CHAPTER 7

CONCLUSIONS

Leachate recirculation was proposed in the mid-1970s as a means to enhance landfill biodegradation and manage leachate. The desire to operate landfills as bioreactors rather than waste tombs combined with the increasing costs associated with the transport and treatment of leachates and the potential for in-situ treatment of problematic landfills has increased interest in leachate recirculation. Leachate recirculation systems (LRS) provide an easily operated and inexpensive method to manage leachate, decrease landfill stabilization time, and remediate problematic landfills. The most commonly used LRS techniques are the horizontal trench and the vertical well.

The greatest challenges to full-scale leachate recirculation operations have been system design and operational control. This project has produced the first comprehensive body of information on how certain parameters, including leachate application rate, waste permeability characteristics, and daily cover placement, affect leachate routing within the landfill. In addition, this project has identified modeling and data collection requirements imperative to the success of future modeling efforts of this nature.

The following conclusions regarding the design and operation of leachate recirculation systems were based on modeling of hypothetical leachate recirculation scenarios as well as data collected at full-scale leachate recirculating landfills. The modeling was conducted using a modified form of the United States Geological Survey (USGS) software package entitled SUTRA (Saturated and Unsaturated Transport Model).

- Modeling of the horizontal trench applying leachate to a uniform waste mass suggested device spacings of 4 to 15 m depending on the permeability of the waste mass and the leachate application rate. These spacings can be considered conservative since landfill operations will most likely result in an anistropic waste mass with increased lateral permeabilties. Devices should be distanced at least 2.5 m from the landfill grade to limit surface seeps.
- Modeling of the vertical well applying leachate to a uniform waste mass suggested device spacings of 6 to 11 m, again depending on the permeability of the waste mass and the leachate application rate. These spacings can also be considered conservative due to the likelihood of increased lateral permeabilites. Modeling results did not indicate that surface seeps would be a concern for this application method.
- In order to maximize the area impacted, leachate recirculation operations should be cycled from one area to another, pumping at a relatively intense rate for a short period of time, then moving to another area.

- The lateral movement of leachate will increase as waste permeability decreases. However, as waste permeability decreases the potential for development of artesian conditions and surface seeps will increase.
- Excessive compaction may significantly lower waste permeability causing higher waste saturations and can result in the upward propagation of leachate causing surface outbreaks at high rates of flow.
- Over pumping may result in leachate seeps at the sides of the landfill or upward movement of leachate and possibly artesian conditions at the landfill surface.
- Compaction may promote anisotropic conditions with respect to permeability, increasing lateral spreading and retarding downward movement.
- The heterogeneous characteristics of waste appears to increase the rate at which the leachate moves vertically and promotes movement of leachate around low permeability areas.
- Uniform wetting could be achieved by processing waste before landfilling to produce a more homogenous waste mass.
- Daily and intermediate cover materials should be degradable in order to limit interference with leachate flow. If non-degradable materials are used, they should be breached often and at regular intervals in order to prevent short-circuiting leachate along the cover material.
- Channeled flow is major leachate movement mechanism which is not understood well at this time.