Re-evaluating the Life Expectancy of a Landfill

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Introduction

Greg Kuntz, P.Eng.
Manager Environmental Services
City of Regina

Prior to 2015, I worked in consulting
• Contaminated Sites
• Containment Structures
• Earthworks
City of Regina Landfill

• Fleet Street Landfill
  • Began operation in early 1960s
  • Initially a box cut and disposal
  • Currently operating on 6 engineered cells
  • 1st expansion 2009
  • 2nd expansion 2015
  • Annual disposal of approximately 250,000 tonnes/year
Landfill Life and Closure Plans

- General understanding of closure plan
- General understanding of expansion plan
- Preliminary plans had been in place since 1993
History of Expansion and Closure Reports (Only the Important Ones)

• Fleet Street Permit to Operate a Waste Disposal Ground, Saskatchewan Ministry of Environment, 2016;
• Fleet Street Landfill, Landfill cells 4, 5 and 6 – fill plan review, AECOM, 2015;
• Expansion of the Municipal Sanitary Landfill – completion of Phase 1 – project record manual, AECOM, 2015;
• Annual Landfill Reports, 2004-2015;
• Solid Waste Disposal and Recovery Facility Phase 1 – Stage 1 Operations and Maintenance manual, AECOM, 2011;
• Landfill Expansion – Phase 1 Stage 1, Hazco, 2011;
• Environmental Impact Statement (EIS) for the 3-phased Landfill expansion, AMEC, 2009;
• Report for City of Regina Fleet Street Solid Waste Disposal and Recovery Facility Life Expectancy Evaluation…..
• Annual Ground-truthing and Slope Stability Monitoring Reports, 2007/08/09, by AMEC Earth & Environmental;
• City of Regina Fleet Street Landfill Test Cover Program – Year Three Performance Monitoring Report ...........
• Project Proposal for the Expansion of the City of Regina Municipal Landfill: ...........
• City of Regina Existing Landfill Site Groundwater Monitoring Program, Municipal Engineering, 1986-2007;
• Regina Landfill Gas Assessment Fleet Street Landfill, Conestoga-Rovers & Associates, 2003;
• Fleet Street Landfill Planning Report, Engineering & Works Department, 2002;
• Fleet Street Landfill 2001 Landfill Planning, Earth Tech (Canada) Inc., 2001;
• Landfill Emissions Study Final Report, Faculty of Engineering, University of Regina, 2001;
• Fleet Street Landfill Optimization Study Final Report, Reid Crowther, 1995; and
• Fleet Street Landfill Proposed Closure Plan, Reid Crowther, 1993.
Boxes upon Boxes

We have been thinking about this for a while!
What we “Knew”

- The north portion of the landfill was ready for closure
  - We had reached maximum extent to the North and East
  - We could not go higher
- Side slopes shall not exceed 4:1
- The landfill would run out of capacity by approximately 2030
- An expansion across Fleet Street was imminent
### What we “Knew”

**Life Remaining**

<table>
<thead>
<tr>
<th>Description</th>
<th>Maximum Elevation</th>
<th>Estimated Available Space (m³)</th>
<th>Estimate Life using Annual Acceptance Rate of 250,000 m³/year</th>
<th>Estimate Life using Annual Acceptance Rate of 300,000 m³/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cells 1, 2 and 3</td>
<td>615 m</td>
<td>1,125,000</td>
<td>4.5 years</td>
<td>3.7 years</td>
</tr>
<tr>
<td>Cell 4</td>
<td>625 m</td>
<td>1,000,000</td>
<td>4.0 years</td>
<td>3.4 years</td>
</tr>
<tr>
<td>Cell 5</td>
<td>635 m</td>
<td>1,000,000</td>
<td>4.0 years</td>
<td>3.4 years</td>
</tr>
<tr>
<td>Cell 6</td>
<td>645 m</td>
<td>1,025,000</td>
<td>4.1 years</td>
<td>3.5 years</td>
</tr>
<tr>
<td>Total</td>
<td>645 m</td>
<td>4,150,000</td>
<td>16.6 years</td>
<td><strong>14.0 years</strong></td>
</tr>
</tbody>
</table>

Total time for Phase 1 landfill: 14.0 years
Time to Close and Expand

- Request for proposal issued for cap and closure activities issued in 2015
- Scope was
  - Final design for historic landfill
  - Preliminary closure for Phase I expansion
  - Gas well expansion
  - Revised groundwater monitoring system
Proposal Evaluation

- Several consulting firms submitted
- Standard cap and closure proposals were received
- One identified the potential to get more airspace while providing a good cap and closure design
- Awarded to AECOM
Reassess the Plan

• First step was to compile the information already existing
• Quickly became clear that more space was available than currently believed
• Some design parameters were based upon assumptions, some were lost in a stack of paper others were lost in staff transition
Dig Deeper

• Can we go higher?
• Are we at final extent or is additional footprint available?
• Can we increase the side slope?
• Can we improve upon proposed final geometry?
• Once closed, there is no coming back to these questions
Maximum Landfill Height

• Based on the EIS, we are not at maximum elevation
• We can go approximately 15 m higher
• The landfill will be taller than City Hall!
Are we at the Final Extent of the Footprint?

• Turns out we aren’t!
• There is approximately 3 m more space beyond our current footprint in the historic landfill
Can we Increase the Side Slopes?

- Needed a geotechnical investigation to prove this
- Most of our slopes aren’t even 4:1
- We can increase our side slopes to as steep as 3.3:1 to 3.5:1 (we are still working on that)
Can we Improve upon Final Geometry?

• All previous items improve the geometry of the landfill
• How do we maximize the space over the historic landfill?
  • “Piggy Back” up and over the historic landfill so that leachate is properly dealt with
Final Geometry

“Piggy Back Barrier”
So was it Worth it?
Absolutely!

- By asking these questions we have extended the life of our landfill by approximately 15 years from what we thought
- Historic knowledge was combined into a single document
- Clear path forward
Deliverables – What we wanted from the start

- We are getting a preliminary cap and closure design
- We are getting a gas well expansion plan
- We are getting a cost estimate to help determine our liability
- We are getting a re-designed groundwater monitoring plan for the current operation but that also transitions into closure
Deliverables – What Else we are Getting

- A design for the Piggy Back barrier layer
- A revised footprint with perimeter berm design
- A revised final geometry
- A fill plan

- 15 more years of capacity!
Does This Apply to Other Landfills?

• A clear plan is valuable at any landfill
• This is scalable – On a landfill our size it is obvious but similar extension of life can be realized on any landfill
  • 1 year = 250,000 tonnes in Regina
  • There is value in the airspace but also in delaying an expansion
  • Smaller landfills can extend their life significantly with less “new” airspace
Other Initiatives to Save Airspace

• Waste Diversion initiatives
• Air Space Efficiency Audit
• Optimizing equipment
• Optimizing soil cover activities
Lessons Learned

• This can be applied to any landfill
• More information is not necessarily better information
• Engineering reports and documents need to be translated into an actual plan to ensure continuity
• Trust but verify – avoid the myths
• Things change, so reassess – sometimes you need to bring in others to confirm what you suspect
Thank You
Questions????