LEACHATE MANAGEMENT THROUGH MINIMIZATION

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Introduction

Communities across the nation are faced with addressing landfill leachate management due to increasingly stringent water quality regulations and the cost of treating these waste waters. Federal Subtitle D and state solid waste regulations require proper and prudent management techniques. When leachate volumes became unmanageable at a coastal North Carolina Subtitle D Facility, immediate measures needed to be taken to minimize the problem. Although there are many ways to manage leachate treatment and disposal, a simple method is to reduce and/or minimize the generation of leachate in the first place. Utilizing this concept, a unique approach to reducing leachate was implemented which included both temporary and permanent geosynthetic rain covers (GRC).

Background

The landfill, covering approximately 18 acres, began receiving waste in October 1993. As part of the site's original permit application, the primary method of leachate management was recirculation. In this scenario, leachate was removed (pumped) from the landfill cells to two (2) on-site leachate storage impoundments (LSI's). Leachate was then periodically pumped to the landfill for injection into the waste, and subsequently transferred back to the LSI's, at which time the leachate received aeration and settling. Ultimately, leachate was hauled off-site from the LSI's to a local wastewater treatment plant for disposal. This was being performed at a cost of just under $0.03 per gallon. However, as a result of significant rainfall and with the in-place waste beginning to approach saturation, the leachate volumes became increasingly unmanageable and leachate recirculation was terminated in early 1995. It is estimated that the facility was generating an average of approximately 15,000 gallons per day with peak flows over 30,000 gallons per day.

By August 1995, the LSI's were at capacity; containing a total of approximately 3 million gallons of leachate, and measures had to be taken immediately to solve the problem. Although the leachate was being hauled to a nearby POTW for ultimate treatment and discharge, the agreement between the landfill and the POTW was not guaranteed and the landfill was notified that discharging could be terminated at any time. The back-up treatment agreement with a second POTW was in-pace but was essentially cost prohibitive to implement, particularly considering the volumes stored on-site that would need to be disposed.

The Use of Geosynthetic Rain Covers

As an initial step in August 1995, HDR assessed the facility's overall leachate management program. The results of the assessment, as approved by the North Carolina Department of Environmental Health and Natural Resources (NCDEHNR), recommended the installation of geosynthetic rain covers (GRC). The primary difference, however, was to deploy both "temporary" and "permanent" GRC's in combination to cover all exposed areas of the landfill. In this manner, the generation of any "new" leachate would be precluded.

The uniqueness of this application was that the GRC's were placed not only on lined areas yet to receive waste (i.e., above the protective cover material) but over the entire exposed waste/cover soil area of the landfill. Based on HDR's analysis, and in discussions with site operation personnel, the only areas that were not covered were sloped (greater than 20%) areas (amounting to about 2 out of the total 18 acres) and the main access road (constructed from reclaimed pavement asphalt).

The other major action HDR recommended was to expedite landfilling in the areas that had not yet received waste (an approximate 2 to 3-acre area) so that the entire lined area had at least one lift of waste. This would act as a buffer and, if performed quickly enough (3 to 4 months), would be incapable of reaching field capacity and would all but eliminate the formation of any leachate from this portion of the site.

GRC Design Considerations

In choosing the materials to be utilized as GRC, the following design/operational factors were considered:

- UV Stabilization;
- Resistance to extreme temperatures and wind;
- Maneuverability (weight);
- Resistance to leachate exposure;
- Low permeability;
- Durability (strength); and
- Cost.

It was also recognized that the temporary GRC would have differing requirements from the more permanent GRC since it would be used for a much longer period of time, over larger areas, and would need to be reused.

Temporary Geosynthetic Rain Cover

HDR's recommendations were initiated and bids for installing the GRC were received in September 1995. As a result of the base liner design configuration, landfilling operations were redirected to the 3-acre area in the southwest corner of the site to achieve the goal of having one lift of waste over the entire landfill. Until this area could be filled, however, the 3 acres were covered with a temporary GRC consisting of a 6.5-mil thick, black/white, scrim-reinforced HDPE geomembrane with taped seams and waste tire ballast (white side up). As landfilling in this area of the site progressed, the GRC was rolled back to allow waste placement. As runoff/rainfall water was collected on the temporary GRC, it was pumped into the adjacent stormwater channel at the perimeter of the landfill. Although there was a problem with the ballast on the temporary GRC, this area of the site was filled by early January 1996 and the temporary GRC was no longer needed.

Permanent Geosynthetic Rain Covers

Design, procurement, and installation of the "permanent" GRC was completed in early November 1995. This GRC was designed as a more durable member since it was planned to be in place in areas that would not receive waste for 6 to 12 months and was intended to be relocated and reused as landfilling operations continued. The permanent GRC was designed as a 16-mil, black/white scrim-reinforced HDPE geomembrane with an anchored rope-tire chain and perimeter anchor trench ballast system. The seams were field-sewn and taped with a high-strength asphalt based industrial tape. A total of approximately 13 acres of permanent GRC was installed (white side up).

Material properties of both the temporary and permanent GRC's that were installed are provided below.

Property	Temporary GRC 6.5-mil	Permanent GRC 16-mil
Weight	3.1 oz/sq.yd.	7.6 oz/sq.yd.
Grab Tensile Strength	85 lbs (warp)	267 lbs
Bursting Strength	120 psi	469 psi
Hydrostatic Resistance	40.4 psi	427 psi
Tear Strength	20 lbs (warp)	66 lbs
Total Thickness	6.5 mils	16 mils
Color	black/white	black/white

Conclusions

Prior to HDR's involvement, the facility was generating, on average, approximately 25,000 gallons per day (gpd) of leachate. Following the installation of the GRC's, in late 1995, average site leachate flows are down to less than 5,000 gpd. The local POTW which had been treating and discharging the hauled leachate suspended the receipt of any additional leachate in January 1996. However, as a result of the significantly reduced flows, the landfill has several months to implement other alternative disposal options. In this regard, HDR is currently assisting the client in finding a more permanent leachate treatment and disposal solution for the site to utilize in concert with the GRC's.

In summary, all reports indicate that, for this project, geosynthetic rain covers provided a cost-effective, reliable barrier against stormwater infiltration and leachate generation on the landfill site.

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