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Technical Bulletins provide information to States, compact regions, and other interested parties on issues related to the development of low-level radioactive waste disposal facilities. The Bulletins distribute information that is either of immediate concern to the States and compact regions, or that is not suited to more formal reports. These Bulletins are published on an as-needed basis.

The objective of this Technical Bulletin is to provide States and compact regions with information to assist in proactively considering transportation during planning for development and operation of disposal facilities for low-level radioactive waste.

MANAGING COMMERCIAL LOW-LEVEL RADIOACTIVE WASTE BEYOND 1992: TRANSPORTATION PLANNING FOR A LLW DISPOSAL FACILITY

G. J. Quinn
WASTREN, Inc.

Executive Summary

Transportation is an integral part of developing and operating a low-level radioactive waste (LLW) disposal facility. Planning for a facility should proactively address transportation to foresee needs and take appropriate actions. The term "transportation" is used broadly in this technical bulletin to refer to any of the activities and issues associated with the transport of people, nonradioactive materials (equipment and supplies), and LLW to and from a disposal facility. Those transportation activities and issues include: construction traffic, operations traffic including LLW shipments, accident prevention measures, highway infrastructure improvements, routing, shipment restrictions, inspections and enforcement, emergency response preparations, incident notifications, public outreach programs, plus other related subjects.

As indicated above, transportation for a LLW disposal facility can be viewed as performance of work that directly supports development and operation of a facility or safety-related activities that reduce various transportation hazards. Many of the safety-related activities may involve State organizations. Most safety-related activities are already addressed in existing Federal or State regulations and are independent of preparations for a LLW disposal facility. Only a few activities specifically require action by a State because a LLW disposal facility is being developed or operated. This technical bulletin proposes prior planning by States as a means of ensuring that

transportation-related actions deemed necessary by a State are addressed.

A principal reason States need to consider transportation during preplanning for a disposal facility is public concern with the safety of transporting packages of LLW. Transport of nonradioactive materials is also a concern, but it is better understood by the general public since the opening of any new industrial facility of comparable size creates new traffic. In contrast, transportation of radioactive materials, which includes shipment of LLW, is not common to the general public's awareness. The low awareness of LLW transport is due in part to a well-established record of safety. However, in many communities, a safe operating history for more than 20 years under the modern Federal radioactive material transport regulations does not ensure that present-day transport of LLW is viewed as safe by the public, their elected representatives, or special interest groups. Because of transportation-related concerns, public resistance to a proposed LLW disposal facility may increase.

The activities related to transportation for a LLW disposal facility are discussed under the following headings:

- Safety
- Legislation, regulations, and implementation guidance
- Operations-related transport (LLW and non-LLW traffic)
- Construction traffic
- Economics
- Public involvement.

This technical bulletin presents information on the many activities and issues related to transportation of LLW to allow interested States to investigate further those subjects for which proactive preparation will facilitate the development and operation of a LLW disposal facility. The intention is to provide a listing of activities and related issues that will prompt States to consider and determine which LLW transportation subjects are of further interest to a State, the current position a State has on a particular subject, and the need for a State to take actions. The intention is not to offer one or more recommended approaches on any particular issue, but to assist in proactive consideration of transportation in the planning process for a LLW disposal facility. Since many issues related to the safety of LLW transport are already addressed in Federal regulations, States may find proactive participation involves cooperating with Federal agencies and ensuring compliance with Federal requirements.

By working to gain a further understanding of how transportation is an integral part of a LLW disposal facility, States may identify potential concerns sooner during the development and operation of a facility. This will help States make decisions, plan actions, devise mitigative measures, and carry out responsibilities for management of LLW after 1992. Proactively considering issues during planning should not hinder transport of LLW, but rather should allow safe transport to continue and further enhance the safety of the public.

Introduction

Beginning January 1, 1993, the Low-Level Radioactive Waste Policy Amendments Act of 1985 (the Act) makes States responsible for managing commercial LLW generated within their borders. In response, some States formed compact regions to jointly manage LLW generated in all member States of that compact region.

Some States and compact regions will not be able to establish permanent disposal capacity for their LLW by the 1993 deadline. As a result, many States have begun examining alternative management techniques while developing a permanent disposal facility. One of the options being considered is temporary storage of LLW at either the point of waste generation or at the point of waste collection. Another option is temporary storage at any of several centralized temporary storage facilities.

In order to manage their LLW, some States may develop temporary storage facilities in addition to a permanent facility. For both types, States must plan for both LLW and non-LLW (construction- and operations-related) transportation activities.

One important consideration for transport of LLW is the range of hazards associated with such shipments. Both the amounts and types of radioactivity in LLW shipments will vary. Accordingly, the safety considerations in Federal regulations increase as the hazards associated with the radioactive material in a LLW shipment increase. Information on the extent and variety of State experiences with LLW and other radioactive material shipments is available from sources provided in Appendix A.

The number and kinds of activities and issues discussed below are evidence of the complexity of the subject of transportation for a LLW disposal facility. Existing rules for safe transport of LLW should generally address the public's concerns. However, each State faces a different set of local conditions that may warrant special attention. For example, emergency response preparations by local first responders is a topic presently of interest to many States. Each State should evaluate each issue and assess if action is needed. The following information is provided to assist States with such an effort.

Safety

Transportation safety and the public's perception of safety are important in the development and operation of a LLW disposal facility. Fortunately, transportation safety is well developed and safety performance requirements are extensively addressed in existing regulations. Safety requirements range from everyday traffic control signs and highway construction standards to specialized rules that ensure the design of packages for transport of certain quantities of radioactive materials will survive severe traffic accidents. Transport of LLW, as a subset of radioactive materials shipments, is addressed by these previously promulgated safety regulations. It is not necessary to develop whole new sets of transportation regulations in response to the opening of a LLW disposal facility. States developing and operating a facility will need to ensure existing requirements are met, and should also address special local concerns.

Development of safety regulations for transport of hazardous materials (of which LLW is a subset) is an evolutionary process. When Federal regulations originated (around 1886), only the most acute transportation safety hazards were addressed such as the risks of explosives and flammable materials. Now there are 20 different classes of hazardous materials addressed in Federal regulations. As the regulations evolved from experience, requirements for hazard communications and integrity of packages were added to the Federal rules.

Public participation is essential when making decisions that affect public safety, such as deciding how to meet some transportation safety requirements or deciding to create new requirements. New traffic patterns may emerge on highways leading to a LLW disposal facility, depending on the size of the facility. Such changes could affect the safety of the public; even the perception that changes would affect public safety must be addressed. A public spokesperson can address such changes and provide helpful information on both the immediate and long-term effects of these changes. States may obtain public input from such interaction and decide to reduce the effects of the changes.

Regardless of whether safety problems are real or perceived, an effective, knowledgeable spokesperson should be prepared to address all potential issues. Some issues have effects that are directly observable and near term. Others have only the potential for an effect. Issues may include increased traffic (noise, dust, and diesel fumes from large trucks); seasonal concerns (icing on highly crowned or narrow roads); risks from traffic accidents; overloading of local facilities (police, motels, or restaurants); adequacy of existing roads, traffic controls, or bridges; adequacy of local emergency response teams, equipment, and facilities to handle

increased traffic or radioactive releases; and changes to the environment from construction of new infrastructure (roads and bridges).

A public spokesperson may also be required to address longer-term safety issues that would become evident only after years of traffic during the operation of a LLW disposal facility and possibly only after exhaustive studies. For example, the degradation of existing infrastructure due to heavy traffic, such as potholes in roads and bridge failure, could make traveling less safe for local residents. Also, there is the question of a small additional risk from doses of ionizing radiation absorbed by members of the public from incident-free LLW shipments. The effects of small incremental radiation doses would be very difficult to measure, but States may be asked to discuss the issue and its ramifications. Transportation risk analysis models can predict such effects.

Efforts to ensure the public's safety that go beyond compliance with existing laws and regulations must be balanced with potential risks of harm. A risk assessment is implicit in decisions made regarding State expenditures for transportation safety. Risk-based decision making allows States to compare fund expenditures on various competing alternatives. For example, costs to assess and reduce small doses of ionizing radiation (frequent occurrence with incremental individual and total population consequences) could be compared against costs to prevent or mitigate severe accidents (infrequent occurrence with significant individual consequences and potential consequences beyond an accident site).

The risks of harm from traffic accidents alone can have various influences on the public (even before risks from doses from incident-free LLW transport are considered). Risk of harm to the public from accidents is the probability of an accident (number of specific-severity accidents per year) times the consequences of the accident (injury and property damage for each accident of that severity type). While reducing risks from severe accidents can be achieved by decreasing either the chances of severe accidents occurring or the consequences of a severe accident, the public is not impressed by probabilities. If a serious accident could happen, no matter how remote the chance and harmful the consequences, the public will be very concerned if they perceive the consequences to be unacceptable.

Funds spent to improve roads, perform route evaluation and selection, inspect LLW shipments more frequently, and improve emergency response capability would all tend to reduce risk of harm to the public from accidents. States must decide between alternatives competing for funding and attempt to balance efforts that can be funded to reduce risks.

In addition to balancing technical tradeoffs to reduce transportation risks, the public's perception of the factors involved in a risk assessment should be considered when making funding decisions to enhance safety. Communication of commensurate risk is necessary for successful public outreach and for States to balance the reductions in transportation risks among the various possible means to reduce those risks. Transportation studies show that although approximately three million packages of radioactive materials are shipped in the United States annually, there have never been serious injuries or fatalities attributable to the radioactive nature of those shipments. LLW is one type of radioactive material. Appendix B provides references on radioactive materials shipments and accident studies.

Legislation, Regulations, and Implementation Guidance

Legislation, regulations, and implementation guidance for the transport of LLW have a long history of continuous development. Current requirements are always subject to further review as part of an evolutionary process to achieve better transportation safety. States have participated and will continue to participate in this process. States may need to participate specifically in response to public interest following transport of LLW to new locations. States are encouraged to examine existing legal frameworks for safe LLW transport and study

and interpret existing laws. If necessary, States may develop laws and regulations that will be compatible with Federal regulations and address local concerns in their State. Guidance for implementing State requirements may also be needed, sometimes in cooperation with regulators from Federal agencies or neighboring political jurisdictions.

Federal regulations for transport of radioactive materials, which includes LLW, are part of the Hazardous Materials Regulations (HMR) promulgated by the U.S. Department of Transportation (DOT). The HMR were issued pursuant to the Hazardous Materials Transportation Act of 1974, as amended. The HMR govern the safety aspects of hazardous materials transportation and include requirements for classification, packaging, hazard communication, handling, transport, and incident reporting.

Of necessity, the HMR are complex. They address the legal, technical, and operational safety requirements for transport of thousands of hazardous constituents. The HMR apply to transportation of hazardous material in commerce including LLW shipments. The HMR contain standards for preemption of State, political subdivision, and Indian tribe requirements that are either (a) not "substantially the same" as Federal requirements, (b) exclusively a "covered subject" in the Federal rules, or (c) "highway routing" requirements.[1] The preemption standard is intended to clarify the relationship between Federal and non-Federal laws governing the transportation of hazardous materials.

In the broadest area of preemption by DOT, non-Federal rules are preempted if dual compliance with both non-Federal and Federal requirements is not possible, or if a non-Federal rule as applied or enforced creates an obstacle to the accomplishment and execution of Federal requirements.

In a specific area of preemption, "covered subjects" are the exclusive jurisdiction of Federal rules to ensure a consistent national set of rules for shippers, carriers, and receivers of hazardous materials. The "covered subjects" are:

- The designation, description, and classification of hazardous materials
- The packing, repacking, handling, labeling, marking, and placarding of hazardous material
- The preparation, execution, and use of shipping documents pertaining to hazardous material
- The written notification, recording, and reporting of unintentional release in transportation of hazardous materials
- The design, manufacturing, fabrication, marking, maintenance, reconditioning, repairing, or testing of a package or container that is represented, marked, certified, or sold as qualified for use in the transportation of hazardous materials.

In another specific area of preemption, a future rulemaking in the HMR will add Federal standards that States and Indian tribes may use to establish, maintain, and enforce the designation of highway routes over which DOT-regulated hazardous materials may or may not be transported by motor vehicle.

Legislation, regulations, and implementation guidance for transporting LLW to a disposal facility are part of the broader subject of radioactive materials (RAM) transport (such as shipment of medical radioisotopes, sealed sources for industrial applications, LLW, and other radioactive wastes.) Further, RAM transport is part of the still broader subject of hazardous materials transport (such as shipment of explosives, flammable materials, poisonous gas, oxidizers, corrosives, RAM, and other hazardous materials). As States consider some of the following regulatory subjects, States should also recognize that, for purposes of Federal transportation regulations, LLW is but one type of RAM, which is but one type of hazardous material. In this context, some regulatory requirements described as applicable

to LLW transport should be recognized as applicable to the more general cases of RAM or hazardous materials transport.

In addition to the Federal DOT, a State DOT and other agencies may have regulations applicable to transport of LLW. The jurisdiction of each agency may influence how State programs and regulations develop. The U.S. Nuclear Regulatory Commission (NRC), State radiation control organizations, U.S. Environmental Protection Agency (EPA), and State environmental protection organizations may all have regulations applicable to the LLW contained in a particular shipment. Each agency is concerned with a certain subset of the generic term, hazardous materials. Both chemical and radioactive substances, which can be either valuable products or wastes, are included in the Federal DOT definition of hazardous materials as applied to transportation. For purposes of waste disposal, environmental protection organizations regulate hazardous wastes while nuclear/radiation control organizations regulate radioactive wastes. LLW is not a hazardous waste unless the waste is also mixed with chemical constituents regulated by an environmental protection organization.

The following issues in transportation regulation are intended to present an initial listing of major subjects for consideration by States. The subjects are addressed in existing regulations in use for transport of hazardous materials. The safety record for shipping radioactive materials, such as LLW, using these regulations is exemplary. Each State is encouraged to perform their own proactive determination of the status of transportation regulation by reviewing the existing applicable Federal, State, political subdivision, and Indian tribe requirements for transport of LLW as a subset of RAM (see Appendix C). By evaluating regulations currently in effect, States may determine that legislation, regulations, or other requirements will help facilitate LLW shipments. Note that such rules must meet Federal preemption standards.

Even with the high degree of safety and uniformity across the country established by Federal DOT regulations, States may still find it advantageous to enact legislation and promulgate regulations or other requirements for LLW shipments that are not subject to preemption by the Federal regulations. When not preempted, States can enact rules that will be appropriate strictly for instate purposes of furthering safety or other objectives.

The transportation-related regulatory issues important to the process of planning a LLW disposal facility are:

Fees. Transportation-related fees are a standard means of having a service paid for by the user of the service. Fees used for enforcement and the planning, development, and maintenance of emergency response capabilities are allowed under DOT regulations. Other fees may be preempted by Federal requirements.[2]

Determine if fees would be applied as permits or licenses; per LLW shipment or annually; to shippers, carriers, or receivers; or determine if there is some other type of appropriate fee. An administrative organization, likely already available for other transportation fees, would be needed to establish the fee structure for LLW transportation, make permits or licenses available, check that fees were paid for LLW shipments, and revoke permits or licenses when necessary.

Permits. Permits are routinely used for oversize and overweight truck shipments. States considering permits specifically for LLW shipments may note that some permits have been preempted by DOT (Reference 2). Procedures and requirements that would result in uniform permitting of LLW shipments in all States in a compact region may improve efficiency.

Overweight Trucks. States have already set motor vehicle weight restrictions. These apply to all overweight truck shipments, which infrequently include some LLW shipments. A lead-shielded shipping cask may be used for LLW containing gamma-emitting radioisotopes, and the heavy shipping container may result in an overweight ruck shipment. Permits that authorize

such overweight LLW shipments are already in use.

Shipping Packaging Design. An empty shipping container for LLW is called packaging and one loaded with LLW is called a package. Packagings used for some LLW shipments must meet NRC requirements for integrity following a transportation accident.[3] The NRC performance criteria are applicable to a packaging design if greater than a certain quantity of radioactivity is to be transported in a package. For lesser quantities, DOT performance criteria apply. LLW packaging design requirements are a "covered subject" under DOT regulations and preempt State requirements.

Shipment Restrictions. Permits for oversize or overweight shipments sometimes include restrictions on travel or impose other conditions. Restrictions on some LLW shipments may be cost-effective and improve safety. Many types of non-Federal restrictions for hazardous material shipments were ruled inconsistent with DOT requirements and preempted (Reference 2). Without regard to whether Federal or non-Federal rules would apply in specific circumstances, types of restrictions and other conditions considered in the past include use of headlights at all times, specification of separation distances between vehicles, travel through tunnels or over bridges, travel at specific times of the day (daylight hours only, no rush hours, no weekends, or no holidays), maximum speeds, travel in certain highway lanes (right lane only), use of a vehicle with appropriate warning signs ahead of and behind a shipment, prior communication, preapproval of a shipment, and limitations on shipments due to severe weather or unacceptable road conditions.

In considering these or similar restrictions, it may be useful to review existing Federal inconsistency rulings (Reference 2). When new requirements are deemed necessary, States may use Federal regulations that establish procedures for determining if a non-Federal requirement will be preempted.[4] As noted previously, States participate in the evolutionary process of determining regulations for safe transport of hazardous materials. Federal rulings on shipment restrictions imposed by States help define when Federal or State requirements apply.

Inspections and Enforcement. Inspections are performed for regulatory compliance at State borders, at weigh stations, and on roads for all types of shipments including trucks carrying LLW. Penalties are prescribed for noncompliance with administrative and safety requirements. States have already established the responsibilities of various organizations performing trucking inspections, the capabilities required to adequately perform such activities, and the means to provide those organizations financial support for performing the effort. In reviewing inspection and enforcement methods for LLW shipments, it is recommended that uniform standards be set that allow reciprocal recognition of inspections among member States in a compact region. As a current topic of discussion, there is a position that developing reciprocally acceptable criteria and procedures is a near necessity to facilitate preshipment, in-transit, and upon-arrival inspections of radioactive materials shipments including LLW.

Emergency Response. State and local governments have established and continue to maintain emergency planning and response capability for truck accidents. Organizations responsible for responses are identified, emergency response actions needed are preplanned, and routine training exercises are performed. When accidents involve hazardous materials, including LLW shipments, instate first responders to accidents are assisted by national organizations when requested. In reviewing emergency response preparations for LLW shipments, it may be useful to plan for, train for, and execute LLW shipment emergency responses. Based on preopening preparations for shipments of transuranic wastes to a new DOE site, there appears to be technical and public confidence benefits in practicing accident response scenarios for transportation emergencies involving such wastes. LLW or other radioactive material transportation accidents may

be added to the types of accidents included in routine drills.

Shipment Notification. Federal requirements for notification of States regarding radioactive material shipments apply to truck shipments of those quantities of LLW that are required to be transported in NRC approved, Type B shipping packages. When required, States on a route must be notified as specified in the regulations. Other types of notification requirements have been confirmed or disallowed in Federal inconsistency rulings (Reference 2). Notification-related requirements (without regard to consistency with Federal rules) include two-way radio communication, immediate notification of State police or local officials of any accident, written notification to State agencies of accidents, notifications of schedule changes and delays, application for approval of shipments, written preshipment approval, and notification of emergency plan implementation.

While States may be preempted from requiring certain shipment notifications, voluntary agreements between shippers and States have been used to obtain shipment schedule information for State agencies on a real-time basis to help coordinate shipment inspections and enforcement activities.

Routing. The designation of routes over which hazardous materials, including LLW shipments, may or may not travel is a good example of the evolutionary nature of the regulatory process as applied to transportation safety. DOT inconsistency rulings have considered several non-Federal rules on routing (Reference 2). The inconsistent rules, at a minimum, prompted Federal agencies to develop Federal rules. There are already Federal regulations that ensure highway route controlled quantities of radioactive materials are transported over "preferred routes" selected to reduce time in transit. Federal requirements will be expanded to include routing for all hazardous materials in a future rulemaking.

States may designate a "preferred route" using DOT's guidelines or an equivalent routing analysis that adequately considers overall risk to the public.[5] The designation must include cooperation with affected local political jurisdictions and States to ensure continuity of designated routes.

One aspect to consider in evaluating routes is identification of designated safe parking, repair, refueling, or driver relief areas or facilities.

Incident Notification. Reporting requirements for the notification of Federal authorities regarding incidents during LLW shipments are a "covered subject" with rules specified in DOT regulations. While some non-Federal rules for accident notification of State and local authorities have been permitted under DOT inconsistency rulings, others have not (Reference 2). States considering incident notification requirements should determine the organization responsible (shipper or carrier) and the timing of and method for making the notifications. DOT can assist a State with a preemption determination on a new State-proposed rule on notifications.

Financial Liability and Insurance. The minimum acceptable levels of financial responsibility for hazardous materials shipments, including LLW, by motor carriers is specified in Federal regulations. Insurance policies or surety bonds are required for LLW shipments to provide monetary coverage for incidents. State requirements and limitations for LLW carriers should consider Federal insurance coverage requirements and limitations.

Driver and Operator Training. Federal requirements establish minimum qualifications and training needed for LLW carrier companies and drivers. States considering driver training or testing requirements should coordinate with Federal rules.

The preceding information on regulations related to transport of LLW identifies that safety is a major consideration at the national level and continues to be improved. As an evolutionary process, Federal safety regulations for transportation are continually pressed to ensure that "safe"

is safe enough. States facilitate this process even when State requirements are preempted. Issues of significant public interest and support can be raised for consensus in Congress and addressed directly as a change to national law.

Operations-Related Transport (LLW and non-LLW Traffic)

Some additional traffic associated with operations of a LLW disposal facility will be attributed to shipments of LLW. However, operations-related transport for a facility may contribute a larger amount of non-LLW traffic, depending on the facility size. Operating personnel and supplies will need to be transported to the site to receive, handle, and dispose of the LLW. Transport of both categories of materials involves performance of work and regulatory oversight.

Two types of State organizations will be involved in the operations-related transport for a LLW disposal facility. One type will be a State's disposal facility authority with responsibility for ensuring that the receipt of LLW is performed adequately. (Responsibilities of this authority described below will likely be performed with the support services of a disposal facility operating contractor.) The other type of State organization will be a State's regulatory authority responsible for ensuring compliance with transport regulations and, in particular, with those requirements applicable to LLW shipments.

For both types of organizations, the operations involved in making a LLW shipment are of interest. One organization wants to ensure that operations proceed safely, smoothly, and predictably. The other organization wants to ensure that operations are performed safely and in compliance with requirements. The following discussion highlights operational aspects of LLW shipments to provide a sketch as to what activities require oversight.

Transport of LLW (as a RAM and a hazardous material) must be performed in accordance with DOT regulations, which provide the following definition:

Transport or "transportation" means any movement of property by any mode, and any loading, unloading, or storage incidental thereto.[6]

Accordingly, LLW shipment and oversight activities include:

- Preparing LLW for Shipment – Many activities are required to prepare each LLW shipment. For each activity, a shipper must perform the safety-related steps adequately (i.e., comply with applicable regulations and requirements). Preshipment activities performed by a shipper to meet transportation-related requirements include classifying LLW materials, verifying the integrity of LLW containers, preparing LLW payloads, loading payloads into shipping packages, closing packages, torquing bolts, testing seals, placing shipping packages on vehicles, measuring external radiation dose rates and radioactive contamination levels, marking and labeling shipping packages, placarding vehicles, inspecting vehicles, and completing shipping papers.

- LLW Manifests – When NRC issued regulations controlling the transfers of LLW to land disposal facilities, the information to be provided on a shipment manifest was defined but not the format for the information. The three currently operating disposal sites have evolved two forms with unique features. With new LLW disposal facilities opening, the possibility of differing formats being created prompted the NRC to initiate a proposed rulemaking on a uniform LLW shipment manifest. Since the manifests are to serve as shipping papers, DOT requirements must also be included in the baseline set of information needed on the manifest for regulatory purposes. States will have an opportunity to comment on the proposed rulemaking in 1992; the goal for a final rule is calendar year 1992.

- LLW Shipment Inspections – States and compact regions may have more than one

regulatory oversight organization with jurisdiction over a LLW shipment. Coordination among those organizations will help determine which organization performs inspections and the locations and timing of inspections. Alternatives include preshipment, in-transit, and upon-arrival inspections.

- Unusual or Off-normal Events – Disposal facilities may receive LLW that does not comply with applicable transport requirements. Recovery activities include achieving a safe shipping package or payload handling condition at the disposal facility, reporting the incident to proper authorities, noting corrective actions to be taken in the future, and assessing fines or initiating punitive actions for noncompliance.

- Scheduling and Logistics – Coordination between State disposal authorities and waste shippers will help minimize traffic congestion and ensure that a facility can handle the expected number of LLW shipments. Otherwise, delays may occur in unloading reusable shipping containers. Such delays may result in additional costs for each day that return of the equipment is delayed.

- Unloading Shipping Containers – A State disposal authority (i.e., operating contractor) coordinates with LLW shippers to predetermine the types of LLW shipping containers sent for disposal, the types of handling systems required for unloading, and the radiation dose rates from payloads.

- Preparing Empty Packaging for Return Shipments – A State disposal authority (i.e., operating contractor) may be required to close reusable shipping containers in compliance with applicable regulations. Requirements may include activities to measure internal contamination levels, perform seal testing, measure external contamination and dose rate levels, decontaminate the containers if necessary, place shipping containers on vehicles, perform checks of vehicle condition, and other preshipment preparations.

- Traffic – Estimating the number of LLW shipments to a LLW disposal facility and preplanning traffic controls will minimize any potential traffic problems. There is a potential that a higher number of shipments than the long-term average could occur from an influx of LLW when new disposal facilities first open, a result of the need to reduce inventories of LLW that will be placed into storage at generator sites after 1992.

- Infrastructure Improvements – Some changes may be desirable to improve the infrastructure of highways on routes expected to be used for a LLW disposal facility. (Rail line improvements are also a possibility, although not many LLW shipments have been transported by train.) Improvements may include new roads, traffic signals or highway signs, wider roadbeds, higher load-capacity bridges, or better railroad tracks and crossings.

- Non-LLW Traffic – A LLW disposal facility will generate some additional non-LLW traffic on a day-to-day basis. It is recommended that plans allow for traffic from operators, regulators, suppliers of equipment and services to the facility, and visitors interested in the disposal operations such as the public, elected officials, and representatives of other States' disposal facilities. These workers and visitors will transport themselves and non-LLW deliveries to a disposal facility. In planning for traffic controls and infrastructure improvements, non-LLW traffic should be considered in addition to the expected LLW traffic.

Construction Traffic

A new LLW disposal facility requires construction equipment to fabricate buildings and prepare excavations for construction of engineered waste disposal units. This equipment is standard in the sense that the radioactive waste destined for disposal at the site does not require any special construction equipment for preparing the site. The construction equipment is similar to that used to build any large industrial facility. Typically, large earth-moving equipment (bulldozers), portable cranes, dump trucks, cement delivery trucks and large equipment delivery trucks should be expected on the roads leading to a facility during the construction phase.

Some construction traffic issues noted below are precursors to issues associated with actual LLW shipments that will follow. Disposal site construction traffic may need:

- Overweight shipment permits
- Fees for permits
- Shipment restrictions
- Inspections and enforcement
- Routing restrictions
- Infrastructure improvements.

Economics

Many issues associated with transportation safety have a common element: cost. Maintaining and improving safety in transport of LLW will not be without expense and will involve the tradeoff of alternatives. Topics related to the economics of LLW transportation include:

- Cost Identification – Identify all of the costs necessary to manage the safe transport of LLW. These may include costs for enforcement of regulatory compliance; provision of emergency response capability; administration of organizations that perform the regulation promulgation, permitting, inspections, and notifications; improvements to highway infrastructure needed due to a new disposal facility; and provision of operations support at a disposal facility for LLW shipments.

- Cost Effectiveness – Distinguish between costs allowed to be collected for LLW transportation by law and regulation from costs incurred over and above the legal mandate. Perform a cost/benefit analysis that enables expenditures to be decided based on a consistent framework regarding the many possible alternatives that improve safety.

- Cost Recovery – Determine the sources of funding to support all of the costs identified, establish the mechanisms to obtain the funds, and determine whether there should be full cost recovery, taxpayer subsidies, or excess revenues collected.

- Cost Accountability – Establish a financial accounting procedure that ensures funds collected for transport of LLW under DOT regulations are used for only those purposes, as required by DOT.[7]

Public Involvement

The development and operation of a LLW disposal facility may affect communities because of the types and amounts of traffic on the local roads. Public participation in the safety-related, decision-making processes will greatly increase public acceptance. Transportation issues are public concerns. A public spokesperson may be asked to address the availability of information regarding transport for a LLW disposal facility, construction traffic, LLW traffic, accident prevention measures, risks of transport associated with a LLW disposal facility, emergency response preparations, challenges to demonstrate the safety of all transportation operations, infrastructure improvements, shipment restrictions,

inspections and enforcement capabilities, and incident notifications.

For some LLW disposal sites, the first opportunity to gather information from the public may be the siting process for the facility. Transportation may be considered in the siting process in several ways:

- Minimize distances from LLW generators to a disposal site. For example, if the major generators are in the western portion of a State or compact region, consider western sites for the facility.

- Proximity to major highways. The adequacy of existing highways and traffic control infrastructure between alternate locations and the nearest major highway can be compared for various locations.

- Historical accident and weather data on highways to alternate locations. Expected road features, terrain characteristics, accident rates, and weather conditions may suggest one location would be preferable to another.

- Modal availability. The location of a site may be influenced by the availability of access by both motor vehicle and train.

Summary

Transportation plans can potentially become an issue when planning for LLW disposal facilities. It is important to include all affected parties in these plans. Since compliance with regulations provides a means to ensure the safety of the public, it is important to examine the adequacy of existing regulations to engender safe operations for both LLW and non-LLW transportation. Other transportation issues include operations-related traffic, construction traffic, economics, and how the public perceives the safety of LLW shipments.

References

1. Code of Federal Regulations, 49 CFR 107.202, "Standards for Determining Preemption," Office of the Federal Register, February 1991.

2. *Federal Register*, 54 *FR* 26710, "Summary of DOT Inconsistency Rulings," June 23, 1989.

3. Code of Federal Regulations, 10 CFR 71, "Packaging and Transportation of Radioactive Material," Office of the Federal Register, January 1990.

4. Code of Federal Regulations, 49 CFR 107, "Subpart C-Preemption," Office of the Federal Register, February 28, 1991.

5. *Federal Register*, 55 *FR* 21480, "Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials," June 13, 1990.

6. Code of Federal Regulations, 49 CFR 107.3, "Definitions," Office of the Federal Register, February 1991.

7. Code of Federal Regulations, 49 CFR 107.202(c), "Standard for Determining Preemption," Office of the Federal Register, February 1991.

APPENDIX A

Information on LLW and Other Radioactive Material Shipments

Recent publications are available from the following organizations:

Conference of Radiation Control Program Directors, Inc., *Directory of State Agencies Involved with the Transportation of Radioactive Materials*, Mr. C. Hardin, Attn: Ellen, 205 Capital Avenue, Frankfort, KY, 40601 (502) 227-4543.

Midwest Office of Council of State Governments

Lisa Sattler (708) 810-0210

Southern States Energy Board
Alex Thrower (404) 242-7712

Western Governors Association
Laura Scheely or Ron Ross (303) 623-9378

Western States Energy Board
Jim Miernyk (303) 573-8910

APPENDIX B

Radioactive Materials Shipments and Accidents Studies

References for the general subject of radioactive materials transportation and accidents that may be of interest include:

H. S. Javitz, T. R. Lyman, C. Maxwell, E. L. Myers, and C. R. Thompson, *Transportation of Radioactive Material in the United States: Results of a Survey to Determine the Magnitude and Characteristics of Domestic, Unclassified Shipments of Radioactive Materials*, SAND84-7174, Sandia National Laboratories, Albuquerque, NM, 1985.

J. D. McClure and A. Tyron-Hopko, *Radioactive Material Transportation Accident/Incident Analysis*, SAND85-1016, Sandia National Laboratories, Albuquerque, NM, 1986.

R. M. Ostmeyer, N. C. Finley, J. W. Cashwell, and J. D. McClure, *The Potential Consequences and Risks of Highway Accidents Involving Gamma-Emitting Low Specific Activity (LSA) Waste*, SAND87-2808, Sandia National Laboratories, Albuquerque, NM, 1988.

APPENDIX C

Sources of Information on Legislation and Regulations for the Transport of Radioactive Materials

States considering requirements for transport of low-level radioactive waste (LLW) to disposal facilities need to know currently applicable Federal legislation and regulations. In addition, requirements in effect in other States or other political subdivisions and Indian tribes may be of interest for comparison purposes. For some LLW transportation issues, States may have similar interests and concerns. Sources of information for determining existing applicable Federal and State statutes, regulations, other legislative items, and local ordinances are discussed below.

Hazardous Materials Information Exchange

The Hazardous Materials Information Exchange (HMIX) is a computerized bulletin board designed especially for the distribution and exchange of hazardous materials information. The HMIX is managed by the Federal Emergency Management Agency, Technological Hazards Division, State and Local Programs and Support Directorate, and the Department of Transportation, Research and Special Programs Administration, Office of Hazardous Materials Transportation. The HMIX provides a centralized data base for sharing information pertaining to hazardous materials emergency management, training, resources, technical assistance, and regulations. With the HMIX, you can receive information, provide information to other users, or interact with peers. To serve the hazardous materials community, the HMIX is available 24 hours a day, seven days a week. For information, call 1 (800) 752-6367 or 1 (800) PLAN-FOR. Illinois residents, call 1 (800) 367-9592.

National Conference of State Legislatures

The National Conference of State Legislatures (NCSL) is a bipartisan, nonprofit organization created to serve the legislators and staffs of the nation's fifty States. The NCSL provides information for policymakers to exchange ideas on issues of interest to States. One of the many services provided by the NCSL is the LEGISNET computerized research data base.

LEGISNET is available to all State legislators and their staff who may query the system by means of computer terminals at any location. A data base with transportation legislation and regulations is being added to LEGISNET. This transportation regulation data base is funded by the U.S. Department of Energy (DOE), and is an important part of the preparations to transport spent fuel from nuclear power plants to a DOE facility.

Present plans call for the transportation regulations data base to be available through LEGISNET starting in the spring of 1992. The data base on LEGISNET will be a continuation of an earlier effort for DOE by Battelle Memorial Laboratories for DOE's Office of Civilian Radioactive Waste Management, in preparation for future spent fuel shipments. The Battelle effort published a document, the *Transportation Legislative Data Base* (TLDB), BMI/OTSP-08, October 1989, which is available from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

Although the transportation regulations data base on LEGISNET is not yet established, the information expected to be available will be similar to that found in Battelle's *Transportation Legislative Data Base*. States that would have needs concerning LLW transportation not found on the data base can likely obtain help from NCSL. The following categories of information are identified and listed for each item in the TLDB:

Item Number - Unique alphanumeric identifier assigned to each item in the data base.

Action Type - Identifies the item as a:

- Statute
- Regulation
- Pending Legislation
- Other

Source – Identifies the originating level of government.

State – Identifies the State of origin or the State affected by the item.

Citation – The correct citation to the statute or regulation, or the bill number in the case of pending legislation.

Title – The official title of the item, where available. If an official title is not available, an appropriate title describing the item is created for

it. Such titles are followed by the designation "(unofficial)."

Transport Mode - The specific mode(s) of transportation addressed by the item:

- Motor Vehicle
- Rail
- Vessel
- All
- Unspecified

Regulatory Authority – Identification of regulatory responsibilities listed in the item. For example, if the item is a statute, this category will list the regulatory agency or agencies that are with the authority to promulgate regulations to enforce the provisions. If the item is a regulation, the promulgating agency and any other agencies or bodies that are with regulatory authority under it are listed.

Issues – Identification of the subject matter and principal transportation topics of interest contained in each item:

- Routing
- Shipment Notification
- Emergency Response
- Physical Protection
- Driver - Operator Training
- Inspection and Enforcement
- Insurance - Liability
- Cask Design and Testing
- Overweight Trucks
- Transportation of Defense Waste
- Incident Notification
- Shipment Restrictions
- Infrastructure Improvements
- Permits
- Transportation Operations
- Regulations
- Fees
- Materials Licensing

Summary – A concise explanation of each statute or regulation's essential provisions and requirements.

Access to the transportation regulations data base through LEGISNET is available through State legislatures. For more information on access, contact Jim Reed at NCSL (303) 830-2200.

DISCLAIMER