.	None	Tri-State	U.S. Ecology Beatty, Nev.	Waste	LSA	173.392(j)(2) 173.393(n)(3)	Suspended permit. Referred to Calif. & DOT for enforcement.
3-17-81	Mare Island Naval Shipyard Vallejo, Calif.	None	Tri-State	U.S. Ecology Beatty, Nev.	Waste	LSA	173.392(c)(1) 173.393(n)(2)	Suspended permit. Referred to NRC & DOT for enforcement.

TABLE NO. III

Date of Inspection	Shipper	Broker	Carrier	Location of Inspection	Type of RAM	Type of Package	Violations Found	Actions Taken
3-23-81	Gulf Nuclear, Inc. Webseter, Texas	None	Gulf Nuclear,Inc.	U.S. Ecology Beatty, Nev.	Waste	White I Yellow II Yellow III	173.392(j)(2) 173.393(n)(3) Article 2.3 of Nev. Regs. 173.393(i) 177.842(a) 177.842(b)	Suspended permit. Referred to Texas & DOT for enforcement.
3-30-81	Nev. Engineering and Technology Corp. Long Beach, Calif.	AWC, Inc. Las Vegas	AWC, Inc. Las Vegas	U.S. Ecology Beatty, Nev.	Waste	LSA	173.392(n)(2)	Suspended permit of generator & broker. Referred to DOT for enforcement.
3-28-81	Mallinkrodt St. Louis, Missouri	None	Yellow Cab Co. of Las Vegas Cab No. 1476	McCarran Airport Las Vegas	Radio-Active NOS.	Yellow III	172.504	Referred to DOT for enforcement action.

TABLE NO. III

DATE OF INSPECT.	SHIPPER	BROKER	CARRIER	LOCATION OF INSPECTION	TYPE OF RAM	TYPE OF PACKAGE LABELS	VIOLATIONS FOUND	ACTION TAKEN
5-26-81	New England Nuclear	None	Tri-State	Beatty, NV	Radioactive Waste, NOS	White I & LSA	one, 49 CFR 172.556(a)	Suspended permit three months referred DOT for further enforcement.
6-1-81	Public Svc. Electric & Gas	None	Tri-State	Beatty,NV	Radioactive Material NOS	LSA	Three, 49 CFR 173.392(c)(1)	Suspended permit three months, assessed administrative penalty of $3000, referr to DOT for further enforcement.
6-15-81	UNC Recovery Systems	None	Tri-State	Beatty,NV	Radioactive Material NOS	LSA	one, 49 CFR 173.392(c)(1)	Suspended permit six months, assessed administrative penalty of $1500, referr to NRC and DOT for further enforcement.

TABLE NO. III

DATE OF INSPECT	SHIPPER	BROKER	CARRIER	LOCATION OF INSPECTION	TYPE OF RAM	TYPE OF PACKAGE LABELS	VIOLATIONS FOUND	ACTION TAKEN
9-10-81	Rochester Gas & Electric Co.	None	McCormicks	Beatty, NV	Waste Radioactive Material, N.O.S.	LSA	two, CFR 173.392(c)(1) and Article 2.4 of NV regulations for the site.	Suspended permit three months, assessed administrative penalty of $1500, referred to NRC and DOT for further enforcement.

TABLE IV

Summary of Low-Level Radioactive Waste Shipments Received at the Nevada Test Site for Burial

Data for Federal FY 1981

Period	Volume in Cubic Feet
1st Quarter	39,642
2nd Quarter	38,195
3rd Quarter	37,771
4th Quarter	42,537
Total	158,145

Average number of truck loads per month = 13

TABLE V

Shipments of Radioactive Materials
To and From the Nevada Test Site

No. of Shipments	Principal Shippers	Major Isotopes Shipped	Curies Shipped
Average/Month = 23 Total/Year = 277	EG&G, Inc. Lawrence Livermore National Laboratory Las Alamos National Laboratory Reynolds Electrical Engineering Co. Environmental Protection Agency Birdwell Division, Seismograph Service Corp.	(Totaling more than 2 curies each per year) Am-241, C-14, Cm-244, Co-60, Cs-137, H-3, Hg-197, Ir-192, MFP, Mo-99, Pu-238, Pu-239, Pu-242, U-233, U-238	Average/Month = 146 Total/Year = 1755

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16. ABSTRACT (200 words or less)

This report describes a study conducted by the State of Nevada between September 1980 and September 1981 concerning the transportation of radioactive materials. Data is presented on the surveillance of airport terminals, inspection of shipments of radioactive materials to the state disposal site, and on the transportation of radioactive materials to the largest user in the state, the Nevada Test Site. It was noted in the metropolitan areas that taxicabs were used in the delivery of medical isotopes. The major recommendations resulting from the study were: future state surveillance should include hazardous materials, the U. S. Department of Transportation should tell the state the results of its enforcement, and the U. S. Nuclear Regulatory Commission should inspect its licensees packaging of radioactive waste.

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