

# Financial Considerations for Landfill Post-Closure Building Development

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for

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# Finance Issues

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- Seismic design criteria is vague; criteria in CCR Title 27 for landfills and CBC seismic design criteria for buildings. The cost impacts of each need to be evaluated.
- Settlement and size of structure
  - Landfills continue to settle over time and deep foundations are needed for major structures to transfer building loads below compressible landfill unit.
  - Lateral loads can be an issue where buildings are sited on landfills. Settlement of the ground surface can reduce the lateral capacity of the foundation system.
  - Slope stability must be evaluated. Flatter slopes, larger setbacks, need to assess the effects of slope movement on the proposed development
  - Must consider settlement and corrosion in foundation and utility design

# Finance Issues (Con't)

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- Special Utility Designs
  - Vapor cut-off barriers, placards, alarms, warnings for utilities where granular bedding can be a migration pathway for gases. Leak detection systems. HDPE welded piping can accommodate more differential settlement. Settlement vaults where utilities tie into buildings. Designs to avoid penetrations into the landfill cover.
- Corrosion Protection; cathodic protection may be required to protect steel foundation components and buried metallic utilities
- Ongoing post-construction monitoring. Revenue generating property development have better mechanism to provide for ongoing monitoring, reporting and repairs.
- Costs will be considerably greater than construction at non-landfill sites.

# Strategies for Property Development

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Can side-step some issues through good technical studies and design

- Perform technical studies to develop information regarding potential site constraints.
- Existing landfill cover thickness; environmental quality of landfill cover soils; is there a potential for excavating into landfill refuse?
- Total and differential settlement; used for design of new buildings, drainage systems, surface improvement, etc.

# Design for Settlement - Examples

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- Building slab will remain at existing elevation while surrounding site (parking lots, curbs, etc.) will settle.
- Design hinged slabs (e.g., at building entrances) to accommodate settlement of surrounding grade.
- Additional measures may be required over time.



# Design for Settlement - Examples

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- Utility vault is vented for gasses; flexible utility connections (inside).
- Hinged slab at building entrance.



# Ongoing Monitoring - Example

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- Landfill regulations require periodic monitoring for methane and other gasses beneath the building structural slab.



# Strategies for Property Development

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- Landfill gas studies; is a landfill gas collection and control system needed?
- Landfill cover design studies; do they consider landscape irrigation? Surface pavements? Details on how landfill covers tie into building foundations.
- Need to make foundation and landfill gas collection system design flexible to allow for future facility expansion and tenant improvements (provide repair details).

# Repair Detail - Example

- Future tenant improvements will require cutting trenches through structural concrete slab and underlying methane mitigation system membrane to install piping, other utilities.
- Repair detail addresses both structural slab and membrane.

