

LICENSE APPLICATION APPROACH FOR THE CALIFORNIA LLRW DISPOSAL FACILITY

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ABSTRACT

US Ecology, Inc. is the State of California's license designee to site, develop and operate a low-level radioactive waste (LLRW) disposal facility to serve member states of the Southwestern Compact. US Ecology identified a proposed site in the Ward Valley of southeastern California in March 1988. Following proposed site selection, US Ecology undertook studies required to prepare a license application. US Ecology's license application for this desert site was deemed complete for detailed regulatory review by the California Department of Health Services (DHS) in December 1989. By mutual agreement, disposal of mixed waste is not proposed pending the State of California's decision on appropriate management of this small LLRW subset.

INTRODUCTION

Licensing matters were a primary consideration throughout the site screening, site selection, characterization, facility planning and design phases of this project. Extensive pre-licensing consultation between US Ecology and the State of California and its contractors helped focus licensing-related studies and promoted early resolution of various technical questions. The license application was submitted in two phases to facilitate timely preparation as well as completeness checks by the DHS. This flexibility promoted a coordinated effort to achieve compliance with the January 1, 1990 federal LLRW Policy Amendments Act milestone for submittal of a complete license application.

Based on the technical studies undertaken, US Ecology believes the Ward Valley site meets the minimum technical requirements for licensing, and that licensing analyses will demonstrate that the performance objectives for protection of public health and safety will be met. The full range of analyses required under the 10 CFR Part 61 regulations are presented in the license application. Principal review matters relating to licensing include the following:

1. Characterization of the vadose zone;
2. Compatibility of facility design with site characteristics;
3. Compatibility of facility operations with site characteristics and facility design; and
4. Evaluation of disposal unit performance.

During license application review, US Ecology anticipates responding to written DHS inquiries. Confirmatory data submittals are also planned to provide information from the on-going environmental monitoring program and ambient condition vadose zone monitoring. The project schedule anticipates license approval in late 1990, followed by facility construction, as-built inspection, and initial receipt of waste in late-1991, well in advance of the federal Policy Act milestone.

This paper summarizes the program undertaken by US Ecology in consultation with the DHS to select and charac-

terize the Ward Valley site, and to prepare the license application and environmental assessment report.

STATEWIDE SCREENING

California Senate Bill 342 directed the DHS to conduct a statewide screening study for potentially suitable siting areas. DHS completed this study in March 1984, applying the 10 CFR Part 61 site selection criteria and additional factors relevant to California. Chief among these additional criteria was a preference to areas with less than 10 inches of average annual rainfall.

US Ecology expanded on the State's work in preparing its application to serve as license designee. The company proposed siting in topographically closed desert basins on the premise that such sites can generally be characterized and modeled with a high degree of confidence. A model of a technically ideal desert site was developed for identifying and comparing candidate sites. An ideal site would be located on a large, tectonically stable bajada surface in a topographically closed basin in a portion of the desert that is remote from areas of concentrated or significantly growing population. The site would be situated well above the flood hazard zone of the dry lake and away from large washes, and should have a minimum depth of 100 feet to groundwater. The site would be free of hazards from fault rupture, landslide, sand dunes, subsidence and volcanism. The site would have no known economic mineral or energy resource potential and no nearby activities that could severely impair facility performance. The site would not be complex and would be capable of being characterized and modeled. Fourteen desert basins in the southeastern desert were identified as preliminary study areas. After securing license designee status in late 1985, US Ecology reviewed the 14 study areas and added four additional areas. These 18 basins in Inyo, Riverside and San Bernardino Counties provided the focus for detailed regional screening studies.

REGIONAL SCREENING

Regional screening studies of the 18 study basins during 1986 were integrated with an extensive public involvement

program. Citizen input was obtained through public meetings, speaking engagements with service organizations in the desert communities, consultations with Native America groups, and recommendations from a twelve member independent Citizens Advisory Committee (CAC) supported by the League of Women Voters Southern California Regional Task Force.

Regional screening was structured around six CAC meetings and three rounds of public meetings and workshops. Prior to each round of public meetings, CAC members commented on US Ecology's plans. After each round of meetings, members discussed the public's input and worked with US Ecology to translate that input into specific siting guidance. The public meetings progressed from providing basic information about the siting process and LLRW management to discussing the technical and operational details of a facility.

During the third round of ten public workshops, resource persons were available to discuss displays on groundwater protection, transportation, radiation properties and safety practices, and sources of LLRW. A drum containing noncontaminated waste samples was displayed along with a videotape of US Ecology's Beatty, Nevada disposal site operation. DHS personnel were on hand to discuss their independent regulatory role. Raised relief maps depicting the 16 candidate site areas were displayed. Citizens were asked to identify which siting areas they considered the most and least favorable on questionnaires, and to explain their reasoning.

After reviewing the public workshops' results, CAC members were asked to individually rate the 16 siting areas. Resource materials included computerized maps showing the application of technical exclusion and high avoidance criteria, detailed descriptions of each site area, public workshops results, and all resolutions and citizen correspondence sent to the CAC, the League, US Ecology or DHS regarding site selection. Each CAC member was asked to indicate if a site should be considered in the top five, bottom five, or middle six category and to state the reasons for their classification. The group then convened to discuss results and, in some cases, to revise individual ratings.

SELECTION OF THREE CANDIDATE SITES

US Ecology designated three candidate sites for detailed field work in February 1987. The decision was based on field reconnaissance by US Ecology and its support contractors, CAC recommendations, agency input, public meeting comments, citizen letters, resolutions received from local officials, and consultations with Native American tribal groups. Two of the siting areas, the Ward and Silurian Valleys, were considered most favorable by CAC members. The third site, in Panamint Valley, was rated most favorably by citizens completing siting questionnaires at the round

three workshops. Additional field studies and analysis of land ownership status assisted US Ecology in defining a four square mile candidate in each valley.

CANDIDATE SITES EVALUATION

Evaluation of the three candidate sites required compilation of technical, environmental and socio-economic information. Technical data collection was guided by a Site Characterization Plan which was reviewed and later revised to reflect comments received from affected agencies and interested citizens and organizations.

Initially, each candidate site received equal attention. Mineral resource assessments, well canvasses, electrical resistivity soundings, gravity and magnetics surveys, seismic refraction/reflection work and surface water flow studies were initially conducted. These studies were intended to identify fatal flaws from a licensing standpoint. Exploratory borings, groundwater table observation wells and meteorological stations were also planned for each site. However, after seismic profiles for the Panamint Valley site indicated the potential presence of earthquake faults underlying the site all field work was deferred.

At the same time field studies were underway, US Ecology worked with the League of Women Voters to establish a Local Advisory Committee (LAC) for each site. The purpose of the LACs was to serve as objective fact-finding bodies, to share local views with the company, and to help make information available in the community. The LACs, formed through independent local nominations, invited local citizens to attend well-publicized meetings at which time was set aside for public question and comments.

Each LAC focused on identifying local concerns about the project, describing technical studies underway at the sites and discussing the Committee's role. To reduce potential bias in favor of, or opposing the closest site, members were asked to review information only on the site in their vicinity, rather than all three sites.

Site descriptions included available data from the geotechnical, meteorological and biological field studies as well as information on demographics and land use; cultural resources, medical and emergency response service availability; road conditions and transportation networks, and community economic profiles. The descriptions were then discussed and refined at LAC meetings. Site comparison information was also obtained from state, federal and local agencies attending an interagency meeting on the project sponsored by the Department of Health Services and the Governor's Office of Planning and Research.

During this siting phase, US Ecology continued direct public outreach efforts and opened locally-staffed public information offices in the local communities. Arrangement of numerous citizen bus tours to the Beatty, Nevada LLRW

disposal facility was a major focus of activity.

PROPOSED SITE SELECTION

Comprehensive descriptions of each candidate site were mailed to CAC members in September 1987. They were asked to compare and contrast the three sites and indicate which site should be proposed for development and which sites, if any, should be dropped from further consideration. At a meeting convened to discuss the results, the CAC unanimously recommended that the Panamint Valley site be removed from consideration. The group split its vote on the question of which of the two remaining sites was preferred. Questions regarding the nature and extent of potential desert tortoise impacts at the Ward Valley site were at the heart of the CAC's lack of consensus.

Both the Ward and Silurian Valley sites satisfied US Ecology's model of a technically ideal desert site that additionally as generally supported by the local community. Both sites were considered licensable, both offer good transportation access and both are remote from nearby residents. Neither site overlies potable groundwater and neither contains significant cultural resources. Both sites are managed by the U.S. Bureau of Land Management (BLM), and are eligible to be transferred to state ownership. No known mineral resources are present at either site and neither site is subject to mining claims. From the standpoint of technical factors related to licensing, however, Ward Valley is clearly the better location. Contributing factors include superior surface water and erosion control conditions, greater depth to groundwater and bedrock, greater distance to active and potentially active earthquake faults, and superior infiltration resistance characteristics. From a biological standpoint, development of the Ward Valley site involves a greater environmental impact due to its location in desert tortoise habitat and in an area of greater overall biological diversity.

US Ecology requested guidance from the California DHS before designating a proposed site. DHS advised US Ecology that technical factors relating to licensing should receive the greatest consideration. Impacts to the desert tortoise were considered to be mitigable. The Ward Valley site was subsequently designated as the proposed site in March 1988.

SITE CHARACTERIZATION AND LICENSE APPLICATION DEVELOPMENT

Extensive pre-licensing consultation between US Ecology and the DHS and its support contractors helped focus site characterization and license application development activities, and promoted early identification and resolution of technical and regulatory questions. Prior to detailed site characterization, US Ecology issued a general Site Characterization Plan for review and comment by the DHS and

over 80 state, local and federal agencies and interested groups. This dynamic document was modified based on comments received on the Plan, and was later refined in consultation with the DHS and its contractors based on detailed site characterization studies underway at the Ward Valley site. The DHS retained Roy F. Weston and EnviroSphere as consultants to advise the DHS in matters related to the characterization, design, and licensing of the site. During the characterization and design phases, work meetings have been held between US Ecology, DHS, Weston and EnviroSphere to consult on appropriate work scopes for data gathering and analysis tasks. The workscopes and budgets for the geotechnical field work were reviewed in detail to ensure that US Ecology and the DHS concurred upon the approach for tailoring the generic NUREG guidance to the level of detail and appropriateness judged necessary to demonstrate the performance of this arid site. Site characterization and preoperational environmental monitoring field data, including comprehensive meteorological data reports, was submitted to the DHS for review and comment to ensure consistency with the dynamic plan and their interpretation of the guidance.

The facility design criteria and the resultant plot layout were reviewed with the DHS to ensure implementation of the enhanced technology guidance that was provided by the state to address public concerns and provide an increased level of confidence that both the public and the environment will be protected. This guidance consisted of four elements related to the facility design features, three of which US Ecology had identified in the 1984 application to become the license designee.

DHS also reviewed and commented upon US Ecology's Quality Assurance Program Plan and the related contractor Quality Assurance Plans. Both the administrative and field procedures used to implement these plans were submitted to DHS for review by their quality assurance and technical consultants. Field work in progress was audited by US Ecology and DHS to verify compliance with the procedures. Audits of contractor offices were performed to ensure work was properly planned, implemented and documented to meet the quality guidance of NUREG-1293.

As licensing work proceeded, DHS and its support contractors reviewed a series of US Ecology working documents to help ensure that data and analyses required for licensing would be developed in a timely and technically acceptable manner. These included:

1. Environmental Monitoring Plan - Describes the rationale and the selection of parameters, media and frequency for the preoperational environmental monitoring program. Established requirements for

data review and evaluation, QA/QC, and documentation.

2. Vadose Zone Study Plan - Defined the field work planned for the year-long ambient condition monitoring program and for the ponded infiltration test. Described the technical basis for the testing approach and the instrumentation and installation methods to be used.
3. Pathways Analysis Working Paper - Described the radioactivity release scenarios and the level of analysis detail, waste characterization and source term development, transport mechanisms and the computer codes utilized. Model documentation and validation problems for models used in transport mechanism and dose assessment analyses were also submitted.

US Ecology's license application was submitted to DHS in two phases. This flexible approach allowed DHS to begin preliminary completeness reviews of certain sections while US Ecology was finalizing others. The DHS completeness check identified several areas requiring additional information. Following US Ecology's response and subsequent DHS review, the license application was deemed complete in December 1990.

MAJOR LICENSING ISSUES

Although all information included in the license application is important to the proper design, operation, and closure of a LLRW disposal facility, much of the information describes items that are not directly related to the proposed facility and would be similar in scope and nature for any LLRW disposal facility. For example, methods of waste receipt and inspection are critical to the control of the types of materials disposed at the facility and thus to the long-term performance of the site. Items such as these, although important to the performance of the site, are not generally site-specific. There are also items (such as population growth) that, although they may be site specific, are believed to represent no critical issue in the review of the application.

There are however some issues which, for one reason or another, require greater discussion and analysis. These technical matters will require a greater level of review due to the judgment required and the approaches chosen by the applicant to develop the license application in a timely, cost-effective manner. These matters are discussed below in greater detail.

As stated by the NRC in NUREG-0945, the groundwater pathway, generally is the pathway of concern for land disposal facility performance assessment. This disposal facility relies primarily on the waste form, the arid climate and the thick unsaturated zone for protection of the groundwater. Therefore, the major licensing issues are related to

characterization and modeling of the unsaturated zone and elements of facility design and operations that complement the natural conditions.

Characterization of the Unsaturated Zone

Since the unsaturated zone is the site feature most important to the long-term isolation of the waste constituents, the characterization of this zone and understanding of the hydrologic behavior in the undisturbed state and after construction and closure of the disposal unit are critical to the assessment of the long-term performance of the disposal unit. Site characterization studies have focused upon obtaining realistic measures of the saturated and unsaturated properties of the unsaturated zone. The data obtained include laboratory measures of geologic, chemical and hydraulic properties of the unsaturated sediments. Small-scale field tests have been conducted to measure hydraulic properties by independent methods. A large-scale infiltration test has been conducted to provide comprehensive measurements of the response of the unsaturated zone to a controlled stress. Environmental radionuclide data have been collected to provide estimates of moisture travel times.

The unsaturated zone data have been collected with full consideration given to the methods by which the data are interpreted and used. Concurrent with the collection of the data, a computer model was developed and calibrated to simulate the behavior of the unsaturated zone. The model was constructed to conform to the observed physical characteristics of the unsaturated zone, and parameters were adjusted within reasonable ranges to duplicate the data obtained through the infiltration test. The objective was to sufficiently characterize the unsaturated zone to provide conservative but reasonable input to the performance assessment models.

Compatibility of Facility Design with Site Characteristics

The long-term integrity of the facility depends to a large degree on the compatibility of the design of the facility with the characteristics of the site. Facility features should complement the natural features of the site. Features engineered to enhance waste containment should both take advantage of the favorable characteristics of the site and mitigate less-favorable site characteristics. The facility design is compatible with the natural characteristics of the site. Examples of the compatibility of the design are:

1. Disposal unit covers are designed to exploit the naturally low infiltration at the site.
2. Wastes and backfill are placed in such a manner as to maximize the stability of the mass.
3. Surface drainage is designed to divert water around the

disposal unit with minimum changes in the natural flow patterns.

4. All waste classes are disposed of deeper than a very conservative estimate of potential scour depths at the site.
5. Site layout allows incremental trench construction such that only minor temporary diversion features are needed to protect the unsaturated zone from excessive wetting during operations.
6. Excavation of Class A trenches are deeper than the BC30 trench to ensure that any migration of waste constituents from the Class A trenches would not flow to the BC30 trench.

Compatibility of Facility Operations with Site Design and Characteristics

The long-term performance of the disposal facility also depends in large measure upon the facility's operational techniques. Facility operation must be compatible with site design and the physical characteristics of the site. The arid environment at the Ward Valley site provides some flexibility in site operation that might not be available in more humid environments. However, operations must always be directed toward the ultimate goals of site stability and long-term isolation of the wastes. At the Ward Valley facility, these goals are met by protecting the unsaturated zone from excessive wetting during operations and by placing wastes and backfill in a stable mass in the trenches.

Characterization in Disposal Unit Performance

Characterization of the long-term performance of the disposal unit is necessary to demonstrate that the facility meets the performance objectives. Facility performance is evaluated through a series of related analyses of facility stability, radionuclide mobilization and transport, radionuclide transfer to human or environmental receptors and dose contribution. These evaluations are conducted in the following parts.

1. Potential pathways along which waste constituents might migrate are identified. Critical exposure locations and receptors along these pathways are identified or selected to represent bounding cases.
2. Normal infiltration rates through the disposal unit are evaluated. The evaluations are based upon a review of literature of basins similar to Ward Valley and upon site-specific calculations.
3. Abnormal infiltration rates through deteriorated disposal unit covers are estimated using unsaturated zone models. Rates are estimated for a range of improbable,

but realistic, cover failures. Critical infiltration rates are selected for use in the transport analyses.

4. Radionuclide releases for normal and abnormal conditions are calculated using the infiltration rates and models of waste leaching. Calculations of airborne releases from the waste to support an evaluation of transport along the air pathway are made.
5. Unsaturated and saturated zone fluid transport models are used to route the mobilized waste constituents along fluid pathways to selected evaluation points.
6. Radiological impacts on real and hypothetical maximally-exposed individuals are calculated.

These cases were selected to represent the bounding scenarios for facility performance, and the analyses demonstrate the required assurance that the facility will meet the performance objectives.

ENVIRONMENTAL ASSESSMENT

US Ecology completed its Proponent's Environmental Assessment (PEA) in August 1989. The PEA was distributed for review to interested federal, state and local agencies. The PEA and the agency comments on it provide a basis for development of a joint Environmental Impact Report/Statement (EIR/EIS) by DHS and the BLM. (An EIS is being prepared to support BLM's land transfer decision.)

Potential project impacts on the desert tortoise, a recently listed state threatened and federal endangered species, were considered sufficiently important such that the DHS established an Ad Hoc Desert Tortoise Work Group to review US Ecology's field studies and to recommend specific mitigation measures.

A second group was established by US Ecology to work with Native American groups expressing concern about the project. Even though no significant archaeological resources exist on the site, discussions, US Ecology proposed a study to identify trails used by Native Americans to traverse Ward Valley and surrounding areas. Several additional impact categories will require specific measures to minimize impact on the environment. Examples include facility design and operational measures to control dust, building design features to reduce glare and minimize visual obtrusiveness, and training and equipment provision for local government emergency response personnel.

SUMMARY

US Ecology, Inc., the State of California's license designee, recently became the first entity to submit a complete license application for a new LLRW disposal facility under the 10 CFR Part 61 regulatory framework. Site selection was guided by the requirements of Part 61, consultation with the DHS, and an open process that provided for extensive

public and agency input prior to key decisions. Site characterization and license application development proceeded with the benefit of additional input from interested agencies, and timely pre-licensing consultations with the licensing agency (DHS) to identify and resolve key technical and regulatory questions. It is anticipated that a license will be

issued followed by initiation of facility construction in early 1991. Waste acceptance is projected prior to the end of that year, more than a year in advance of the federal Policy Act milestone.