AN EXAMINATION OF THE USE OF ENGINEERED CELLS FOR ONSITE DISPOSAL OF RADIOACTIVE WASTE

January 2009

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STATEMENT OF ISSUE

Several states in the nation are host to federal nuclear weapons complex facilities. These facilities generate various types of radioactive, hazardous, and mixed wastes. The federal government is responsible for the management of such wastes, but various circumstances determine how such wastes are managed, and whether a state has any influence in the decision-making process. Under the current regulatory framework, the federal government has a great deal of influence in determining how such wastes are managed, but sometimes states can exercise approval and oversight authorities which grant them some discretion regarding what methods are employed.

At nuclear weapons complex sites, one method employed for managing radioactive or mixed waste is to deposit it into a specially engineered disposal cell onsite. Another method used for managing radioactive or mixed waste is to ship it offsite to other federal or commercial facilities which are authorized to receive such waste for disposal, yet the number of such facilities is limited.

Some states have approved (or concurred with federal approval of) the use of the first method – specially engineered cells for onsite disposal of radioactive or mixed wastes. However, some states have expressed reservations over approving or concurring with such methods, and cite various concerns for the use of onsite cells, including their effectiveness for containing radioactive and mixed wastes; their structural integrity for withstanding seismic events; and their long-term stewardship needs, such as keeping

them guarded and properly maintained. Some state officials plan to monitor the experiences of other states, as well as the developing plans proposed for the sites that they host, in order to further explore whether onsite disposal of radioactive or mixed waste is in their best interest, or whether shipment of wastes for offsite disposal is the more desirable course of action.

EXECUTIVE SUMMARY

Four of the states profiled in this report have experience hosting onsite radioactive or mixed waste disposal cells. One of the states profiled in this report (Kentucky) has considered use of an onsite cell as a mixed waste disposal option, but has not yet expressed approval for construction of such a facility.

A number of states profiled in this report cite establishment of cost assurances via binding state-federal agreements as ideal for ensuring proper cell construction, state oversight involvement, and long-term stewardship of a cell. They also recommend that the goals set for proper use of onsite waste disposal cells be achievable and enforceable. Identification of the roles and responsibilities of both federal and state agencies involved in site cleanup is key. For example, potential changes in agency roles stemming from changing circumstances at a site should be identified in the language of the agreement.

The exclusion of classified wastes or other types of waste generated offsite has also been identified as being key to many states' acceptance of use of cells for onsite disposal of wastes. With regards to construction of onsite radioactive or mixed waste disposal cells, various federal and state laws may apply regarding design requirements and waste acceptance criteria.

State officials have valuable advice to share regarding oversight of the design and construction of waste disposal cells at nuclear weapons complex sites that they host. This advice is contained in the case studies that follow in this report. One important design consideration cited by many states is the use of leachate collection systems within cells. States also identify the use of synthetic liners and cover materials, as well as a site's geology, as important considerations.

Early stakeholder engagement is cited as important for building public acceptance of an onsite radioactive or mixed waste disposal facility.

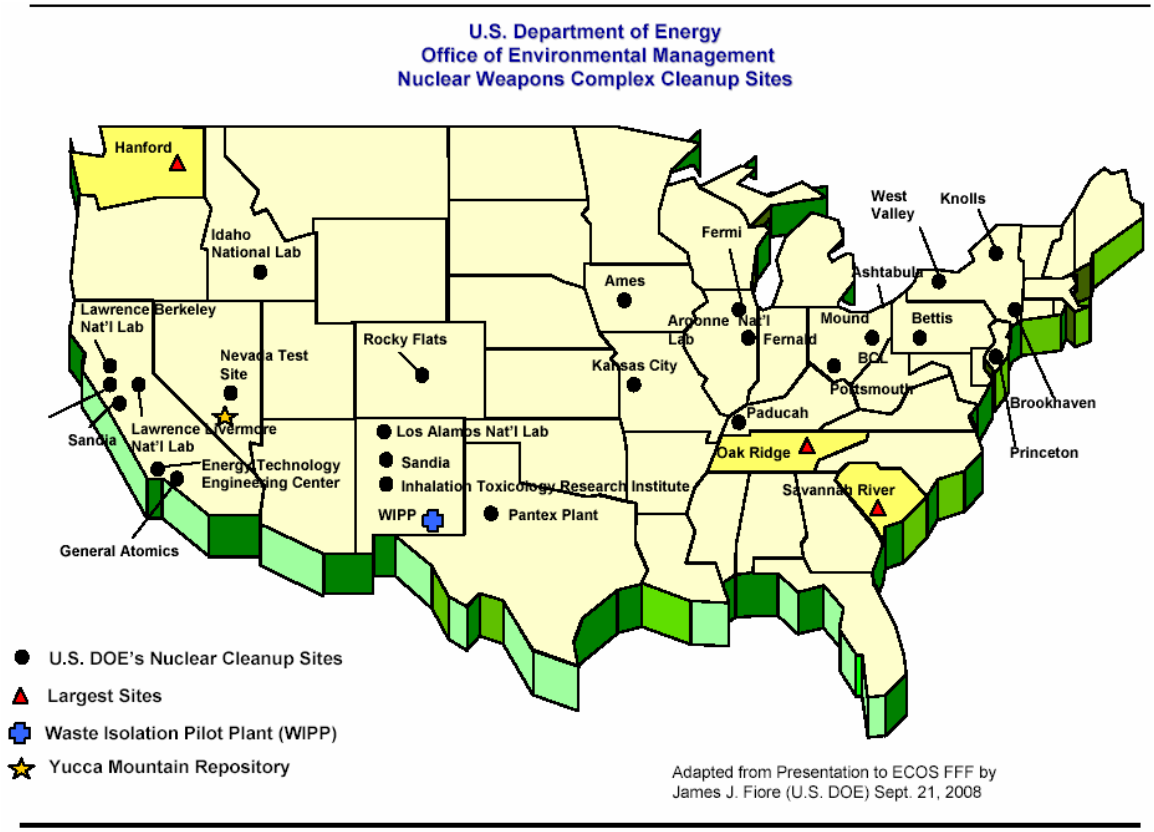
REPORT

Background

Work involved with development of nuclear weapons occurred at various sites within the United States from the 1940s until the late 1980s. These sites are broadly known as the nuclear weapons complex. Since 1977, the U.S. Department of Energy (DOE) has been responsible for managing nuclear weapons production, and for managing nuclear weapons complex sites.

More than a hundred sites, several relatively large in the scale of their operations, have been involved in this program. Environmental remediation activities are currently being undertaken at some of these sites, while others have already been remediated and currently require only security and maintenance work (or no monitoring at all). Over the years, various wastes have been generated at these sites, including hazardous, low-level radioactive, transuranic, and high-level radioactive wastes.

U.S. Department of Energy Office of Environmental Management Nuclear Weapons Complex Cleanup Sites (US DOE 2008b).



The above map displays some of the sites in the U.S. nuclear weapons complex.

At the November 2008 U.S. Department of Energy Intergovernmental Meeting, several state officials gathered at a session for ECOS Federal Facilities Forum (FFF) members. The FFF is a group of state environmental agency officials whose job responsibilities include oversight of environmental management activities undertaken at federal facilities hosted by their state.

At the meeting, many state officials expressed an interest in examining the issue of onsite disposal of radioactive and mixed wastes in specially engineered cells to get a better sense of what is happening nationwide. Members also expressed an interest in learning more about the considerations being undertaken by state and federal officials regarding

use of these cells. Members resolved to learn more about the experiences of their colleagues in other states with regard to onsite disposal of radioactive and mixed wastes, and expressed receptiveness to any recommendations or lessons learned that could be shared. At the meeting, FFF members agreed that a report on this subject would provide a useful resource for state officials. This report attempts to provide this service.

The experiences of five states are profiled as case studies in this report in an effort to highlight lessons learned by officials in these states. Some background information on the history of nuclear cleanup and the regulatory framework that drives this work is also provided.

Regulatory Framework

In 1992, Congress passed the Federal Facility Compliance Act (FFCA), which required DOE to prepare Site Treatment Plans (STPs) to be approved by host states for treatment of "mixed" wastes at nuclear weapons complex sites. "Mixed wastes" contain both hazardous and radioactive wastes. DOE completed development of these plans in consultation with the states by 1995. However, these plans only address storage and treatment of wastes at DOE sites. They do not address cleanup or disposal of wastes.

Decisions regarding disposal of radioactive and hazardous wastes are made under a regulatory framework that has developed under a number of federal laws, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Environmental Policy Act (NEPA), the Resource Conservation and Recovery Act (RCRA), and the Atomic Energy Act (AEA). Most states also have statutes and regulations relating to disposal of hazardous and mixed wastes. For example, many states apply for delegable authority from the U.S. Environmental Protection Agency (EPA) to operate the RCRA hazardous waste management program, and enact laws outlining the rules for management of hazardous wastes that are no less stringent than the federal RCRA for this purpose.

Under NEPA, DOE considers potential disposal options via Environmental Impact Statements (EISs) and announces its decisions in formal Records of Decision (RODs). In the late 1990s, DOE announced through RODs that it intended to send high-level waste to the planned geological repository at Yucca Mountain, Nevada, and would send transuranic waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico.

In 2000, DOE announced that it intended to dispose of low-level waste at sites where it was generated, so long as these sites already had appropriate disposal facilities present onsite. For sites where such facilities did not already exist, DOE intended to use the Hanford site in Washington and the Nevada Test Site in Nevada as regional disposal repositories for low-level wastes (or properly licensed commercial facilities). Similarly, for mixed low-level wastes, DOE would use Hanford and the Nevada Test Site as regional repositories.

DOE is preparing an EIS to use the Hanford, Washington site as a regional low-level and mixed low-level waste repository. However, Hanford is currently not available for this purpose as an existing federal-state agreement bars this from occurring. The Nevada Test Site is currently accepting out-of-state wastes into its mixed low-level waste receptacle, but it is expected to cease accepting any more out-of-state waste once it reaches maximum capacity by 2010.

As authorized by the AEA, DOE self-regulates in devising and implementing radioactive waste disposal plans, so long as these wastes are not mixed with hazardous wastes. In this case, it is DOE policy to evaluate the risks of the radioactive wastes, and to devise and implement a waste disposal option, pursuant to DOE Order 435.1. If a radioactive waste disposal cell does not already exist onsite, DOE may consider constructing a new cell, or it may transport the waste to another DOE site or a properly licensed commercial facility.

If any radioactive wastes at a DOE site become mixed with hazardous wastes classified as RCRA constituents, then other various cleanup scenarios may occur.

One scenario involves cleanup of mixed low-level waste being pursued under CERCLA, whereby DOE conducts a Remedial Investigation and Feasibility Study (RI/ FS). As part of the RI/ FS, DOE reviews various options for disposing of the mixed waste, and chooses one of the options to recommend. Under this scenario, EPA is the lead agency and issues a Record of Decision that either concurs with DOE's selected remedy or identifies an alternate remedy to be implemented. Opportunity for public notification and comment must also be rendered. Typically, DOE and EPA make efforts to consult or ask for concurrence from a host state when planning cleanup proposals under CERCLA, but this is not required. The cleanup options that EPA and DOE consider may include construction of a mixed waste disposal cell onsite or shipment of the mixed wastes for disposal to other DOE or properly-licensed commercial sites. Under CERCLA, EPA may review the efficacy of the ROD every five years for cleaning up a subject site, and can amend the ROD as deemed necessary.

As a separate but related procedure under CERCLA, DOE, EPA, and the host state may negotiate a Federal Facility Agreement (FFA) for cleaning up and properly maintaining a site polluted with mixed wastes. Agreements that enjoin the host state, EPA, and DOE are sometimes alternately referred to as "tri-party agreements." FFAs may incorporate by reference existing Records of Decision. Sometimes, DOE and EPA will negotiate an FFA early in the process, and FFAs may contain schedules for Records of Decision and various cleanup services to be rendered.

Another scenario regarding cleanup of mixed wastes involves activities being pursued under RCRA. Under this scenario, either EPA or the host state may issue a consent order stipulating milestones DOE must meet for cleaning up and disposing of mixed wastes at a subject site. Whether it is EPA or the state that can issue a consent order is determined by whether the host state has applied for and secured primacy for operating the RCRA program (RCRA authority is delegable by EPA to states that both properly apply for

primacy and enact state laws for managing hazardous wastes no less stringent than the federal RCRA).

Consent orders may include plans for constructing a mixed waste disposal cell onsite or may include plans for shipping mixed wastes for offsite disposal to other DOE or properly licensed commercial facilities. If an onsite cell is proposed for construction, then DOE must propose Waste Acceptance Criteria (WAC) for the cell and apply for a RCRA permit before any waste may be disposed of in the cell. The agency with primacy (either EPA or the state) can approve, disapprove, or approve with modification DOE's application to construct an onsite mixed waste disposal cell and accompanying WAC.

Consent orders for cleanup and disposal plans issued under RCRA are usually negotiated between the agency with primacy and DOE. The agency with primacy may also issue a RCRA consent order unilaterally if it claims that the mixed wastes pose an imminent danger to public health. However, DOE can file lawsuits against such orders, claiming that no imminent danger exists, and claiming that such orders are unreasonable, outside the bounds of what is authorized by RCRA, or too onerous for the agency to implement. Numerous technical and political considerations often make it more advantageous for a state and DOE to mutually negotiate a RCRA permit or consent order rather than entering into an adversarial permitting process or a litigation scenario focused on a unilaterally issued order.

RCRA consent orders are ultimately enforced by the agency with primacy (the state or EPA). DOE is required to perform the work outlined in the consent order as able according to funds available to the agency. The agency with primacy may stipulate in the consent order any penalties that may be levied to DOE for failure to meet the scope of work required by the consent order. The agency with primacy may also charge DOE administrative service fees for regulatory oversight, permitting, and monitoring. If DOE cannot perform the work prescribed by the consent order due to a lack of appropriations, then the agency may attempt to claim relief from the responsibilities citing provisions in the federal Anti-Deficiency Act.

DOE may undertake cleanup of mixed wastes under RCRA without the establishment of a consent order, but many states have elected to implement consent orders in an attempt to accelerate cleanup of the sites they host.

Benefits

The central benefit cited by DOE and states for using onsite disposal cells is that there is often less cost involved with disposing of waste onsite rather than shipping it offsite. Additionally, onsite disposal can reduce transportation-related risks. Less offsite shipping of wastes can also reduce a project's carbon footprint as less fossil fuel might be used for transportation.

Another benefit of use of onsite disposal cells is the provision of a reliable disposal option for a site's wastes. Only a few commercial disposal cells exist in the nation that

are licensed to accept mixed low-level waste from out-of-state sources, and the Nevada Test Site hosts the only other repository that currently accepts such wastes from out-of-state sources (although the Nevada Test Site cell is expected to cease accepting such wastes once it reaches capacity by 2010). The reliable availability of a cell onsite can expedite cleanup projects and/or reduce the footprint of a site's contamination. Such remediation can render portions of the site useful again for restricted (i.e., parkland) or unrestricted (i.e., industrial) uses.

Finally, construction and use of onsite disposal cells can provide a short-term boost to a local economy by supporting a base of local jobs.

Concerns

Some states have cited concerns over use of specially engineered cells as onsite receptacles for radioactive wastes. One concern is about the structural integrity of these cells and their ability to withstand seismic events.

Another concern is the long-term stewardship responsibilities that can be required for disposal cells, such as the proper maintenance and guarding of cells that is required once they are constructed. These long-term stewardship responsibilities are costly and can be required in perpetuity due to the nature of the radioactive and/ or hazardous wastes. States want to ensure that mechanisms are established to fully fund and support these activities for as long as they are necessary, but states have generally found it difficult to secure such funding assurances.

A third concern is that the availability of a cell as an onsite disposal option can sometimes lead to less recycling or segregation of wastes at a site. In this scenario, sites may become host to permanent disposal cells which contain more waste than may be necessary.

All of these concerns can lead to community acceptance issues. If a local community becomes opposed to the idea of onsite disposal of radioactive waste at a DOE site, this may lead state officials to oppose construction of a cell.

CASE STUDIES

Kentucky

At the Paducah Gaseous Diffusion Plant near Paducah, Kentucky, significant amounts of legacy wastes have been generated, including hazardous, low-level radioactive, and mixed wastes (KY DEP 2008). However, mechanisms are currently in place to manage these wastes. For example, some soils contaminated with polychlorinated biphenyls (PCBs) have been placed in storage buildings onsite in accordance with RCRA. Some low-level radioactive waste generated at a uranium conversion facility onsite has been shipped to other facilities offsite for disposal (including the Nevada Test Site in Nevada and the Envirocare facility in Utah) (KY DEP 2008).

From 2010-2019, the Paducah plant is expected to generate 573,000 cubic yards of waste (KY DEP 2007). Plans to demolish the plant over a 30-year period from 2019-2039 could generate an additional 3.15 million cubic yards of waste. Various types of wastes are expected to be generated, including low-level radioactive waste and various hazardous wastes as defined by RCRA and the Toxic Substances Control Act (TSCA), including asbestos and PCBs (KY DEP 2007).

In early 2000, DOE proposed to the State of Kentucky construction of a radioactive waste disposal cell onsite at Paducah (KY DEP 2007). As proposed, the cell would be constructed with the capacity to accommodate the 3,723,000 total cubic yards of wastes expected to be generated at Paducah. The cell would have a footprint of 110 acres (30 acres waste footprint).

The potential cost savings that could result from adding onsite cell disposal as a waste management option at Paducah has been estimated at approximately $1 billion (KY DEP 2007).

The state has cited concerns over onsite disposal cells, including their structural integrity (potential release of material), their long-term stewardship needs, and their ability to achieve community acceptance (KY DEP 2007). Structural integrity during a seismic event is of particular concern since Paducah, Kentucky is within close proximity of the New Madrid seismic zone. The guarantee of financial assurances for proper construction, use, and long-term stewardship of an onsite waste disposal cell is also a concern as such stewardship would need to be in perpetuity (KY DEP 2007). Additionally, changes in Kentucky state law, which currently exempts federal facilities from financial assurance, might be required to allow for continued funding of cell stewardship to be secured.

The state has indicated that it may want to consider establishing restrictions to exclude classified wastes from being disposed of in any onsite radioactive waste disposal cell it might host at Paducah in the future (KY DEP 2008).

Nonetheless, the state has expressed an interest in reducing the footprint of the Paducah site, and in excavating and better managing wastes currently located in unlined burial grounds at the site. The State of Kentucky is working closely with DOE, EPA, and the community of Paducah to evaluate its waste disposal options (KY DEP 2007). The state has cited possible benefits for authorizing construction and use of a cell to dispose of its wastes onsite, including local job creation, less risk associated with less transportation of waste offsite, the reliability of the disposal site, and potential to recover some of the site's land for industrial use sooner (KY DEP 2007).

The state expects DOE to issue a CERCLA Feasibility Study Report evaluating waste disposal options perhaps as early as calendar year 2009, and plans to reevaluate its options then (KY DEP 2007).

Missouri

From 1957 to 1966, uranium was processed at the Weldon Spring Site, resulting in chemical and radiological contamination of the site. The site now hosts an onsite mixed waste disposal cell. Several structures onsite remain active and are operated by DOE (MO DNR 2008b).

Although a prairie habitat is being developed to surround the cell, the Weldon site is located within the Saint Louis, Missouri metropolitan area, and encroachment is an issue. For instance, a local high school is located within one half mile of the disposal cell (MO DNR 2008b). Also, conservation areas and a hiking trail are located near the Weldon site, as are a U.S. Army reserve training area and an Army ordnance plant that is no longer operating (MO DNR 2008b).

In the early 1980s, the State of Missouri did not pursue signing on as a party to the Federal Facilities Agreement that would dictate cleanup and disposal activities to be undertaken at Weldon. When the idea of using an onsite radioactive waste disposal cell was considered by DOE, EPA was a party to the deliberations, but the State of Missouri did not actively engage in this process. However, the State of Missouri did provide input during site evaluation for placement of the cell, as well as when cell design criteria were being considered (MO DNR 2008a). At the time, EPA encouraged the State of Missouri to follow the decision-making process. State officials note that when they raised concerns EPA was receptive to hearing them (MO DNR 2008a). EPA and DOE signed a Record of Decision (ROD) in September 1993 to authorize design and construction of the cell (US DOE 2008d). Among other considerations, it requires monitored natural attenuation of a contaminated aquifer and surface water bodies (MO DNR 2008b).

Construction of the cell began in April 1997 and was completed in October 2001 (MO DNR 2008b and US DOE 2008d). Remedial activities were conducted from 1986 to 2005. The total cost of the remedial actions was approximately $9 million. No disposal fees were paid, and no offsite wastes were allowed into the cell (MO DNR 2008b).

The cell contains approximately 1.48 million cubic yards of contaminated materials, including asbestos, low-level radioactive waste, minimal transuranics, and mixed and treated hazardous wastes (MO DNR 2008b). The cell occupies approximately 45 acres, stands 75 feet above the ground, and is capped with uniform white limestone aggregate (MO DNR 2008b). The cover system also contains layers of clay, geosynthetic liner, sand, and cobblestones (US DOE 2008d). Due to potential discovery of listed chemical waste, the disposal cell was designed to meet RCRA subtitle C waste standards (MO DNR 2008b). Exposed surfaces were engineered to resist long-term erosion, and the cell was designed to deter migration of contaminants and to remain stable for 1,000 years (US DOE 2008d). The cell was positioned on a geologically stable area, and waste placement methods were designed to reduce settling and minimize volume (thereby supporting the cover system), retard radon emissions, and withstand the maximum credible earthquake (MCE) that could be forecasted for the New Madrid fault system. Clean fill materials were used to construct a dike around the structure to resist erosion, limit moisture

infiltration around the cell, and further minimize radon emissions. The cell was placed outside the 100-year floodplain (US DOE 2008d).

It is possible that other wastes might be generated at Weldon in the future (MO DNR 2008a). The existing cell has capacity to accept more wastes, but the State of Missouri believes that, in such a case, DOE would probably ship the waste for disposal somewhere offsite (possibly the Nevada Test Site, for example) (MO DNR 2008a).

Initial design considerations included a leachate-type collection system both in the top and bottom of the cell. However, due to cost considerations, the choice was limited to only top or bottom (MO DNR 2008b). With authority under the overarching FFA, DOE and EPA made the final decision to design the cell to include only a leachate collection system in its bottom; in its comments on the matter, the State of Missouri concurred with this decision (MO DNR 2008a).

Collected leachate is now treated in a wastewater treatment plant and is released via state-permitted discharge into an area that drains into the Missouri River (MO DNR 2008b).

Residual groundwater contamination including volatile organic compounds, explosives, and uranium remains in the shallow aquifer and nearby springs (MO DNR 2008b). Some residual soil and sediment contamination remains in an inaccessible location within the quarry which drains to the Missouri River (MO DNR 2008b).

A subsequent Federal Facilities Agreement has since been developed for the Weldon Spring Site. The State of Missouri has signed on as a party to this agreement that stipulates plans for the Weldon Spring Site's long-term stewardship (MO DNR 2008a). The State of Missouri has secured continued funding for its state oversight of this process that has involved the Missouri Department of Natural Resources (DNR): interacting with the site's neighboring landowners, which includes two other Missouri state agencies (the Departments of Conservation and Transportation); providing independent monitoring and interpretation of onsite data; and engaging the greater Saint Louis community in outreach, which has resulted in development of a local site awareness and education committee (MO DNR 2008b).

The Missouri DNR recommends to other states considering approval and use of an onsite radioactive waste disposal cell to clearly identify their oversight roles and responsibilities and to secure funding supporting such oversight work while maintaining an onsite presence (MO DNR 2008b). The Missouri DNR found it beneficial to maintain an onsite presence while overseeing all cleanup activities under its site agreements. This provided more accessibility of the site to state officials who engaged in site design, site status, and site sampling activities. This also facilitated sharing of information between agencies and the public, and for gathering input from the public.

The Missouri DNR also recommends that all costs of long-term stewardship of an onsite radioactive waste disposal cell be identified and documented in a feasibility study. The state found the process of documenting all aspects of the long-term stewardship for

present-day activities, as well as future risk, to be a challenging undertaking. The agency has stated that it is difficult but important to identify the roles and responsibilities of the interested parties, and to set institutional controls that are achievable, enforceable, and supported by agreement language. The ROD should outline how the parties will respond under various scenarios of changing conditions at the site (MO DNR 2008b).

Additionally, Missouri DNR recommends that states engage with DOE and a site's local community early and often during planning and implementation of remediation and disposal activities. In Missouri, having the state involved as a third party (along with DOE and EPA) was viewed favorably by the public and perceived to provide independent oversight (MO DNR 2008b).

Ohio

The Fernald Onsite Disposal Facility is a mixed waste disposal cell located about 18 miles northwest of Cincinnati, Ohio at the Fernald site. The most stringent requirements of RCRA as well as the Uranium Mill Tailings Radiation Control Act (UMTRCA) were followed in developing a design for the Fernald cell (OH EPA 2008b). Liners, caps, and leachate management systems were incorporated into the design of the cell (OH EPA 2008c). An EPA waiver of an applicable Ohio state law was secured so that the cell could be sited near a sole source aquifer, but would not set an undesirable precedent for more such sitings in the future. This aided in state acceptance of the cell (OH EPA 2008b).

For years, a cleanup effort was undertaken at Fernald pursuant to a cleanup agreement between DOE and EPA, and a Consent Decree between DOE and the State of Ohio (OH EPA 2008b).

At Fernald, Waste Acceptance Criteria (WAC) were established as part of a feasibility study and were finalized in a Record of Decision (OH EPA 2008c). The WAC dictated the concentrations and size of wastes that could be deposited in the cell. The stipulation that no offsite waste be allowed into the cell facilitated stakeholder acceptance of the facility and reduced the oversight responsibilities of the state (OH EPA 2008c).

Within its WAC, Ohio established maximum concentrations of types of wastes not to be exceeded. The state considered this more ideal than the use of averages because this may have precluded the addition of large volumes of clean disposal to the cell to meet average requirements of other types of wastes deposited. A manifest system was used to generate a paper trail listing types of wastes found in excavations to ensure that only waste acceptable to the cell was deposited there (OH EPA 2008c).

Waste segregation standards and remediation goals were established for Fernald through a WAC Plan and a Sitewide Excavation Plan. Waste placement standards were an important aspect of these plans. Concrete crushers and debris compactors were sometimes used to allow debris to be more efficiently placed and to reduce void spaces (to discourage debris settling and cell collapse) (OH EPA 2008c).

At Fernald, no classified wastes were placed in the cell. The State of Ohio viewed potential disposal of such wastes into the cell as undesirable. If classified wastes had been proposed for disposal into the cell, one state official thinks that this would have created public acceptance problems, and could have increased the potential oversight role negotiated for the state.

For the Fernald cell, the State of Ohio followed a protocol for rejecting any proposed design change that would decrease its efficacy (OH EPA 2008c).

During construction of the Fernald cell, extreme temperature changes threatened to negatively affect installation of synthetic liners within the cell as warmer temperatures led to excess plastic liner use and the tendency to get folds in the liner (OH EPA 2008c). At Fernald, the cell cap was vegetated with native grasses for good evapotranspiration and erosion protection. Careful mowing and management of weeds and invasives has been considered important for proper maintenance (OH EPA 2008c). Proper installation of erosion matting on the cell cap during construction was important for achieving vegetative cover. At Fernald, coir matting seemed more effective than jute matting for this purpose, though the metal stakes involved in the coir installation became tripping hazards (OH EPA 2008c).

During construction of the Fernald cell, a channel around the cell was covered with rocks. This created some maintenance problems including nearby ponding of water and growth of trees amid the rocks. In retrospect, the use of vegetated channels might have been easier to maintain, and might have prevented these problems (OH EPA 2008c).

During construction of leachate collection systems, careful oversight of installation is recommended, and the use of butt-fusion welds may be required for proper installation of pipes (OH EPA 2008c).

The State of Ohio recommends that other states considering acceptance of an onsite mixed waste disposal cell define their roles and responsibilities for oversight of such facilities beforehand as this is difficult to negotiate after a construction authorization agreement has been reached (OH EPA 2008c)[1]. Establishing funding and authority in an agreement to enable the state's oversight role to change if conditions with the disposal cell change is desirable (OH EPA 2008c). The State of Tennessee's establishment of an oversight trust fund may be an ideal arrangement (OH EPA 2008c).

Negotiating waste recycling or minimization standards or percentages prior to agreement is also recommended. Otherwise, these efforts are reduced when easy and less expensive cell disposal of wastes becomes available (OH EPA 2008c).

[1] One Ohio official has expressed the wish that the state had stipulated a role for monitoring its cell via in-situ cap sensors in its agreement with DOE. Under the current arrangement at Fernald, potential failures of the cell's storage capabilities would only be apparent after-the-fact through monitoring of wells down-gradient from the cell (at Fernald, DOE actually installed in-situ monitors in the cell, but DOE stopped operating them when earmarked funds expired and there was no regulatory driver to keep the monitors operational) (OH EPA 2008c).

State officials cite early stakeholder outreach as key for acceptance of the facility by the public (OH EPA 2008c). The state contends that, once a greater understanding of the situation at Fernald was developed through meetings and interaction, there was more support for developing a responsible means for disposing of low concentration/high volume wastes at Fernald than there was for shipping such wastes offsite (OH EPA 2008c).

Aside from the Fernald site, there has been some consideration for the potential of a radioactive waste disposal cell being constructed for the Portsmouth site near Portsmouth, Ohio, but such considerations are preliminary, and it is unclear how much this possibility is being explored (OH EPA 2008a).

Tennessee

A radioactive waste disposal facility has been built at DOE's Oak Ridge site in Oak Ridge, Tennessee. The Oak Ridge Environmental Management Waste Management Facility (EMWMF) consists of four (4) cells and is located in East Bear Creek Valley approximately one (1) mile west of the Oak Ridge Y-12 Complex. The cells have a combined current capacity of 1.15 million cubic yards, and were built to dispose of large volumes of contaminated waste generated by remedial actions throughout the Oak Ridge Reservation (US DOE 2008c and TN DEC 2008c).

DOE, EPA, and the State of Tennessee took part in the planning and decision-making that authorized the facility and its design, with input from the public (TN DEC 2008c). The record of decision (ROD) that authorized the cells was jointly signed by DOE, EPA, and the State of Tennessee in 1999 and allows build-out up to 1.7 million cubic yards (US DOE 2008c and TN DEC 2008c). Prior to the ROD, DOE had estimated that 90% of the waste would be low activity/ high volume waste appropriate for safe onsite disposal. The State of Tennessee was anxious to expedite the disposal process in order to lessen the risks of groundwater contamination and to return some Oak Ridge lands to useful conditions (TN DEC 2008c).

Waste Acceptance Criteria (WAC) for various contaminants were developed for the cells based on a volume weighted sum of fractions calculation (TN DEC 2008c). This process involved use of lowered contaminant detection limits and complicated calculations for undertaking careful waste characterizations (involving exhaustive state oversight work), but this ultimately provided for better flexibility for how waste could be disposed of in the cells (TN DEC 2008c).

More than 500,000 cubic yards of waste has already been placed into the EMWMF (US DOE 2008c). The amount of deposited waste is anticipated to double by 2010 as wastes from the K-25 Building demolition are expected to be placed there (US DOE 2008c).

The State of Tennessee is awaiting consideration of the Integrated Facility Disposition Project (IFDP)—a plan to further decontaminate and decommission excess building facilities, and to clean up wastes at Oak Ridge (US DOE 2008a). It is estimated that the

IFDP would involve management of an additional 2- 3 million cubic yards of waste. If the IFDP is fully funded by Congress, then additional cell capacity may be constructed up to the build-out limit of 1.7 million cubic yards to accommodate more waste (US DOE 2008c). Additionally, DOE is analyzing the costs for possible expansion of the cells to 2.3 million cubic yards, in case such an expansion were authorized (US DOE 2008c). State officials have expressed a desire that any such expansion not create any groundwater contamination issues, and that non-radioactive wastes from IFDP (such as clean building debris) be segregated and put into another existing landfill nearby in order to maximize available space within the cells for storage of radioactive wastes (TN DEC 2008a and TN DEC 2008c).

The State of Tennessee continues to participate in oversight of the EMWMF at Oak Ridge, and periodically conducts audits of the cell waste lot profiles. One challenge confronting the state is what to do with leachate that collects at the bottom of the cells. Due to uncertainties in the ROD, it is unclear how this situation might be addressed (TN DEC 2008c). Another challenge is that portions of the cells were constructed such that the bottoms were positioned into the water table (original estimates of the groundwater level were not accurate), and the State of Tennessee has concerns about the structural integrity of the cells' liner under these conditions (TN DEC 2008c). A groundwater suppression system has been designed and constructed (TN DEC 2008d).

The State of Tennessee desires long-term stewardship of the site in perpetuity due to the nature of the contamination in the cells (TN DEC 2008c). To this end, the State has established a trust fund to which DOE is making annual allotments until the principal in the fund reaches $ 14 million. The fund will be tapped to support surveillance and maintenance of the cells into the future (TN DEC 2008c). The state plans to monitor the cells hosted at Oak Ridge, and feels well-positioned to negotiate amendments to the ROD to address changing conditions with the cells, if such negotiations become necessary (TN DEC 2008c). If cell capacity is expanded beyond what is allowed by the current ROD, then the size of the trust fund would further increase (TN DEC 2008b).

Washington

The State of Washington is host to the Environmental Restoration Disposal Facility (ERDF), a radioactive waste disposal cell at the Hanford Site near Richland, Washington. This facility is currently the primary disposal location for low-level and mixed low-level waste at the Hanford site. The facility was designed according to RCRA Title C standards. Its design includes the use of double liners and a leachate collection system (WA DOE 2008b).

The ERDF opened in 1996, and by 2001 it had received over 1.81 million metric tons of nuclear debris. The total waste received through 2007 is over 6.4 million metric tons (WA DOE 2008a).

A Record of Decision (ROD) was signed by DOE, EPA, and the State of Washington to authorize the ERDF (WA DOE 2008b). As part of the ROD, the state insisted that no

offsite wastes be allowed into the ERDF. This point aided in state and public acceptance of the facility (WA DOE 2008b).

Aside from the ERDF, the Hanford site also hosts two lined disposal trenches with a capacity of 240,000 cubic meters which are currently being used for disposal of treated Hanford low- level and mixed wastes under an interim RCRA permit status. These trenches are in process of trying to secure a final RCRA permit (WA DOE 2008a). These trenches were designed to comply with RCRA Title C, and incorporate double liners and a leachate collection system (WA DOE 2008b).

Additionally, the Hanford site hosts the RCRA-permitted Integrated Disposal Facility which will not receive any waste for several years, but is expected to eventually receive approximately 82,000 cubic meters of low-level and vitrified low activity tank wastes from the Hanford cleanup in the first phase of its use.

A Federal Facilities Agreement (FFA) exists which stipulates the cleanup plans for Hanford. Under this plan, DOE will be responsible for long-term stewardship of these disposal sites in perpetuity, and the State of Washington expects to continue to receive federal funding to support its oversight responsibilities at Hanford (WA DOE 2008b).

DOE is currently preparing an Environmental Impact Statement (EIS) under NEPA to evaluate the potential use of Hanford as a regional repository for offsite low level and mixed wastes. Currently, disposal of offsite wastes at Hanford is prohibited by a legal agreement between DOE and the State of Washington (WA DOE 2008b).

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