41. LASL DISPOSAL SITE STUDIES

Objective

The basic objectives of this task are to understand the mechanisms controlling radionuclide transport from a shallow-land burial facility in an arid environment, and to use this information to validate transport models for use in estimating the impact of buried radionuclides. The models involved are BIOTRAN/ARM/SERATRA covering biological uptake and surface erosion and runoff. An unsaturated flow model will be added in the near future.

1034 General

In the past, this task was directed at site specific goals with some potential generic applications. This year, the site specific work will be finished and closed out, and the remaining work will be redirected to only generic applications. The results of this project will be useful in assessing the results of the other LASL low-level waste tasks on barriers and site closure, as well as similiar work at other labs.

Work efforts can be divided into three sub-tasks:

1. Geological. Some effort will be expended on completing the description and mapping of the geology at LASL. Since this is site specific, it is not expected that this work will continue past mid-year.

2. Hydrology. A small effort will be spent on completing the descriptive report on the hydrology at LASL. Emphasis will then be shifted to radionuclide transport in unsaturated environments. The movement of moisture and related radionuclide transport in arid environments is dominated by strong interactions of the liquid and vapor phases of the soil water. This subtask will test our knowledge of those interactions and apply that knowledge to the control and monitoring of radionuclides in arid locations.

Field and laboratory experiments will be conducted to determine the extent to which moisture movement relates to transport of soluble materials. Experimental results will be interpreted through the use of a partially saturated flow model, but emphasis will be placed upon the development of simplified methods for measurement and description of moisture flow.

Tritrium, a dominant radionuclide in most low-level waste, is particularly mobile in hydrologic and biologic systems, and as tritiated water vapor provides an opportunity to identify mechanisms governing gaseous transport. Field and lab experiments will be conducted to quantify these mechanisms and to identify possible techniques for controlling tritium releases from arid burial sites.

3. Evaluation Methodology. This subtask is to develop a methodology to evaluate

the impact of buried LLW based upon an analysis of future land use, release/containment conditions, and environmental transport. For the past two years, LASL has been working with PNL to combine the biological, surface runoff and stream transport models. A substantial amount of funding for this effort was expected to be provided by the TRU program, but the FY81 budget was zeroed. This funding loss will mean that the results will take longer to achieve than what had been expected.

The evaluation methodology will be based upon: a technique to determine most likely land use in the future: radionuclide release mechanisms and rates: and computer simulation of pathways in an arid environment (biological, wind, and water erosion, runoff, stream transport, and unsaturated transport). Test runs of the models made to date are very encouraging.

MILESTONES

1. Issue LASL Hydrological Report, 11/80
2. Issue LASL Geological Report, 2/81
3. Descriptive Report on Unsaturated Transport, 9/81
4. Incorporate Selected Fission Product into BIOTRAN, 9/81
5. Validate Airshed Meteorology Model, 8/81
6. Complete Testing of Unsaturated Flow Model, 9/81
7. Develop Basic Land Use Evaluation System, 4/81
8. Compare BIOTRAN Climatology Predictions With Tree Ring Data, 5/81

Current Year Work Plan
Task AL 3.5.4 AR

A. <u>What have we committed ourselves to do?</u>

<u>Basic task</u> is to understand the mechanisms controlling radionuclide transport from a shallow-land burial facility in an arid environment
Read the LLW "Goals" paper (handout?)
<u>Sub-tasks</u>:

1.) Complete the description and mapping of the geology at LASL.

2.) Complete descriptive report on LASL hydrology. Develop project on unsaturated transport with emphasis on methods of measurement and description of moisture flow, tritiated water vapor transport and possible techniques for controlling tritium releases.

3.) Develop a methodology to evaluate the impact of buried LLW based on an analysis of future land use, release/containment conditions, and environmental transport.

Low-Level Waste (AR-05-15-15, AP-05-25-15)
ID - Lead Office

General

The primary goal of this program is to assure that States and DOE sites have the necessary tools, including technology, to deal with commercial and defense wastes, respectively. This program should place substantial emphasis on identifying and resolving the institutional issues in establishing an adequate and accepted low-level waste management system in the U.S. This shift in focus is needed to implement the instructions in the President's February 12, 1980 statement on radioactive waste management. That statement directed DOE to work with States, other Federal agencies, industry and the public to develop a rational plan to establish regional disposal sites for commercial low-level waste and to support the actions being taken by the States to address this problem. The program should give priority to completing a strategy for managing this nation's low-level wastes and to satisfying the near-term technical needs for implementing the strategy. Guidance on applications of existing technology and procedures for implementing new and improved technologies for low-level waste management should be developed for use by both the DOE and the commercial sector.

Programmatic

Development of technology to improve shallow land burial performance and stabilize disposal sites should continue and be directed toward minimizing the need for long-term maintenance and surveillance. Field tests of improved shallow land burial technology should continue toward a planned completion in FY 1982. Draft criteria for site selection, waste form, and site closure should be issued for review by mid-FY 1981 and finalized by mid-FY 1982. By mid-FY 1984, the criteria and the results of the shallow land burial technology development should be incorporated into a handbook of specifications and guidelines to support establishing a new shallow land burial site in a humid environment. A draft manual on site stabilization techniques should be issued in FY 1981. The final, to also include new technologies, should be available by early FY 1985. Guidelines to support planning, construction, and operation of interim storage facilities should be completed in FY 1981. Demonstrations of intermediate-depth burial in humid and arid environments should begin in FY 1981 and produce the information to support guidelines and procedures for implementing this technology by mid-FY 1986. Work on additional alternative disposal methods should be halted. An assessment of techniques for reducing waste generation should be issued by late FY 1981 to the commercial industry and other DOE contractors. Advanced waste treatment technology for further testing should be selected by late FY 1981 and lead to completed demonstrations by mid-FY 1985. Program support should provide for generic research at development facilities. However, capital equipment, construction, and design to adapt a technology to a particular site where the facility is expected to become operational, upon successful demonstration, should be provided under the interim operations at that site. LLW Technology/ ORNL funding includes $300K for additional environment-related development efforts.

B. What are the milestones we have committed ourselves to for each subtask?

1. Issue LASL Hydrological Report 11/80.

2. Issue LASL Geological Report 2/81

3. Report on unsat. transport 9/81

4. Land use evaluation system report 4/81

5. Environmental transport models 8-9/81

C. Progress & problems to date

Topics for investigation & possible inclusion in modeling effort -

1. denudation and stream erosion

including:

- Erosion rates & their distribution (slope retreat, & including fissuring, block failure, etc.)
- Effects of climate and topography
- Removal of impermeable layers (manmade & natural)
- Reduction / increase in transport pathlengths
- Effects of man's use of site.
- Interactions among these: eg. wetter climate → increase streamflow → faster slope retreat

Tasks include ??

Incorporation of Willis' climatology studies through interaction with BIOTRAN tree growth strategies..?

Further studies of climatology based on pollen data, dry lake bed studies etc, etc.

Effects of man's activities on soil properties (esp. erosion) climate, etc. etc. The man-land use perspective
See Manners & Mikesell
Perspectives on Environment.

An archeologist's perspective
- land use - land values
- natural hazards....
see above.