Sandia National Laboratories

Environmental Program

ASTD Mixed Waste Landfill Accelerated Site Technology Deployment

Technology Need

Landfills are an important part of past, present, and future methods to manage and dispose of hazardous waste in the U.S. Approximately 3000 landfills have been identified on DOE sites alone. Many of these landfills are located on sites that have an arid environment. The current baseline cover for hazardous waste sites is a Resource Conservation and Recover Act (RCRA) Subtitle 'C' cover. While the RCRA cover is acceptable to the regulatory community, it is expensive and has performed less than optimally, particularly in arid environments. An Environmental Protection Agency (EPA) study of 163 randomly selected landfills determined that current landfill technologies need improvement. In early recognition of this problem, the DOE has been a leader in developing more effective alternatives to the baseline EPA cover design. Over the last several years, DOE's Office of Science and Technology has supported the Alternative Landfill Cover Demonstration to demonstrate less costly and better performing designs. Thus, the proposed alternative technologies have already been demonstrated on "cold" sites in relatively close proximity to the proposed deployment at the Mixed Waste Landfill.

This Accelerated Site Technology Deployment (ASTD) project is intended to facilitate "breaking the log jam" to multiple deployments. The alternative that we are deploying is not only less expensive than the RCRA baseline but the performance is clearly superior in reducing long-term risks.

Objective

The project objective is to deploy an alternative landfill cover technology on a legacy hazardous and radioactive disposal site near Albuquerque, NM referred to as the Sandia National Laboratories (SNL) Mixed Waste Landfill (MWL) (see Figure 1). The MWL was operated from March 1959 to December 1988 as a primary local disposal site for SNL's work in nuclear weapons research and development. This work is part of the ASTD program to facilitate the deployment of innovative technologies that can significantly reduce the cost and risk of cleaning up DOE sites. This specific first deployment on the MWL includes actions to facilitate subsequent deployments both on SNL and other DOE sites across the U.S.

Figure 1. SNL Mixed Waste Landfill

Project Description

The alternative landfill cover system technology, which is planned for this deployment, is referred to as an evapotranspiration (ET) cover combined with

an integrated fiber-optic performance monitoring system. The ET cover is a soil cover with an engineered vegetative covering. This cover encourages water storage, and enhances evapotranspiration (see Figure 2). The ET cover consists of a single, vegetated soil layer constructed to represent an optimum mix of soil texture, soil thickness, and vegetative cover. Many studies (Nyhan et al. 1986, Nyhan et al. 19 90, Dwyer 1997b) show that a well-designed simple soil cover can be very effective in preventing excessive erosion due to runoff and percolation, particularly in arid environments. The vegetative cover serves as the principal mechanism inhibiting soil moisture movement through the cover and into the waste. However, the texture and depth of soil provide the means of storing soil moisture in the zone where it is available to plants. These studies have shown that vegetation in arid and semi-arid environments has the potential to remove nearly 100% of the moisture that infiltrates into the soil as long as plant roots can access the moisture. Under these conditions, this means that the potential for deep percolation of soil moisture is very low. The vegetation cover will consist of an optimum mixture of species, including cool season and warm season species. Additionally, species with different growth forms (such as grasses, shrubs, or trees) will be used to revegetate the site in order to spread evapotranspiration over as much of the growing season as possible. At normal precipitation for Albuquerque (20.6 cm / yr.), evapotranspiration uses nearly 100% (averages 99.9%) of the precipitation that infiltrates into the soil based on standard model predictions (Hakonson 1996). Maximum infiltration depth for precipitation at the MWL has been shown to be approximately 2 feet below ground surface.

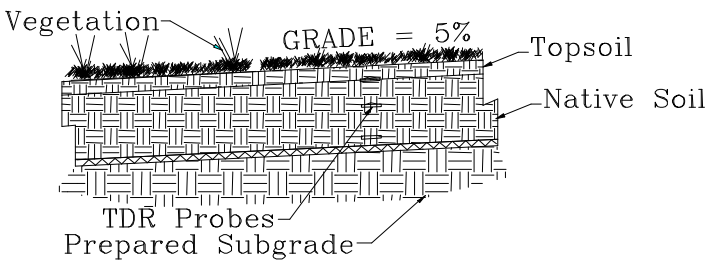

Figure 2. Evapotranspiration (ET) Soil Cover

Advantages

Money is saved since the proposed technology alternative has a significantly lower life-cycle cost than the baseline. The life-cycle cost reduction for closure of the MWL alone is estimated to be $3.6 million. Risks are reduced because the alternative is expected to perform better at limiting water percolation through the cover, thus reducing a major potential source of contaminant migration. In addition, an improved monitoring system will detect problems earlier when impacts are smaller and less costly to correct. Since the MWL represents just 1 of 3000 DOE landfill sites, application of this alternative technology at even a fraction of these sites should provide substantial cost saving, and reductions in risk.

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