

**NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

**1997
LOW-LEVEL
RADIOACTIVE WASTE
TRANSPORTATION
REPORT**

Division of Solid & Hazardous Materials
Bureau of Pesticides & Radiation

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Stephen Hammond, P.E.
Director
Division of Solid & Hazardous Materials

Paul J. Merges, Ph.D.
Director
Bureau of Pesticides & Radiation

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Executive Summary

The amount of low-level radioactive waste (LLRW) transported by highway shipment into, within and through New York State in calendar year 1997 totaled 85,689 cubic feet (2,399 cubic meters) with a total radioactivity level of 56,998 curies¹ (2,108,926 gigabecquerels)². The waste was contained in 2,023 packages in a total of 344 shipments.

Ninety-two percent (92%) of waste transported was Class A, five percent (5.0%) Class B, and three percent (3.0%) was Class C. These classes are established by the United States Nuclear Regulatory Commission (NRC). The classes are distinguished by different allowable maximum concentrations of isotopes and requirements for stability, packaging, and segregation from other wastes. Examples of Class A wastes are trash, paper, plastic, lower specific activity resins from nuclear power plants, and most medical and institutional wastes; Class B wastes generally consist of evaporator concentrates, resins, filters, etc. from nuclear power plants; and Class C wastes include nuclear power plant wastes such as irradiated reactor components.

Of all the waste transported through New York State, approximately seventy percent (70%) of the volume and one percent (1.0%) of the activity was generated in New York State. This consisted of 60,187 cubic feet (1,685 m³) with a total activity of 570 Ci (21,090,000 megabecquerels). These figures do not include the portion of broker consolidated shipments generated by New York State generators. Generally, about half the broker consolidated shipments are New York State generated. The states of Massachusetts, Pennsylvania, Rhode Island, Connecticut, Vermont, Delaware, Illinois, and Maine had their LLRW transported through New York by Part 381 transporters. Massachusetts was the single greatest out-of-state contributor, with 4,914 cubic feet (137.5 m³) and 32 Ci (1,184,000 MBq).

New York State generated waste was sent for treatment or disposal to primarily the Chem-Nuclear disposal facility in Barnwell, South Carolina, Envirocare in Clive, Utah, and the Scientific Ecology Group (SEG) in Oak Ridge, Tennessee. Other treatment or disposal facilities that received waste transported through New York State include the Perma-fix Facility in Gainesville, Florida; and the Alaron Facility in Wampum, Pennsylvania. Wastes transported into New York State either were brought into New York for temporary storage for consolidation and forwarding, or were shipped on New York State roads en route to another state for disposal.

Waste was carried by eight (8) permitted transporters, consisting of two (2) New York State based brokers, two (2) out-of-state brokers, and four (4) non-brokers.

¹Curie (Ci) - the basic unit of activity of any radionuclide that undergoes an average transformation rate of 37 billion transformations per second. One curie is the approximate activity of 1 gram of radium.

²Becquerel - A unit, in the International System of Units (SI), of measurement of radioactivity equal to one transformation per second.

The reader should be aware that individual data entries in the text and tables of this report have been rounded. Because the totals shown in the tables represent the sum of rounded entries, they may vary slightly from one table to another.

SECTION 1: INTRODUCTION

Enabling Legislation

The legislative directive for establishing a low-level radioactive waste (LLRW) permit and manifest tracking system was set forth in Chapter 508 of the Laws of 1986 of New York State. This Act also directed the New York State Department of Environmental Conservation to issue an annual report based on the LLRW manifests received. The law directed that such report shall include, but not be limited to, information on the origin, destination, types of LLRW, and frequency of highway shipments into, within, and through New York State.

Chapter 508 amended sections 27-0303 and 27-0305 of Article 27, Title 3 of the Environmental Conservation Law (ECL) to include LLRW as a regulated waste, require a permit for LLRW transportation into, within, and through New York State, require a manifest tracking system and require promulgation of regulations to implement this program.

On January 1, 1987, the New York State Department of Environmental Conservation amended on an emergency basis the Waste Transporter Permit Regulations codified as 6 NYCRR Part 364 to include LLRW as a regulated waste, require a permit for its transport within the State, and require that manifest copies be sent to the Department.

On February 27, 1987, the Low-Level Radioactive Waste Transporter Permit and Manifest System Regulations (6 NYCRR Part 381) were adopted on an emergency agency action basis and the emergency rule making for Part 364 with similar requirements was allowed to lapse. The emergency Part 381 regulations were maintained in effect until they became a final rule on September 15, 1988, after the issuance of a final environmental impact statement (FEIS). This impact statement was issued in July 1988, and was entitled "Final Generic Environmental Impact Statement for Promulgation of 6 NYCRR Part 381: Regulations for Low-Level Radioactive Waste Transporter Permit and Manifest System."

Purpose and Need

Low-level radioactive waste is defined in Chapter 508 as:

. . . radioactive material that:

- a. is not high-level radioactive waste, transuranic waste, spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content; and
- b. the United States Nuclear Regulatory Commission consistent with federal law and in accordance with paragraph a. of this subdivision, classifies as low-level radioactive waste.

The Low-Level Radioactive Waste Transporter Permit and Manifest System Regulations regulate the transport of LLRW as defined above. These regulations do not, however, regulate radioactive material (RAM) that is not low-level radioactive waste. In addition, LLRW that is generated by the United States Department of Energy (DOE), and the United States Department of Defense (DOD) is not tracked on the manifest system. These agencies and their prime contractors are exempt from 6 NYCRR Part 381 and are, therefore, not required to get permits or submit manifests to the New York State Department of Environmental Conservation.

As stated in the FEIS for Part 381, low-level radioactive waste when properly transported does not constitute a significant environmental impact. The Part 381 regulations were promulgated to ensure the proper transport of LLRW. Manifest copies submitted to the Department in accordance with 6 NYCRR Part 381, Section 381.13 provide the Department and the people of the State of New York with information on LLRW transport within the State. This information is useful in tracking LLRW from its point of origin to its disposal, assessing potential transportation hazards, and assisting emergency response plans where necessary. The manifest tracking system thus provides documentation that LLRW is properly disposed of and assists in enforcement actions to assure that it is.

The establishment of a manifest tracking system results in New York State meeting the LLRW manifest requirements of the NRC set forth in 10 CFR Part 61 and Part 20 section 20.2006 and Appendix F (and Appendix G after March 1, 1998). After March 1, 1998 all licensees are required to use Appendix G which among other things, requires the use of the new NRC uniform manifest. Disposal facilities were allowed to require the use of the new uniform manifest before the March 1, 1998 date, and many of the generators were completing the new manifest forms (Form 540 and Form 541) and sending them along with their shipments. The New York State transportation permit and manifest program (6 NYCRR Part 381) has been determined compatible with the NRC regulatory program for NRC regulated radioactive material.

General Manifest Data Base Structure

Two basic types of LLRW transport movements occur in New York State. These types are: (1) collection of LLRW within and outside of the State by New York State based brokers and storage within the State for a period of time and; (2) pickup of LLRW by out-of-state brokers, non-broker transporters, and New York State brokers (consolidated shipments) for transport to treatment, storage or disposal facilities located outside of the state.

One data base was established to track out-of-state broker collections, non-broker transporters, and New York State broker consolidated shipments which all leave the State for treatment, storage, or disposal. The broker consolidated shipments may represent waste collected in the previous year as well as some waste collected during the present year. Evaluation of this data base provides information on all waste that travels through or from New York State en route to a treatment, storage or disposal facility (TSDF).

A second separate data base was established for New York State based broker collections. New York State based brokers (NDL and Radiac) frequently make collections from New York State LLRW generators and those of neighboring states and store the waste at their facilities for a time prior to shipping the waste for treatment or disposal out-of-state. This time period can be up to a year in some cases. This data base provides information on the LLRW movements within the State that are not immediately shipped out of the State for treatment or disposal. The New York State generated portion of this waste is added to the total annual waste production for New York. This waste is not counted as leaving New York State, however, until it is placed in the consolidated shipments mentioned above.

This report describes three general categories of LLRW transport in three separate sections. The first category is LLRW collections by New York State based brokers. The second category is LLRW collections by out-of-state brokers. The third category consists of non-broker transport and New York State broker consolidated shipments. In addition, the New York State generated component of these shipments is also described.

Classes of Low-Level Radioactive Waste

The LLRW carried by the transporters in this report has been subdivided into three classes by the United States Nuclear Regulatory Commission in 10 CFR Part 61. The classes of LLRW are:

Class A

Class A wastes are wastes for which there are no stability requirements, but which must be disposed of in a manner segregated from other wastes. These wastes, termed Class A "segregated" wastes, are defined in terms of maximum allowable concentrations of certain isotopes and certain minimum requirements on waste form packaging that are necessary for safe handling. Class A wastes are often referred to as Class AS (stabilized) or Class AU (unstabilized). If it meets the stability requirements, it can be disposed of with Class B wastes. These wastes would be typically composed of materials with low concentrations of radionuclides. The large majority of LLRW in New York would fall in this category. These include trash, paper, plastic, low specific activity resins, and most medical and institutional wastes.

Class B

Class B wastes are wastes which need to be placed in stable form (i.e., last a long time and not change its size and shape significantly during that period of time) and disposed of in a manner segregated from unstable waste forms (Class AU). These wastes termed Class B "stable" wastes are defined in terms of allowable concentrations of specific isotopes, and for disposal must satisfy both stable waste form and minimum handling requirements. These wastes would be composed of moderate concentrations of short-lived radionuclides and possible low concentrations of some long-lived

radionuclides. Examples of Class B wastes include evaporator concentrates, resins, filters, etc., from nuclear power plants or from medical isotope production facilities.

Class C

Class C wastes are wastes which need to be placed in stable form, disposed of in a manner segregated from non-stable waste forms, and disposed of so that a barrier is provided against potential inadvertent intrusion after institutional controls have lapsed. These wastes are termed Class C "intruder protected" wastes and are defined in terms of allowable concentrations of isotopes. These wastes have high concentrations of either or both long- and short-lived radionuclides. Class C wastes account for less than ten percent (10%) of the volume of all LLRW generated in New York State. These wastes are generated primarily by nuclear power plants.

SECTION II: LLRW TRANSPORT BY NEW YORK STATE BROKERS

Radiac Research Corporation (RRC) and NDL, Inc. are the two New York State licensed brokers represented in this data base report. A total of 151 manifests from these two brokers were entered into this data base for the year 1997. In addition, generator, broker and transporter names and addresses are entered into the data base. Information regarding LLRW waste class, waste description, and shipment date are entered. Numeric fields such as total packages, disposal volume, and total activity are entered and summed.

Low-level radioactive waste brokers (also called collectors) typically collect LLRW from various generators (both within and outside New York State) and bring the material back to their facilities for storage. The waste packages are eventually consolidated in a number of large loads and transported either by the broker or another transporter to a disposal or waste compaction/treatment facility. The amount of LLRW shipped out of the State in any one year is often close to the amount collected in that year. The waste collected in one year may, or may not, be shipped out of the State in that year. The date the waste is shipped, depends in part, on accumulating sufficient waste for a full consolidated load. New York State brokers collected 3,996 cubic feet (112 m³) of LLRW in 1997 from New York and other states. The waste was contained in 640 packages and had a total activity of 24.38 Ci (902,060 MBq). These same brokers shipped 4,998 cubic feet (140 m³) out of the State in consolidated shipments for disposal during that same time period.

The breakdown for the two New York State licensed brokers is:

NDL 2,131 ft³ (59.7 m³) - 53% of total volume, 19.27 Ci (712,990 MBq) - 79% of total activity

RRC 1,865 ft³ (52 m³) - 47% of total volume, 5.11 Ci (189,070 Mbq) - 21% of total activity

Origin and Destination

Eleven states other than New York had waste picked up by both brokers (NDL and Radiac). This waste was brought back to their facilities in Peekskill (NDL) and Brooklyn, New York (Radiac). The following list in Table 2-1 is in order of volume in cubic feet.

Shipment Frequency

Low-level radioactive waste was collected by brokers several days a week except for holidays and weekends. These LLRW collections consisted mainly of local pickups and return of the waste to the broker's facility. Brokers on the average performed approximately 12.5 collections per month. The minimum number of collections per month was five and the maximum number was 24. A total of 84 generators were serviced by both Radiac and NDL. More than half (45) of these generators were located in New York State.

**Table 2-1
Origin of LLRW in New York State Broker Collections**

Generators	Volume (cubic feet)	Activity (cubic meter)	Number of Collections	Mbq	
New York	1,996	55.9	20.124	744,,588	(77)
New Jersey	1,392	38.9	0.965	35,705	(45)
Massachusetts	271	7.5	3.073	113,701	(13)
Vermont	75	2.1	0.047	1,739	(1)
Pennsylvania	74	2.0	0.004	148	(6)
Delaware	68	1.9	0.007	259	(1)
Connecticut	66	1.8	0.029	1,073	(3)
Maine	38	1.0	0.003	111	(1)
Virginia	15	0.4	0.130	4,810	(1)
Rhode Island	0.7	0.1	0	7	(1)
Minnesota	0.7	0.1	0	7	(1)
North Carolina	0.7	0.1	0	1	(1)
Totals	3,996	111.4	24.385	902,245	(151)

Waste Categories

A variety of LLRW types are collected by brokers from hospitals, universities, and other businesses. Materials contaminated by radioactive isotopes are grouped in general categories or types. The following is a listing of LLRW types collected by brokers and the total number of collections (shipments) for each type (see Table 2-2).

Package Types

LLRW brokers collect primarily Class A waste that is packaged in United States Department of Transportation (DOT) Type A packaging or strong tight containers (STC), if the waste is low-specific activity (LSA). LSA material packaged in STC must be carried in exclusive use vehicles. "Exclusive use" is defined in 49 CFR 173.403 as meaning ". . . the sole use of a conveyance by a single consignor and for which all initial, intermediate, and final loading and unloading are carried out in accordance with the direction of the consignee or consignor. Any loading or unloading must be performed by personnel having radiological

training and resources appropriate for safe handling of the consignment." Only one New York State broker shipment was designated as "Exclusive Use" in 1997. For the most part the Type A packaging used consists of 55 gallon (7.5 ft³), 30 gallon (4.01 ft³), or 5 gallon (.67 ft³) metal drums or metal/wood boxes.

**TABLE 2-2
LLRW Types Collected by New York Brokers**

Waste Type	Waste Class	No. Of Collections	% of Whole
Compactable Trash	AU	92	61%
Scintillation Vials	AU	22	15%
Animal Carcass	AU	11	7%
Absorbed Aqueous Liquids	AU	10	7%
Sealed Souces	C	8	5%
Other (biological, non-carcass)	AU	7	5%
Smoke Detectors	AS	1	<1%
TOTALS		151	100%

Placarding

The DOT specifies packaging, labeling, and placarding requirements in 49 CFR for all hazardous material transport including radioactive material. The DOT labeling requirements are based on the transport index (T.I.), maximum surface radiation levels, and fissile class. The three labels possible for radioactive packages are "White I," "Yellow II," or "Yellow III" (lowest to highest category). For the most part, brokers transport LLRW in packages bearing either the "White I" or "Yellow II" labels. In some cases, a small number of packages may bear the "Yellow III" label. Broker collections containing packages with "Yellow III" labels are required to have radioactive placards placed on the vehicle pursuant to 49 CFR, section 172.504.

SECTION III: LLRW TRANSPORT BY OUT-OF-STATE BROKERS

ADCOM Express, Inc. (ADCO) and Teledyne-Brown Engineering (TBE) are the two out-of-state LLRW brokers that transported waste within or through New York State during 1997. A total of 29 manifests were submitted to the Department by these two brokers. ADCOM Express, Inc. performed 13 LLRW collections servicing primarily universities and hospitals. Teledyne-Brown Engineering performed 16 New York State manifested collections. All collections performed by these two were from New York State generators.

The total activity of LLRW collected by these brokers was 0.607 Ci (22,459 MBq). The total volume collected was 1,072 cubic feet (30 m³). The breakdown by broker is:

ADCO - 355 cu ft (9.9 m³) - 33% of total volume, 0.453 Ci (16,761 MBq) - 75% of total activity

TBE - 717 cu ft (20 m³) - 67% of total volume, 0.154 Ci (5,698 Mbq) - 25% of total activity

Origin and Destination

New York State generators produced the LLRW for all 29 collections by out-of-state brokers. There were no manifests submitted to the Department from these two brokers that showed LLRW from neighboring states passing through New York. The waste collected by the two out-of-state brokers was taken back for storage at their respective facilities. Approximately 355 cubic feet of LLRW went back to ADCO in Illinois and 717 cubic feet went back to TBE in New Jersey.

This waste is eventually placed in consolidated loads and sent to a disposal or waste processing facility.

Shipment Frequency

Low-level radioactive waste was collected by out-of-state brokers approximately 2.5 times per month for 1997. The month of December had the highest number of collections (4) and the month of September had the lowest (0). The waste types (i.e., compactible trash, etc.) collected by the two out-of-state brokers are similar to those collected by New York State brokers.

Generator Category

There are five general categories of LLRW generators that are serviced by out-of-state brokers. These generator categories are: industry, hospitals, universities, research organizations, and government.

Placarding

Low-level radioactive waste which meets the DOT criteria for low specific activity (LSA) can be transported in DOT Type A containers and labeled with the appropriate label or can be stenciled "Radioactive Material LSA" and transported in "exclusive use vehicles." The DOT regulations in 49 CFR require that all vehicles carrying "Yellow III" packages or "LSA" packages carried in exclusive use vehicles must be placarded with the appropriate DOT placard. Out of 29 shipments carried by ADCOM Express, Inc. and Teledyne-Brown Engineering, 14 shipments were designated as "exclusive use" shipments.

SECTION IV: LLRW TRANSPORT BY NON-BROKER TRANSPORTERS AND NEW YORK STATE BROKERS IN CONSOLIDATED SHIPMENTS

Non-broker transporters are those carriers of LLRW that do not perform small broker collections and are not licensed to store LLRW for load consolidation or perform other broker functions. Non-broker transporters typically pick up one large shipment of LLRW from the waste generator and transport it directly to a disposal facility or licensed waste processor.

Four non-broker transporters and two New York State based brokers transported LLRW from or through New York State directly to a disposal facility or a licensed waste processor. These transporters carried 80,621 cubic feet (2,257 m³) of LLRW in 164 shipments within or through New York State during 1997. This is less than the volume of LLRW transported in previous years by these transporters.

New York State broker consolidated shipments represent a consolidation of waste collected and stored at broker facilities in the state. The individual waste packages that are packed and labeled by the generator remain intact and are consolidated into one large load destined for disposal or waste compaction.

Non-broker transporters generally service large industrial or manufacturing firms, and nuclear power plants. Many of the shipments carried by these transporters are of lower volume than the broker consolidated shipments but have higher activity levels. Broker consolidated shipments are comprised of many small broker collections and contain almost exclusively Class AU (A unstabilized) LLRW. Non-broker transporters carry waste classes AS (A stabilized), AU, B, and C.

The total activity of the LLRW transported by non-broker transporters and brokers in consolidated shipments was 56,974 curies (2,108,038 gigabecquerels).

Origin and Destination

Seven states, other than New York State, had their waste transported through this State by these transporters. In addition, broker consolidated shipments contained LLRW collections from various New England states. Table 4-1 shows the volume and activity of LLRW leaving or going through the State.

A total of five (5) different treatment, storage, or disposal facilities (TSDF) were utilized by these transporters during 1997. These facilities are: Barnwell in Barnwell, South Carolina, operated by Chem-Nuclear Systems, Inc.; the Envirocare facility in Clive, Utah; Scientific Ecology Group (SEG) Compactor in Oak Ridge, Tennessee; The Perma-Fix Facility in Gainesville, Florida; and the Alaron Facility in Wampum, Pennsylvania.

Table 4-1 States Transporting LLRW within or Through New York State				
State of Origin	Total Volume (Cubic Feet)	Total Volume (Cubic Meters)	Activity (Ci)	Activity (MB
Broker Consolidated (1)	4,998	140	19.9	736,300
New York (2)	57,120	1,599	545	20,165,000
Maine	8,586	240	0.14	5,180
Massachusetts	4,914	138	31.83	1,177,710
Vermont	4,243	119	56,155	2,077,735,000
Connecticut	572	16	220.32	8,151,840
Illinois	180	5	1.76	65,120
New Jersey	9	<1	<1.01	14
	80,621	2,257	56,973.95	2,108,036,150

¹ Note that only a portion of this waste was generated in New York State.

² Note that this does not include waste in broker consolidated portion.

The majority (72% by volume) of the waste transported by non-broker transporters and brokers in consolidated shipments went to the Barnwell disposal facility in Barnwell, South Carolina, and Envirocare in Clive, Utah. Table 4-2 lists the TSDFs and the amounts each received.

Shipment Frequency

One hundred and sixty four (164) shipments of LLRW were transported out of or through New York State during 1997 by non-broker transporters or New York State brokers in consolidated shipments. This averages out to about 13.7 shipments per month. The number of shipments ranged from 3 to 30 per month. Of the 164 shipments, 142 were shipments of Class A LLRW, 17 of Class B, and 5 of Class C.

Waste Categories

The waste types carried by brokers in consolidated loads are essentially the same as those found in small broker collections except that the volume is larger. The waste is typically Class A unstable (AU) and consists primarily of compactible trash and scintillation fluids. Hospitals, universities, government, research, and non-nuclear industry are serviced primarily by brokers and are represented in the broker consolidated shipments.

TABLE 4-2 TSDF'S Receiving LLRW Transported From or Through New York State				
TSDF	Total Volume (Cubic Feet)	Total Volume (Cubic Meters)	Activity (Ci)	Activity (MB)
Envirocare, Ut	41,471	1,161	0.18	6,660
Barnwell	16,312	457	56,968.81	1,107,845,970
SEG, TN	13,348	374	4.68	173,160
Alaron, PA	9,483	266	0.13	4,810
Perma-Fix, Fl	8	<1	<0	<1
	80,261	2,257	56,973.80	2,108,030,600

The majority of waste types transported by non-broker transporters are derived from nuclear power plants and large industrial and manufacturing firms. These waste types include mixed bed ion exchange resins, evaporator bottoms, filter media, irradiated reactor components, solidified liquids, contaminated soil and debris and compactible trash.

Package Types

The DOT has established two basic types of packaging for radioactive material transport. These package types are Type A and Type B. Generally speaking, Type A packaging is designed to withstand the stress of transportation under normal non-accident conditions, while Type B packaging is designed to withstand the stress associated with actual or hypothetical accident conditions. Normally, any radioactive material exceeding the A1 or A2 values established in 49 CFR 173.435 must be transported in a Type B container. The NRC regulations provide for an exemption to this requirement in 10 CFR 71.52 for low specific activity (LSA) material carried in an exclusive use vehicle. In this case, the LSA LLRW is transported in Type A casks that are much more substantial than typical Type A packaging and have significant shielding. These casks, however, are not designed to meet the accident resistant design criteria for Type B packages. This exemption will change on April 1, 1999, and all waste packages must meet the requirements of 49 CFR 173.427 (a)(1). If the requirements of this section for the unshielded dose at one meter are satisfied, then the waste may be transported in the non-accident resistant package mentioned above. If the waste package exceeds the unshielded dose rate limit, then the waste must be transported in a Type B package.

A total of 1,228 LLRW packages were transported by these transporters during 1997. A total of 94 of the 164 shipments transported by non-broker transporters and New York State

brokers in consolidated shipments were designated as “exclusive use.”

Transporters

NDL and Radiac Research Corporation are the only New York State based brokers that, in addition to local broker collections, also transport LLRW directly to disposal facilities. NDL and Radiac transported 4,998 cubic feet (140 m³) of LLRW with a total activity of nearly 19.9 curies (736,300 MBq) in 1997.

The other transporters include: Horwith Trucking (40,400 cubic feet [1,131 m³], 0.05 curies [1,850 MBq]; Tri-State Motor Transit (26,224 cubic feet [734 m³], 56,952 curies [2,107,224,000 MBq]); Hittman Transportation Services, Inc. (8,586 cubic feet [240.4 m³] with 0.1445 curies [5,346 MBq]); and Kindrick Trucking Company (414 cubic feet [11.6 m³] with 1.633 curies [60,421 MBq]).

SECTION V: COMPARISON WITH NYSERDA DATA

The volume and activity of LLRW mentioned in this report for New York State generators may or may not closely coincide with New York State generator data contained in the New York State Energy, Research and Development Authority's (NYSERDA) LLRW Status Report for the same year. This is due to a number of reasons.

Some nuclear power plants may find it more economical to ship heavy casks of irradiated reactor components directly to LLRW burial sites by rail and/or barge. Shipment of LLRW by rail car or barge is not regulated under 6 NYCRR Part 381 and, therefore, these shipments are not tracked on the manifest data base. The generator of this waste will, however, report it to NYSERDA for that year.

Some radioactive material is shipped out of New York State for decontamination and recycling to facilities such as Scientific Ecology Group (SEG) in Oak Ridge, Tennessee; or the Quadrex Corporation Recycle and Recovery Center also in Oak Ridge, Tennessee. These materials are shipped as radioactive material (RAM) rather than LLRW. Some of this RAM is eventually determined to be LLRW at these out-of-state facilities and is shipped to a disposal site. No LLRW manifests are received by NYSDEC in these cases and therefore, this LLRW is not tracked on the manifest data base. Generators of this material are, however, notified of the resultant volume and activity of the LLRW and include that material in their report to NYSERDA.

Low-level radioactive waste volumes that are contained in this document represent initial volume shipped before compaction. Much of the 13,348 cubic feet of LLRW sent to SEG in Oak Ridge, Tennessee, (Table 4-2) was volume reduced. In many cases, waste volumes found in the NYSERDA LLRW status report are after volume reduction has been performed.

In some cases, shipments of LLRW which are en route to compaction or treatment facilities may have shipment dates near the end of one year and actual disposal dates early in the following year. The NYSDEC manifest data base uses the shipment date to determine whether a shipment is listed in one annual report or the following one. Generators will often send NYSERDA information they received from disposal sites based on the actual date of burial. Waste shipped in one year could conceivably be listed in the next year's NYSERDA LLRW Status Report.

Lastly, the data in this document is based on LLRW manifests received by the Department from permitted LLRW transporters. This report relies on transporter compliance with requirements for sending in manifests. Non-compliance will result in missing data.

SECTION VI: GENERAL CONCLUSIONS

A total of 344 manifests with their associated continuation sheets were received by the New York State Department of Environmental Conservation from all LLRW transporters for 1997 LLRW shipments in accordance with 6 NYCRR Part 381. The manifest data presented in this report provides useful information on the types of LLRW transported, the number of shipments and their frequency, and the origin and destination of the LLRW transported.

The following general conclusions are based on these data:

1. A substantial amount of LLRW (almost half) collected by New York State based brokers was generated in states other than New York. These states are primarily in New England. These brokers collected 3,996 cubic feet (112 m³) of LLRW with a total activity of 24.38 curies (902,060 MBq). These same brokers shipped in consolidated shipments about 4,998 cubic feet (140 m³) with an activity of 19.9 Ci (736,300 MBq) for disposal.
2. The two out-of-state brokers permitted under Part 381 to transport LLRW within New York collected a total of 1,072 cubic feet (30 m³) with a total activity of 0.607 curies (22,459 MBq). One hundred percent of this waste was generated in New York State.
3. A total of 80,621 cubic feet (2,257 m³) of LLRW having a total activity of 56,974 curies (2,108,038 GBq) was transported into, within or through New York State in 1997 by non-broker transporters and brokers in consolidated shipments. These shipments were en route to treatment, storage or disposal facilities (TSDFs) located outside New York. This is a smaller volume of waste than was transported in previous years.
4. The LLRW disposal facility in Barnwell, South Carolina, received twenty percent (20%), by volume, of the waste transported from or through New York State. The Scientific Ecology Group's (SEG) LLRW treatment facility in Oak Ridge, Tennessee, received approximately sixteen and one half percent (16.5%) of the waste. About twelve percent (12%) of the LLRW was transported to waste treatment facilities such as the Perma-Fix Facility in Gainesville, Florida, and Alaron in Wampum, Pennsylvania. About fifty one percent (51%) of the waste went to the Envirocare facility in Clive, Utah. The remaining one half percent (0.5%) of the waste was transported to the broker storage facilities of Teledyne Brown Engineering in Westwood, New Jersey, and ADCOM Express in Tinley Park, Illinois. The majority of the waste taken to treatment or broker storage facilities is eventually transported to the Barnwell disposal facility in Barnwell, South Carolina.
5. The frequency of LLRW transport varies depending on whether the shipment is a

broker collection or a load destined for treatment or disposal. New York State based broker collections occurred several days a week except holidays and weekends. These brokers averaged 12.5 collections per month. Broker collections in New York by out-of-state brokers averaged about 2.5 collections per month.

6. In 1997, a total of 164 shipments of LLRW were transported out of or through New York State by non-broker transporters and broker consolidated shipments. These shipments were destined for waste treatment (i.e., volume reduction) or disposal. The frequency of this type of transport averaged out to 13.7 shipments per month. The range of shipments was three to 30 per month.
7. New York State based brokers and out-of-state brokers transported Class A LLRW. Broker consolidated shipments consisted exclusively of Class A LLRW. Non-broker transporters carried Class A, Class B, and Class C LLRW. Eighty-six and one half percent (86.5%) of LLRW volume transported by non-broker transporters or brokers in consolidated shipments in 1997 was Class A LLRW. Ten percent (10%) of the LLRW volume was Class B, and three and one half percent (3.5%) was Class C.
8. Contaminated compactible laboratory trash constituted the major waste type carried by both New York State brokers and out-of-state brokers. Scintillation vials, absorbed aqueous liquids, animal carcasses, sealed sources and smoke detectors constituted the remainder. The major waste types carried by non-broker transporters are primarily derived from nuclear power plants and large industrial or manufacturing firms. These waste types are (in order of magnitude) contaminated soil and debris, compactible trash, mixed bed ion exchange resins, irradiated reactor components, evaporator bottoms and filter media.
9. Transporters permitted under Part 381 in 1997 performed a total of 151 in-state broker collections and 193 shipments to treatment, storage, or disposal facilities. (Shipments consisted of 29 out-of-state broker shipments and 164 non-broker transporter and broker consolidated shipments.)
10. Part 381 has provisions for exemption from permit and manifest requirements, provided that the applicant can meet existing criteria (381.5(a)-(f)). To date, only a few applicants have applied for and received exemptions.
11. The safety record for low-level radioactive waste transport in New York State is excellent. Only seventeen (17) transportation events occurred in New York State during the period 1971 to 1997, and none of these events involved a release of radioactivity to the environment. A transportation event can be anything from an improperly sealed waste package (called an incident) to a vehicular accident. Of the 17 LLRW transportation events during this 26-year period (1971-1997), 6

were vehicular accidents and 11 were incidents of minor contamination of empty shipping casks which exceeded regulatory limits. This data is from radioactive materials incident reports maintained at the Sandia National Laboratory in Albuquerque, New Mexico.