

LESSONS LEARNED DURING REVIEW OF THE FIRST ABOVE GRADE CONCRETE FACILITY FOR LLRW DISPOSAL

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ABSTRACT

A license application has been filed with the State of Nebraska for construction and operation of the first above grade concrete facility for disposal of low-level radioactive waste in the United States. The state, through the Department of Environmental Control, has had an active low-level radioactive waste (LLRW) program for more than three years. This paper will describe and relate Nebraska's experience with five key elements of a program to review an above grade LLRW disposal facility application. These elements include selecting a consultant team, developing task orders, developing a quality assurance program, developing a licensing plan and review of the actual license application.

INTRODUCTION

In December 1987, Nebraska was selected as the host state for construction of a low-level radioactive waste (LLRW) disposal facility for the Central Interstate Compact (CIC). The CIC, formed in 1983, consists of Louisiana, Arkansas, Oklahoma, Kansas, and Nebraska. The selection was based on a number of factors including volume of LLRW generated, location, transportation access, geology, and others.

US Ecology (USE) was selected by the CIC to develop the CIC LLRW facility. Major responsibilities of USE are to site, design, license, construct, operate, and close the proposed facility. Functioning as USE's principal subcontractor is Bechtel National, Inc. (BNI). The proposed facility would be designed to accommodate 5,000,000 cubic feet of LLRW and would operate for 30 years or until receipt of 5,000,000 cubic feet of waste, whichever comes first.

Statutes provide that the Nebraska Department of Environmental Control (NDEC) act as the lead licensing agency for the proposed facility. The Nebraska Department of Health (NDOH) is the Nuclear Regulatory Commission (NRC) Agreement State agency of record and has radioactive materials license authority. The NDEC and NDOH have implementing rules codified in Nebraska Titles 194 and 180, respectively. For this project, only one license will be issued should the decision be made to license. The license will be a State of Nebraska license and not be specifically issued by NDEC or NDOH. NDEC and NDOH cooperated throughout the project based upon an internal Memorandum of Understanding (MOU) between the agencies outlining the responsibilities and authorities of each.

The University of Nebraska, Lincoln (UN-L) through its Conservation and Survey Division and Geology Department, has also provided considerable project technical assistance to NDEC and NDOH. Other state agencies have been involved in the process as required including civil defense, highways, game and parks and others. The other

major project participant is a consultant team. The consultant team role is explained in more depth later in this paper.

SCHEDULE

The CIC embarked on a schedule designed to meet the milestones contained in the 1985 amendments to the Low Level Radioactive Waste Policy Act. Nebraska's designation as host state in December 1987 was followed by screening to select three candidate sites which was completed in January 1989. Sites located in Nemaha, Nuckolls and Boyd Counties were selected for further detailed site characterization. In December 1989, USE selected the Boyd County site as the preferred site for the LLRW disposal facility. Additional detailed site characterization was conducted in 1990. The Safety Analysis Report (SAR) and Environmental Report (ER), which together constitute the license application, was submitted in late July 1990. Currently, the NDEC/NDOH are in the process of reviewing the license application. At this point, a definitive date on which the decision to issue or deny the license will be made cannot be determined. However, the process is proceeding in a planned and systematic manner. The remainder of this paper will focus on observations and lessons learned during the review process.

LESSONS LEARNED

At this writing, the State of Nebraska has had an active low-level radioactive waste program for more than three (3) years. The LLRW Program Division is part of the Department of Environmental Control. After three years of operational experience several significant observations can be made. The remainder of this paper will focus on five of these observations including:

- Selection of a consultant team
- Development of task orders
- Development of a Quality Assurance Program
- Development of a Licensing Plan

- License application review of above grade concrete LLRW disposal facility

Consultant Selection

When the LLRW Program Division was established within NDEC, five (5) permanent staff positions were authorized including a program manager, a quality assurance/licensing specialist, an environmental engineer, a media specialist and a secretary. Thus, early in the process, NDEC made the decision to retain a consultant team to assist with the regulatory and license review processes. The consultant team would function as an extension of the permanent NDEC staff. This allowed the program to proceed without a significant increase in permanent state staff. An additional consideration favoring the decision to retain a consultant team was that additional specialists could be brought to bear on very specific project issues and the costs would be less than having the same expertise on agency staff on a permanent basis.

The consultant selection process began with development of a Request For Proposal (RFP) by NDEC. The RFP was widely advertised. Proposals were received from nine respondents, most consisting of consultant teams bringing a wide cross-section of expertise to the project. The initial nine submittals were reviewed in depth using NDEC established criteria. Four teams were shortlisted and invited to appear before an interview panel to further present their capabilities. The agency interview panel consisted of the LLRW Program Division Manager, a NDOH representative, an outside (non-agency) representative, the NDEC Director, and the NDEC Hazardous Waste Section Chief. Following the interviews, the consultant teams were ranked and contract negotiations commenced with the number one ranked team. The selection was made based on qualifications. Only after selection, were costs considered. The selected team consisted of seven firms with the lead firm contracting with NDEC. All other firms were subcontracted to the lead firm. This arrangement allowed the NDEC to go through the consultant selection process only once rather than many times for individual project issues. Subsequent to the initial consultant selection, several additional specialized consultants have been retained for specific issues. These have been selected through the joint efforts of state staff and the consultant team with the actual contracting accomplished through the lead consultant.

The selection of a consultant team approximately one year prior to submittal of the license application by the developer has proven to be extremely successful.

Major assistance has been furnished by the consultant team in the following areas:

- Overall program management
- Planning, programming and budgeting

- Scheduling
- Quality assurance activities
- License plan development
- Development of State facility design criteria
- Review of license application consisting of Safety Analysis Report (SAR) and Environmental Report (ER)
- Site characterization oversight

Future assistance areas may include:

- Preparation of Safety Evaluation Report (SER)
- Preparation of Environmental Impact Analysis (EIA)
- Development of license conditions
- Construction phase oversight

Task Orders

The complexity and duration of the project required that a Management Information System (MIS) be established in order to define and control project activities. This was implemented in the Nebraska program through development of a task order system to guide consultant assistance activities for the agency. After considerable study, major task orders were established for twelve functional areas as follows:

- Consultant team program management
- Project office
- Quality assurance
- Site characterization
- Safety Analysis Report (SAR)/Safety Evaluation Report (SER)
- Environmental Report (ER)/Environmental Impact Analysis (EIA)
- Mixed waste
- Licensing
- State of Nebraska facility
- Financial planning and management
- Facility design review
- Construction administration oversight

Actual consultant activities are then conducted through the development and implementation of individual sub-tasks under the major task orders. This system has allowed the identification of discrete sub-tasks that can be properly scoped. Once the scope of work is established, the cost and schedule is negotiated for the sub-task. The sub-tasks are then signed by the consultant team and the agency with the

executed sub-task constituting in effect, a contract for the work and authorizing the consultant to proceed.

Consultant team project management activities are implemented under the Consultant Team Program Management task order. Sub-tasks implemented to date include:

- General program management
- Development of program management plan
- Sub-task preparation and negotiation
- Site inspections
- Developer review meetings
- Scheduling
- UN-L and NDOH liaison

The Project Office task order consists of establishment of an office in Lincoln for the project. This office houses the NDEC and NDOH full-time project staff, consultant team office space and conference space.

Project quality assurance activities are accomplished under the quality assurance task order. Eight sub-tasks have been implemented to date. The quality assurance program is discussed in more depth later in this paper.

Site characterization sub-tasks were implemented generally in parallel to site characterization activities conducted by the developer. These sub-tasks were conducted only on an oversight and observational basis since the developer has actual site characterization responsibility. To date activities have included:

- Drilling observation
- Core sample transfer and storage observation
- Field split sampling
- Geotechnical laboratory services
- Water chemistry laboratory services
- Sampling plan development

The SAR/SER and ER/EIA task orders consist principally of preparing for review of the license application (SAR/ER), conducting the review and preparing the State of Nebraska parallel documents consisting of a Safety Evaluation Report (SER) and Environmental Impact Analysis (EIA). Significant sub-tasks to date include:

- Performance assessment workshop
- SAR completeness review
- ER completeness review
- SAR technical review
- ER technical review
- ER distribution and scoping

The mixed waste task order has not been initiated to date due to the nationwide uncertainty regarding the disposal of mixed waste. At this time, the developer has not submitted an application for disposal of mixed waste.

Project licensing activities are accomplished under the licensing task order. Five sub-tasks have been implemented to-date. The licensing program is discussed in more depth later in this paper.

The State of Nebraska Facility task order consists of two sub-tasks focused on planning and programming for the State of Nebraska Facility that will be constructed on the site if a license is granted. Design criteria for the state facility has also been prepared.

Financial planning and management services consist of interfacing the LLRW Program Division's MIS with the overall State of Nebraska financial system. Services have also consisted of managing the State of Nebraska expenditures for the project and preparing invoices for submittal to the developer. Under Nebraska law, the applicant is required to pay all direct and indirect costs of the licensing and regulatory program.

Facility design review sub-tasks have consisted of review of design criteria and design basis, review of external reports and many meetings between the developer design team and the State of Nebraska consultant design review team.

The construction administration oversight task order has not been initiated yet. Should the license be issued, this task order will be used to provide the State of Nebraska oversight during the actual construction and start-up phases.

The task order system has resulted in development of a significant management information system for control of work scopes, costs and scheduling. Twelve major task orders have been defined. Sixty-two (62) sub-tasks have been initiated. Major assistance has been provided for the budgeting process for the State of Nebraska and as a result, the Central Interstate Compact.

Quality Assurance

As with any project involving radioactive waste, quality assurance (QA) is a major issue. Immediately after consultant selection, development of a quality assurance program began. The selected consultant team had qualified QA auditors in accordance with NQA-1 in place. Quality assurance sub-tasks have included:

- Quality Assurance Plan outline
- Quality Assurance Plan development
- Quality assurance auditor training
- Quality Assurance Plan indoctrination workshop

- Developer compliance inspection audit
- Developer subcontractor inspection audit
- Consultant team QA audits

The State of Nebraska Quality Assurance Plan and its implementing procedures establishes specific requirements and responsibilities and provides for their implementation. Key sections of the Quality Assurance Plan include:

- QA organization
- QA program
- Design controls
- Document control
- Test control
- Control of measuring and test equipment
- Handling, storage and shipping
- Corrective action QA records
- Audits

Numerous implementing procedures are also provided in the plan.

In the development and implementation of the State of Nebraska QA plan, considerable use was made of resources available from the Nuclear Regulatory Commission (NRC), the Department of Energy (DOE) and their contractors. The NRC and EG&G-Idaho were extremely cooperative and helpful in developing the Nebraska program and training both state staff and consultant team members.

To date, several QA audits have been conducted. The initial audit was conducted on the developer. A follow-up has also been conducted on the developer. An audit has been conducted on the principal subcontractor to the developer. Audits have also been conducted on the lead consultant and several of the consultant team subcontractors. QA assistance has been provided internally to the State of Nebraska, specifically to NDEC and NDOH. Surveillance QA audits have been routinely conducted whenever the developer conducts field sampling activities at the proposed site. The QA program is ongoing with audits scheduled for all project participants. Additional QA sections and implementing procedures are being developed as required to meet the needs of the project.

Licensing Plan

The State of Nebraska has statutes dealing with radioactive waste. Similarly, rules are contained in Titles 180 and 194 of the State of Nebraska Code. With this basis, it was determined that some additional framework was necessary to proceed through the licensing process. This resulted in development of a Licensing Program Plan and Licensing Procedures. To date licensing plan sub-tasks have included:

- License Plan index development
- License Plan Phase I development
- License Plan Phase II development
- License Program Plan indoctrination workshop
- Review manager indoctrination workshop

The State of Nebraska License Program Plan defines specific requirements and responsibilities, and provides for their implementation. Key sections of the Licensing Program Plan include:

- Licensing organization
- License application
- Review of SAR and preparation of SER
- Review of ER and preparation of EIA
- Preparation and issuance of License
- Decision concerning license issuance or denial

Implementing licensing procedure include:

- Format, content and submittal of license application
- Review for completeness
- Internal distribution of SAR and ER
- Selection of personnel
- Technical review of SAR
- Application review documentation
- Agency consultation and public comment process
- Technical review of ER
- Preparation and distribution of draft EIA
- Technical review comment tracking and resolution

The License Program Plan and Licensing Procedures are contained in manual format with controlled copies distributed as appropriate. As with development of the quality assurance program, considerable use was made of resources available from the NRC and DOE. An indoctrination workshop for staff and consultant team members was conducted with the assistance of NRC and EG&G-Idaho staff.

The License Program Plan has provided a consistent framework for all personnel involved with the review process to follow. A significant aspect of the Licensing Program Plan was the formulation of the review manager and technical reviewer concept for conducting license application review activities. The license application was subdivided into eight functional areas and a single review manager assigned to each area. The functional areas were developed using the Standard Review Plan (SRP) sections from NUREG 1200 and the Environmental Standard Review

Plan (ESRP) section out of NUREG 1300. These major areas are:

- General information
- Site characterization
- Design and construction
- Performance assessment
- Facility operation
- Quality assurance
- Environmental issues
- Financial assurance

Many technical reviewers, representing the various engineering, scientific and other disciplines appropriate to the major review area, are then assigned to work directly with the review manager. Technical comments are directed from the reviewers to the review manager. The review manager prepares evaluation findings and forwards the complete package to an overview review committee consisting of NDEC, NDOH and consultant team personnel. The output from the overview committee is then directed to the developer for a response. This overall procedure provides a consistent format for technical comment generation, tracking and resolution and has proven to be very successful to date.

Above Grade Concrete Structures

Nebraska law mandates that any disposal facility constructed in the state be located above grade and consist of multi-layered engineered barriers. The facility proposed in the license application consists of reinforced concrete structures located above grade. The structures have a concrete mat base and concrete roof. This project is the first above grade concrete disposal facility to reach the license application stage in the United States. It is generally accepted that this disposal concept is more complex to design from the developer perspective, and similarly more complex to evaluate and review from the regulatory perspective, than shallow land burial. Additionally, the majority of NRC information available to assist both license applicants and regulators is focused on shallow land burial.

Thus, many additional disciplines have been brought into the review process or have been brought in from a perspective different from shallow land burial. Examples include:

- Structural Engineering - Design review of concrete structures. Walls, roofs, foundations and footings interior walls, etc. Seismic design review.
- Geotechnical Engineering - Review of geotechnical engineering reports and evaluation of proposed

footing and foundation design. Seismic design review.

- Mechanical Engineering - Review of heating and ventilation design issues for disposal structures. Review of the fire suppression system design.
- Electrical Engineering - Review of power requirements for disposal structures for lighting as well as power for ventilation and other systems operation.
- Seismology - Review of seismic characteristics of project site related to above grade concrete structure design.
- Nuclear Engineering/Health Physics - Review of shielding design for concrete structures. Performance assessment of above grade concrete structures.
- Civil Engineering - Review of site wide utility design for fire protection. Review of drainage design and retention ponds for stormwater.
- Geology - Review of site characterization from perspective of siting above grade concrete structures.

Early identification of these and other technical issues related specifically to the above grade concept lead NDEC to initiate a process for managing review of these issues. Preliminary informational meetings were held between the developer and their subcontractor, and NDEC and their consultant team. The objective was to allow various disciplines from the developer to interface with their counterparts from the agency technical review team for an exchange of technical information and discussion of issues. These meetings allowed technical review to proceed more expeditiously once the formal license application was received.

Following Licensing Program Plan procedures, the completeness review was accomplished as the first element of the review. The completeness review process required approximately 120 days, which was slightly longer than originally planned. However, the SAR contains approximately 7000 pages. This volume, combined with the above grade disposal concept, caused the completeness review schedule to lengthen.

Currently, the first round technical review has been completed on both the SAR and ER. Comments have followed procedures outlined in the Licensing Program Plan and have been forwarded to the license applicant for response. Approximately 1000 technical review comments were generated during the first round of the review process. As with completeness review, the first round technical review process took longer than scheduled once again due to the volume of the SAR and the increased complexity of above grade concrete concept.

Overall, review of the first above grade concrete disposal facility has progressed very satisfactorily in a manner conforming to State of Nebraska requirements. However, the concept has required utilization of additional engineering and scientific disciplines and has taken longer to accomplish than originally planned.

SUMMARY

At this time, approximately three years after Nebraska was selected as the host state for the Central Interstate Compact and six months after receipt of the license application, several observations can be made regarding the process. Selection of a consultant team to function as a staff extension of NDEC/NDOH has proven to be cost-effective, has brought the necessary technical expertise to the review and has generally been very successful. The task order process allowed early definition of major work elements and

established a framework for scoping, pricing and scheduling discrete work elements. Development and implementation of a formal quality assurance program is necessary to manage QA activities from the regulatory perspective as well as conduct QA review of the license application. The license plan, developed before receipt of the license application, provided the procedural framework for review of the license application. This framework has proven successful to date in the review process. Finally, review of an above grade concrete disposal facility is more difficult and complex than review of other disposal concepts. However, by planning for adequate technical resources on the review team and allowing an adequate schedule, the process is very manageable. The process may result, if a license is granted, in construction of the first above grade concrete structure facility for the disposal of low-level radioactive waste.