



*This article is the third installment in the four-part Landfill Profiles series prepared by HDR Engineering Inc.*

In the northwestern tier of Pennsylvania, necessity breeds ingenuity. Faced with the high costs of leachate management, treatment and disposal under the federal government's Subtitle D, officials at the Kness Landfill, Mt. Jewett, Pa., have found ways to treat leachate while staying within site-specific permitting limitations.

The McKean County Solid Waste Authority (MCSWA) has operated the Kness Landfill since 1990; it was established in 1970. The site's first clay liner was constructed in 1983 beneath a 20-acre area. The system also included a limited leachate collection piping system leading to the on-site, lined leachate impoundments which provided aeration and sedimentation before discharging the liquid to the Little Sicily Run, south of the site. The impoundments' total volume is approximately 1.5 million gallons, which was adequate for the site's active area at that time.

After Pennsylvania's 1988 regulatory revisions, the McKean County Solid Waste Authority designed and permitted a four-cell, 16-acre, double-lined landfill expansion (Quadrants I through IV) in 1991. With a NPDES permit, the authority also constructed two on-site steel leachate storage tanks and a packaged leachate treatment system to meet a Consent Order & Agreement (COA) between the McKean County Solid Waste Authority and the Pennsylva-

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**■ A landfill's daily operations depend upon meeting costly regs. Underneath it all, the leachate continues to flow and officials must find a way to manage it.**

nia Department of Environmental Resources (DER).

**Add It Up**

In 1994, as a result of changes to local sewage planning, the DER required the authority to re-permit the site's leachate management system, terminating discharge to the on-site impoundments. The authority began hauling leachate by truck to a local treatment plant, while McKean County Solid Waste Authority officials evaluated the feasibility of piping leachate to a Mt. Jewett publicly owned treatment works (POTW) plant. If piping the leachate off-site were determined impractical, the authority would be required by the COA to build an on-site plant. The capital cost of constructing an on-site treatment facility was approximately \$1.7 million with an additional \$600,000 for a pump station, grit chamber and building. Annual on-site leachate operations and maintenance costs were estimated at approximately \$100,000.

Since 1991, operators used weirs installed in the leachate collection piping to measure leachate genera-

tion, which averaged between 5,000 and 15,000 gallons per day (gpd). Peak values following heavy precipitation were as much as 50,000 gpd. These volumes came from the 20-acre (partially closed) solid waste area, a six-acre C&D (uncapped) area and approximately eight acres of active landfill area. Also, several areas did not drain properly and tended to intermix stormwater and leachate.

MCSWA had a clear economic incentive to reduce leachate volumes. For starters, hauling the leachate would cost two cents per gallon and disposal would cost \$0.0023 per gallon until the feasibility study was completed. In addition, both the on-site and off-site treatment options would incur higher treatment and disposal costs in the future, compared to the previous leachate storage impoundments.

Meanwhile, construction of the 6.5-acre, double-lined, third quadrant also contributed to the site's leachate management concerns. Like most double-liner systems, the new area's leachate detection zone (LDZ) exhibited relatively high flows. After conducting an extensive leak detection (dye testing) program and repairing eight to 10 liner defects, LDZ leakage was reduced from more than 750 gpd to less than 25 gpd.

Due to an average gate tonnage of 250 to 300 tpd and a filling sequence which progressed from low areas to the higher elevations, the site's newly lined 6.5-acre area brought large amounts of stormwater to the leachate collection system, which also needed to be managed as leachate.

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The authority employed several strategies to reduce total leachate volumes. As a starting point, operations personnel developed a master plan of all leachate collection man-holes, piping, measuring devices, pumps and discharge/inlet points, including grid locations and elevations/inverts.

Next, the facility installed a 15-mil high density polyethylene (HDPE) geomembrane over the 6.5-acre area. This rain cover, which is sloped to a low point, collects all rainfall from the waste and any entering the leachate collection system. The rainfall is pumped off the rain cover or diverted to a surface water channel for de-silting and discharge to a channel which leads to an on-site sedimentation basin. In general, rain covers have been relatively successful at many facilities, depending upon climatic and weather conditions.

In addition to the geosynthetic rain cover (GRC), a rainflap was constructed of mounded protective cover material and a piece of geomembrane was built directly on the liner system. This structure, when draining to waterways, increases the effectiveness of the GRC and facilitates

stormwater removal from the GRC. Oftentimes, rainflaps may be used in place of the GRC. Rainflaps are widely used to divide stormwater from active site areas and to prevent it from becoming leachate.

The operations personnel also re-graded the perimeter of the fill area as well as the intermediate slopes to improve stormwater runoff and to prevent exposing protective cover material or low areas. This immediately reduced the leachate flow.

Because solid waste steadily produces leachate after reaching the point of field capacity, it's best to build the final landfill grades as soon as possible. Since late 1994, the Kness Landfill has filled the subcell area to final grades (as much as possible) to minimize the potential for reaching field capacity and subsequently producing leachate. This was discovered out of the necessity of working in small areas due to the rainflap and GRC.

Finally, officials suspected that several low spots around the landfill perimeter were generating leachate by allowing rainfall to infiltrate the sedimentation and stormwater basins, ditches and inlets. Conse-

quently, site personnel relocated channels, re-graded bench and slope areas and eliminated or relocated stormwater piping and catch basins.

As a result of these leachate reduction measures, the leachate volumes currently hauled to a nearby POTW have been reduced from between 5,000 and 15,000 gpd to 3,000 gpd to 7,500 gpd. In turn, significant cost savings have followed and will continue to benefit the Pennsylvania site as operators move toward a permanent leachate management solution. ■

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