Calculating Landfill Airspace and Value

The amount of remaining airspace is determined by the base footprint of the landfill, the steepness of the side slopes, and the maximum height of the landfill. The more waste that is received, the faster the airspace is consumed. With better compaction, landfills can squeeze more waste into that airspace.

The airspace value is the calculation of the revenue required to fund the ongoing operation of the landfill, the future capital costs, closure costs, post-closure costs, and landfill replacement costs. More detail on each component is identified below.

Operating costs – The costs to operate the landfill including staffing, equipment, customer service, maintenance, etc. Annual operating costs are estimated at $4.1 million.

Capital costs – The investments required from now until the end of the landfill's life. Includes new waste cells, leachate collection systems, haul roads, final cover, storm water management upgrades, and landfill gas upgrades. Capital costs, including final closure costs, are estimated at $50 to $75 million.

Closure costs – The costs of covering and compacting the entire landfill with clay soil and vegetation and converting it to a functional end use (i.e. walking trails).

Post-closure monitoring and care – Regulatory requirement for at least 35 years after the landfill is closed. Includes groundwater monitoring, surface water monitoring, final cover maintenance, and leachate collection system maintenance until it can be demonstrated that the landfill does not have any adverse effects on the environment. Post-closure costs are estimated at $200,000 per year.

Development of a new landfill – Includes an engineering study for site suitability, purchase of new land, roads, fencing, utilities, site grading, landfill liner, leachate collection and treatment system, weigh scales, transfer station, equipment storage, staff facilities, storm water management, etc. The cost to establish a new landfill is estimated at $100 million.

While landfill airspace is the key metric, charging customers based on the volume of waste they are delivering is impractical, therefore, landfills use scales to determine the mass of waste being deposited. The landfill attempts to pack as much waste into the airspace as possible by using heavy equipment to compact the waste as much as possible. The landfill then uses soil to cover the compacted waste and provide a driving surface to enable future operations. Landfills use a measure of apparent density, by measuring the mass of waste deposited, which is divided by the volume of airspace consumed. This density is calculated annually and the 5 year average is 0.74 tonnes per cubic metre. The more densely the waste is compacted, the less volume is consumed for the same mass of waste.

The apparent density is used to convert the value of airspace from a volumetric basis to a mass basis. A mass basis is comparable to tipping fees which can be applied to incoming waste at the landfill scales. It also can define a value, based on mass, for the operating, capital, and closure costs.