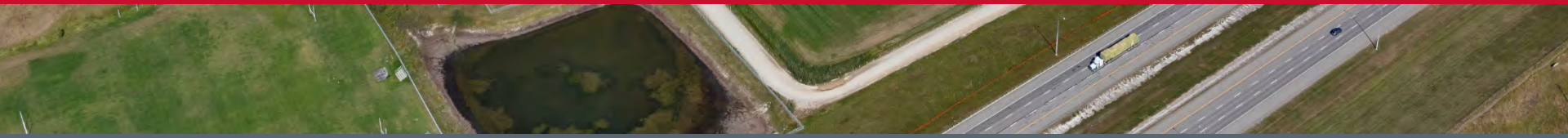
Leachate Quantity Analysis

Final Cover Performance Assessment and Budget Planning Methods



Presentation Overview

Brief overview City of Calgary Landfills

Overview of analysis completed, results, interesting findings

Tools developed to help focus where to spend your money

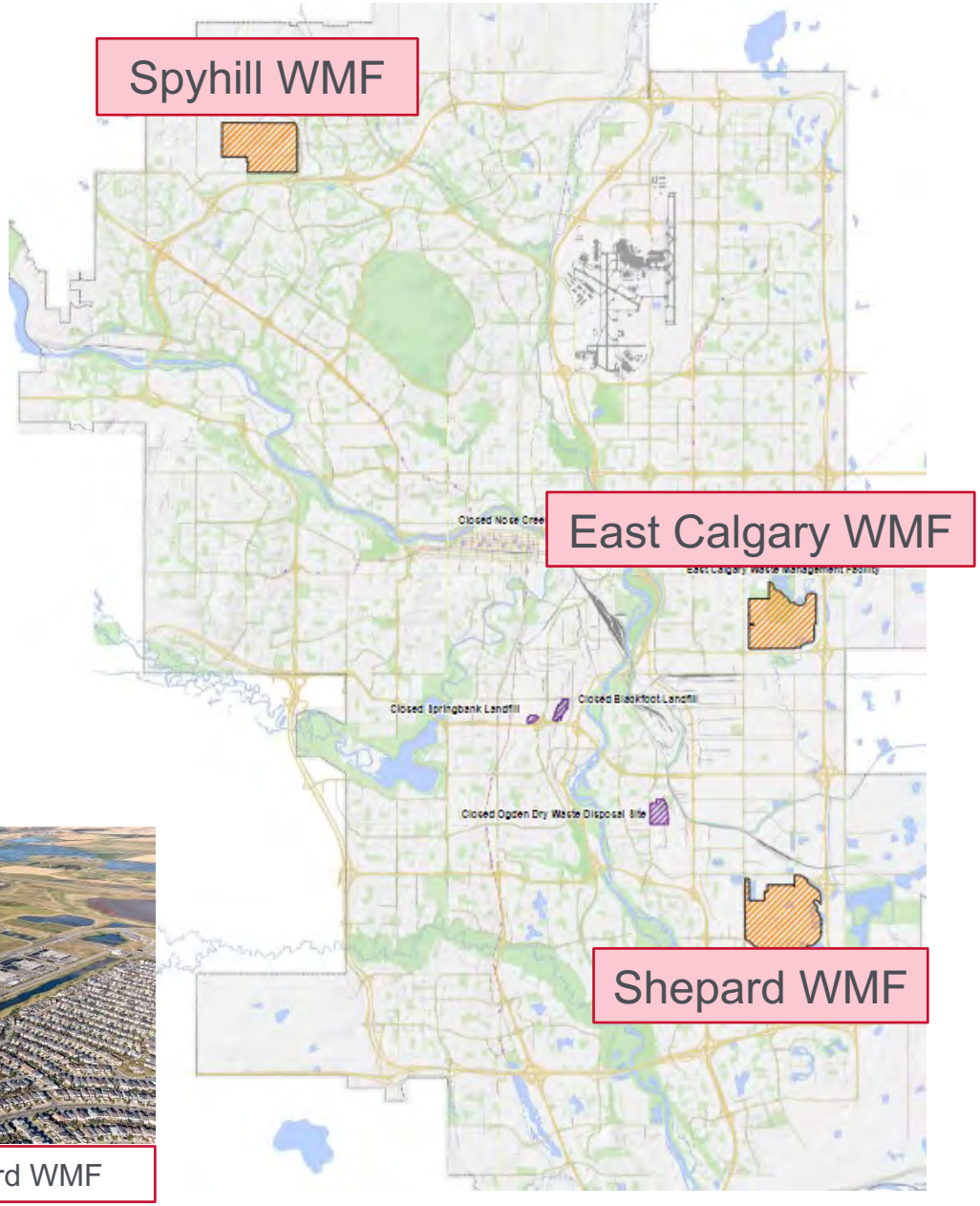
Next steps in analysis / research

Conclusions

City of Calgary overview

East Calgary WMF

Shepard WMF



Spyhill WMF


Phase 3 Cell 4
Phase 3 Cell 3
Phase 3 Cell 2
Phase 3 Cell 1
Area 2
Area 3
Area 1
Image © 2023 Airbus

What data did we have available?

- Leachate Volume data sets were readily available going back to 2010
  - Either individual cells or groups of cells assessed
- Precipitation and wind data available internally
- Lined areas determined from construction drawings
- Main focus on cells that are capped
  - Some active cells included for comparison purposes

What did we want to determine?

How are caps performing and how do they compare to each other?

Do we see changes in leachate data that indicate issues with the caps developing?

Can we identify cells where repairs are financially viable?

Can we rank areas that need additional work?

Alberta Standards for Landfills

calendar days of the date of the deficiency letter.

6.3 Post-Closure

(a) Post-Closure shall be a minimum period of 25 years following the final landfill closure.

(b) Post-Closure will begin 30 days following submission of the Final Landfill Closure Report, unless otherwise authorized in writing by the Director.

(c) In addition to 6.3(a), Post-Closure shall continue until the following circumstances occur:

(i) groundwater quality performance standards for each parameter are met within the compliance boundary;

(ii) subsurface landfill gas concentrations are below explosive limits as described in Table 5.5 at subsurface gas monitoring locations;

(iii) the leachate constituents are:

a. below the upper groundwater quality control limits established for each parameter; and

b. parameters not naturally present in groundwater is not detected in three consecutive sampling events; and

(iv) the accumulated volume of leachate is equal to or less than the previous years accumulated volume of leachate for five consecutive years.

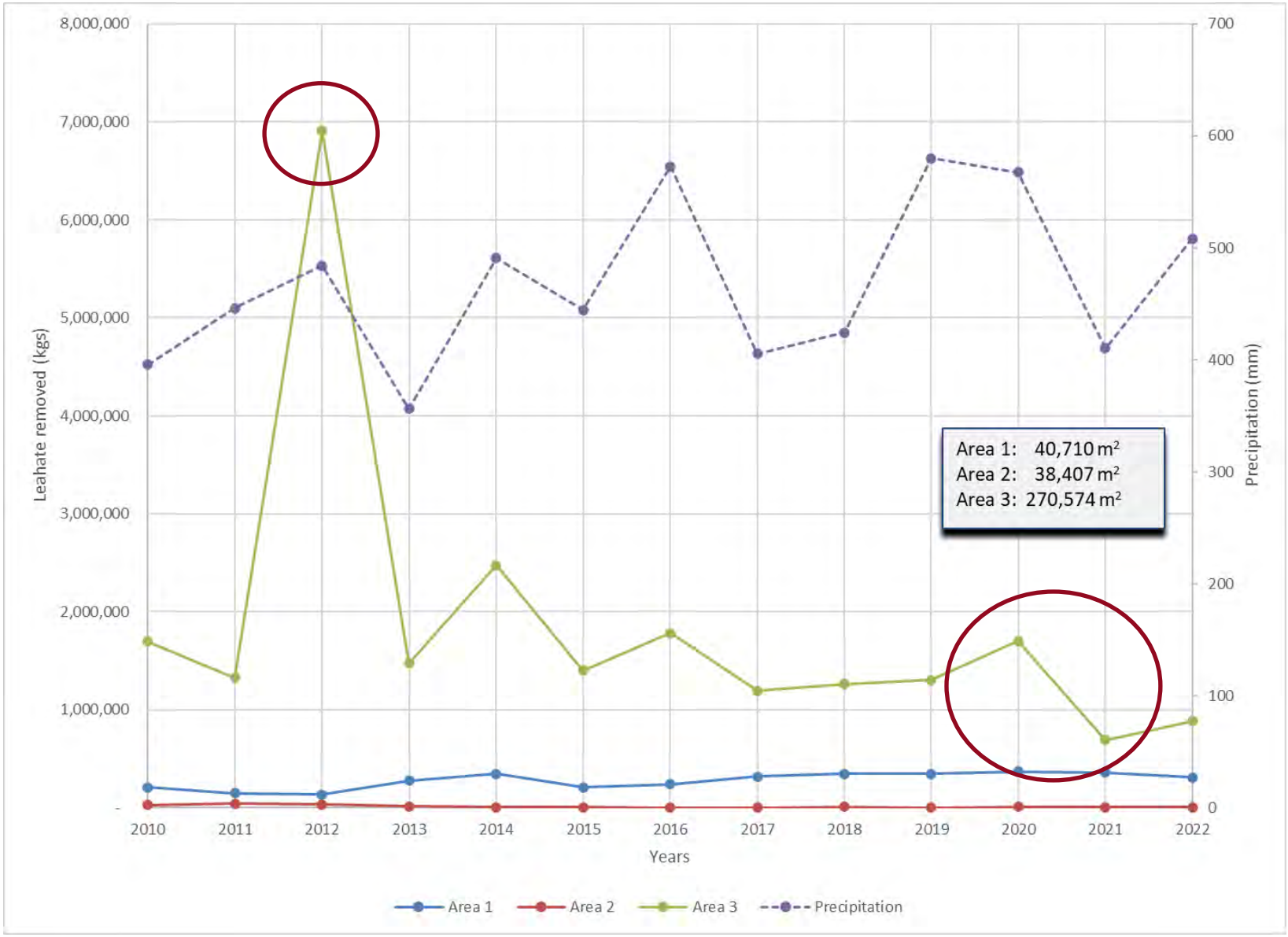
(d) During Post-Closure, the person responsible, at a minimum, shall:

(i) protect and maintain the integrity of the final cover and surface water drainage systems;

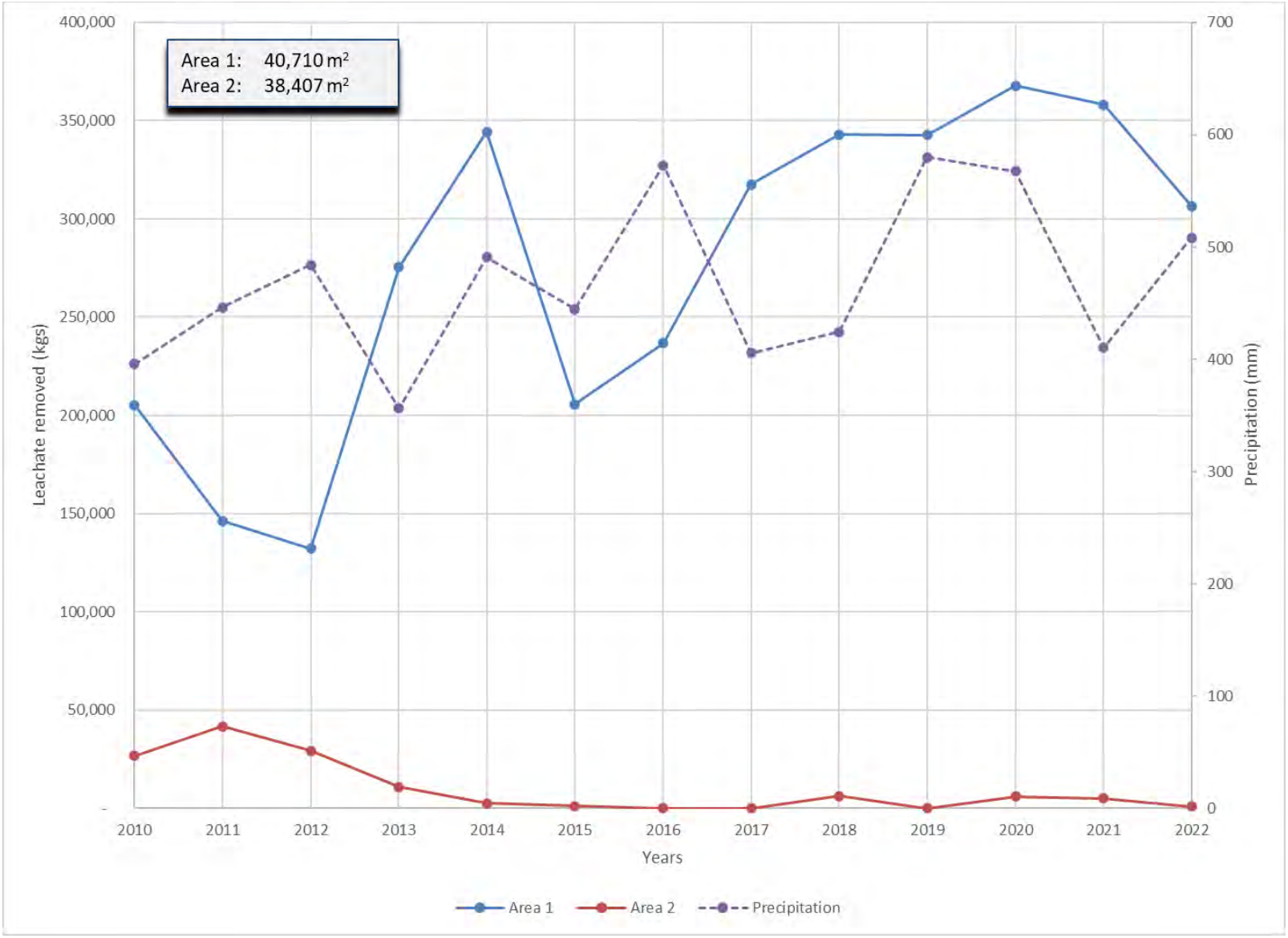
Active vs closed cells

Spyhill	East Calgary	Shepard
• Total leachate in 2022 – 5,020 m^3	• Total leachate in 2022 – 10,850 m^3	• Total leachate in 2022 – 10,350 m^3
• Closed cells leachate - 32% of total leachate	• Closed cells leachate - 55% of total leachate	• Closed cells leachate - 15% of total leachate
• 50% in 2021	• 75% in 2021	• 14% in 2021

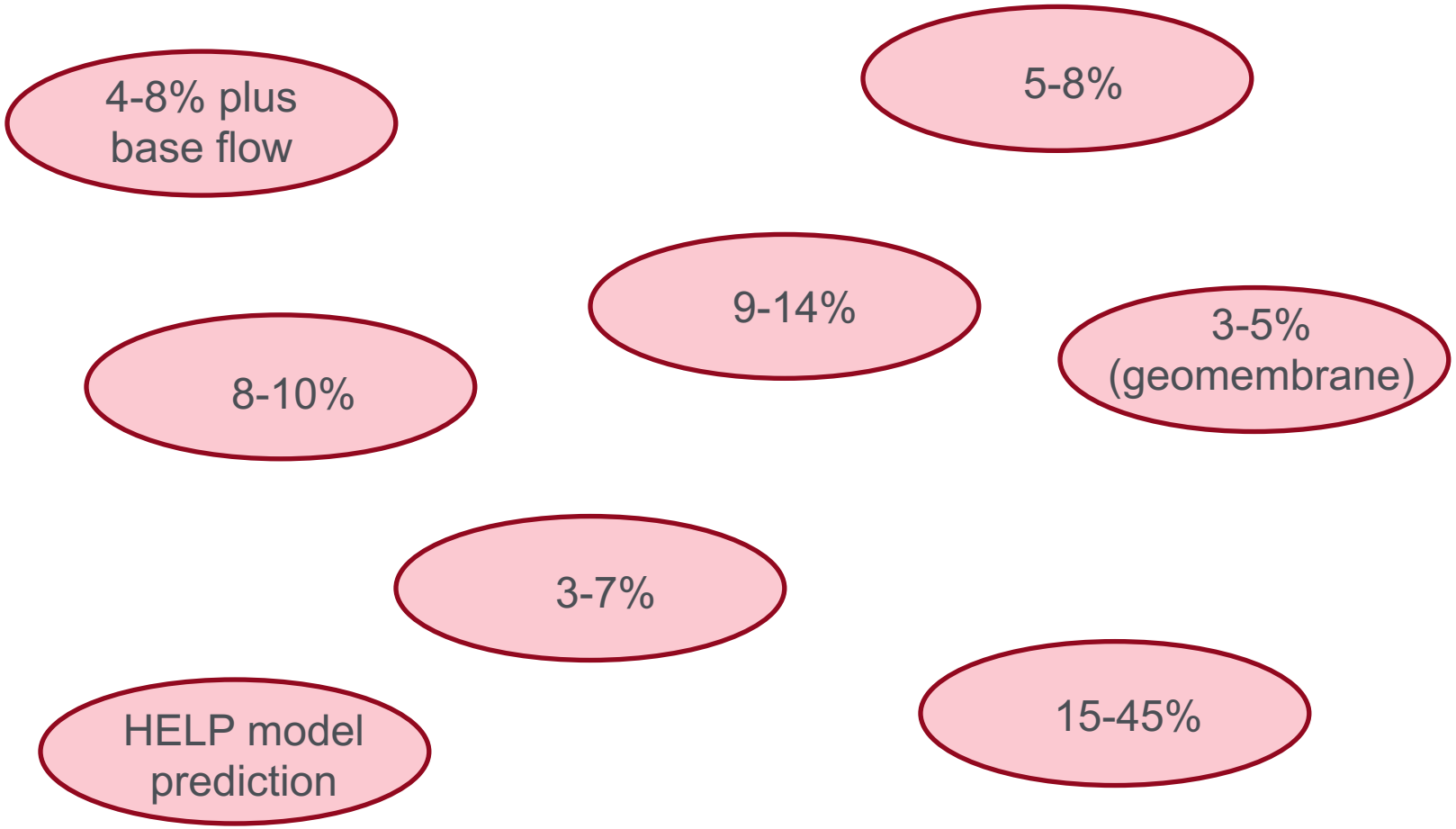
Phase 2 comparison



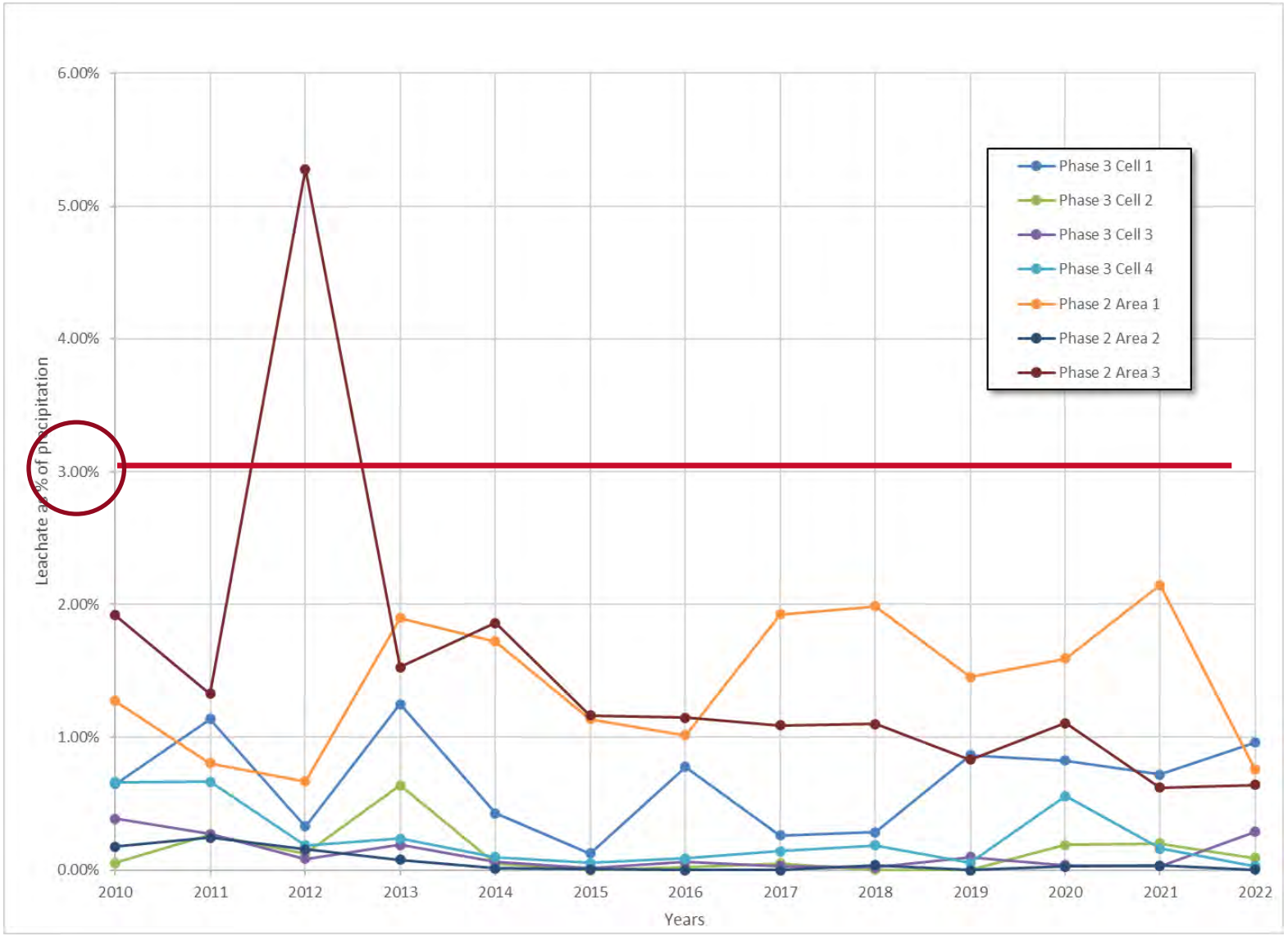
Phase 2 – Area 1 and 2 comparison



Leachate volume in relation to precipitation



Leachate as % of precipitation



Cell comparison

Sump Identifier	Area Ratio	Volume Ratio	VR / AR
Area 1	1.1	122	115
Area 2	1.0	1	1
Area 3	7.0	571	81
Phase 3 Cell 1	1.2	14	12
Phase 3 Cell 2	1.2	2	1
Phase 3 Cell 3	1.0	1	1
Phase 3 Cell 4	1.4	5	3

Leachate Reduction Potential

- If Area 1 produced leachate similarly to Area 2…
  - That would be a reduction of just under 350 m^3 per year
  - That is equivalent to almost 14 truck loads less per year (at 25 m^3 per truck)
  - Hauling and treatment cost per load are $2,000
  - Total annual savings calculated - $28,000
  - A $500,000 investment into cap improvements takes 18 years to pay back

Leachate Reduction Potential

- If Area 3 produced leachate similarly to Area 2…
  - That would be a reduction of about 1,200 m^3 per year
  - That is equivalent to 48 truck loads less per year (at 25 m^3 per truck)
  - $100k in annual savings potentially achievable simply due to expected decline

Future work

- Cost-Benefit for interim covers
- Analyze leachate quality trends (only 1 data point per year) to see how they compare/relate to leachate volume trends
- Using the Microsoft Power BI tool to create graphs and comparisons quicker
- Leachate pumping in unlined areas and data analysis
- Correlation between LFG Emissions and Leachate Production

Conclusions

- Caps are performing better than expected, but not all caps perform the same.
- There is a correlation between precipitation quantity and leachate quantity for quite some time after closure.
- Tools help in screening where investments should be made to improve caps and whether investments are financially viable.
- Data can also assist in forecasting leachate management budgets needed for new cells and when cells are closed.

Questions