The City of Calgary Spyhill Waste Management Facility Phase 1 Final Closure – Evapotranspiration Cover

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Bio

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Project Engineer

I’m an environmental engineer and project manager with AECOM’s Environment business line.

Over eleven years of experience with waste management and northern remediation projects.

Presentation Agenda

01 Site Layout and History
02 Site Closure Objectives
03 Alberta Environment and Protected Areas Landfill Closure Requirements
04 Evapotranspiration Cover Design
05 Construction Overview
06 Post-Construction Monitoring and Reporting
07 Acknowledgements

Site Layout and History

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Original Site Layout (2016 Google Earth Image)

- Phase 1 area is approximately 450 metres by 1,500 metres
- Existing infrastructure on site included SVE system, monitoring wells, compost facility, stockpile areas, stormwater ponds, and Operations' buildings and roads

Site History

- Mainly accepted household waste
- No liner or leachate collection system, expect for east area
- Incomplete records for depth and extents of waste placement
- Original cover soil highly variable

Site Closure Objectives

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Site Closure Objectives

- Meet regulatory commitments with Alberta Environment and Protected Areas
- Achieve a design with near zero percolation rates into the waste mass (minimize leachate production)
- Continued use of the Site area for ongoing and future operations activities
- Have an aesthetically pleasing cover congruent with contiguous land uses

Alberta Environment and Protected Area Landfill Closure Requirements

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Standard Landfill Closures

- Comprised of:
  - 60 cm thick compacted clay cover
  - 35 cm thick subsoil layer
  - 20 cm thick topsoil layer

- Landfill cover alternatives can include:
  - Geosynthetics such as high-density or low-density polyethylene liners
  - Other alternatives authorized by the Director

Evapotranspiration Cover Design

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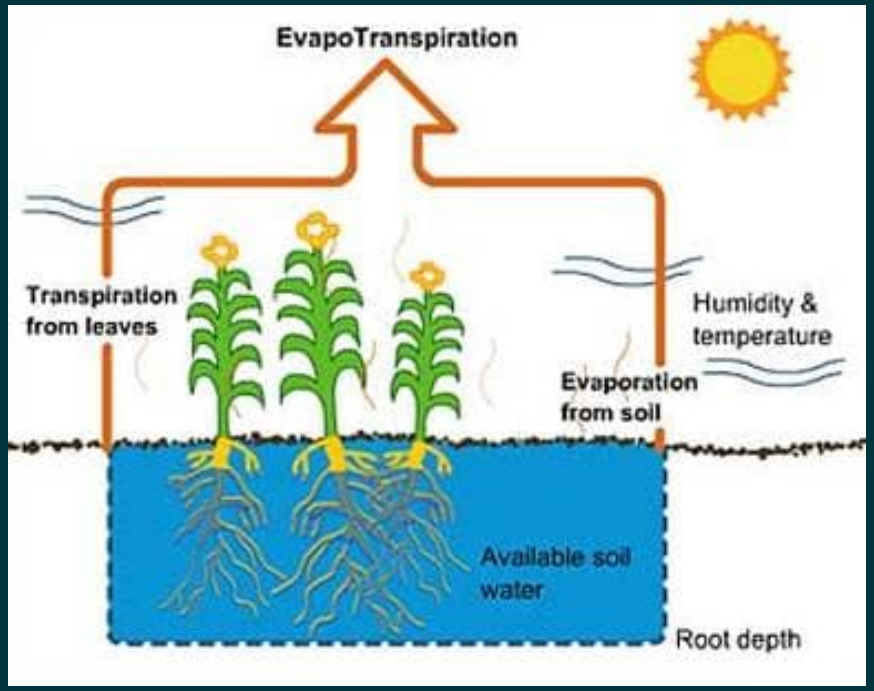
What is Evapotranspiration?

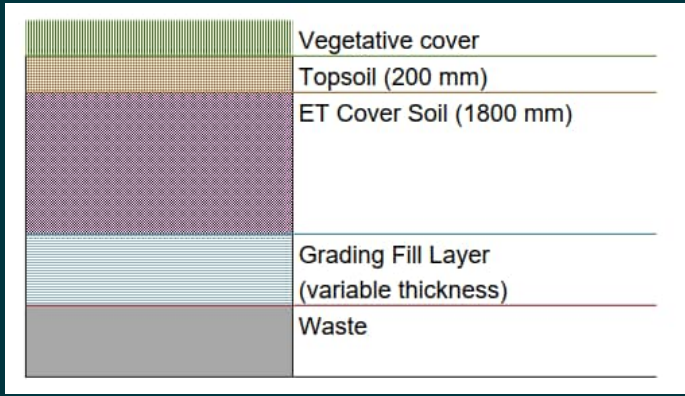
- Process of water uptake by plant roots from soil
- Water is transpired from the plant leaves and from soil
- Natural, effective process to limit water infiltration
- ET Covers are established in the US for landfill closures, particularly in the dryer climates, but aren't used widely in Canada



Phase 1 Design and ET Cover Selection

Why Was an ET Cover Selected?

- Spyhill WMF location and weather data favourable for ET cover due to lower precipitation rates and semi-arid environment
- Subsurface investigations uncovered dry ‘entombed’ waste, which also demonstrated that the site was favourable for ET cover
- Existing soils on site were tested and modelling showed that ET cover would perform equivalent to a standard compacted clay cover
- Prediction (model) of water infiltration based on precipitation, soil texture, water storage in cover, and transpiration through vegetation and the cover soils



Construction Overview

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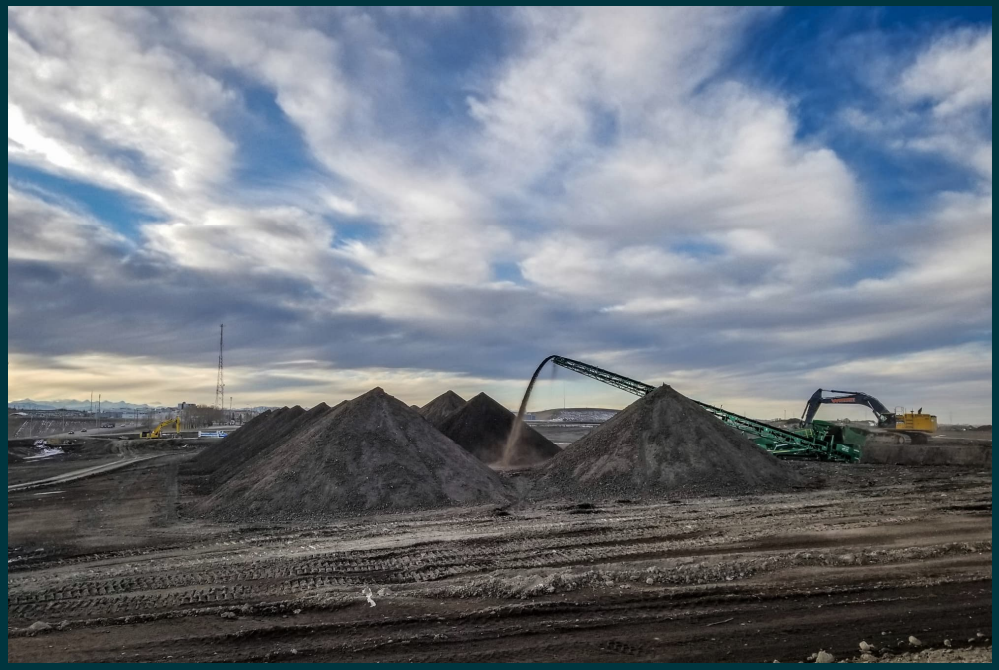
Construction Stage



Construction Stage

Construction Stage

Project Challenges

- Producing ET cover soils
  - Contractor had to screen soil used for ET and topsoil covers
  - More effort up-front work to process soils; less effort to place soils compared to compacted clay
- Establishing vegetation:
  - Extensive areas require monitoring and maintenance (ongoing)

Post-Construction Monitoring and Reporting

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How Do We Measure Success of Final Cover?

- Site Inspections:
  - Vegetation inspections and reporting
  - Determine if seed mixture is establishing
  - Delineate areas with weed growth
- Maintenance and Warranty:
  - Contractor maintenance includes watering, herbicide application, and mowing
  - Reseeding areas where vegetation has not successfully established
- Monitoring:
  - Remote monitoring of ET cover
  - Monitoring profiles containing in situ water content, suction, and temperature sensors over the entire depth of the ET cover system

Instrumentation Install

Phase 1 ET Cover Vegetated Areas

What are Some Outcomes of the ET Cover Project?

- Future applications for other waste management facilities
- Future applications for other landfills in Alberta and Canada
- Progression of landfill design and closure

Environmental Value

- Reduced import of approximately 142,000 m^3 of soil
- Would have required approximately 11,900 additional truckloads to the site
- ET Cover areas are expected to be more resilient freeze/thaw cycles

2016 Pre-construction

2023 Post-construction

Acknowledgements

- The City of Calgary's Waste and Recycling Services
- O'Kane Consultants
- Whissell contracting (Phase 2 construction and ongoing vegetation maintenance)