



The Investigation of an Alternative Tailings Deposition System for Uranium Tailings

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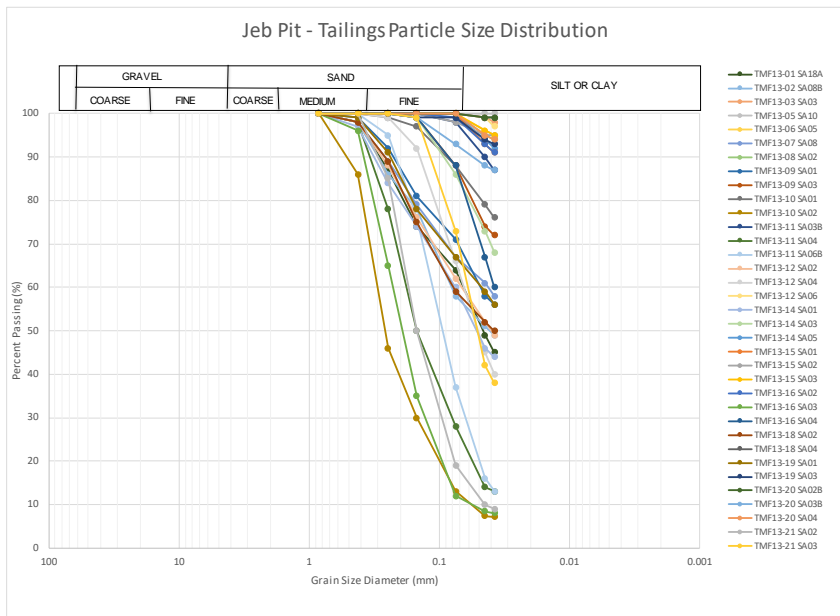
Problem Statement

- Cigar Lake tailings properties and the tailings depositional system are resulting in inefficient use of the existing pit volume.
 - reduce the operating life of the existing TMF
 - accelerate capital expenditures to construct the various phases of optimization and/or expansion.

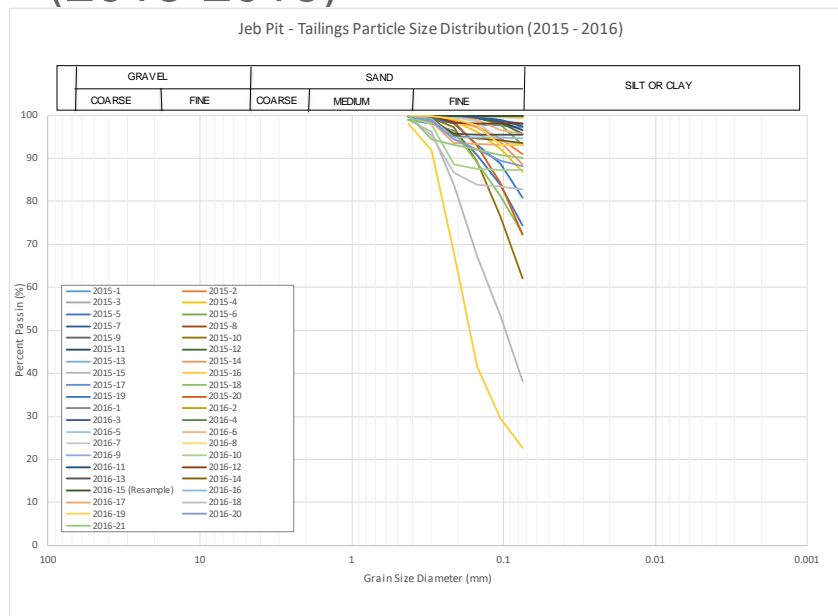


Tailings PSD

JEB/Sue Tailings PSD



Cigar Lake Tailings PSD (2015-2016)



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Deposition System & Considerations

- Tremie adopted to minimize tailings segregation
- Pumping capacity is limited
 - ~ 25% solids for CL tails using the tremie method
 - ~ 35% solids based on existing pumping system
- One point of discharge
 - sufficient capacity for deposition over winter (November to June)
 - walkway freezes-in place resulting in the inability to move the discharge point

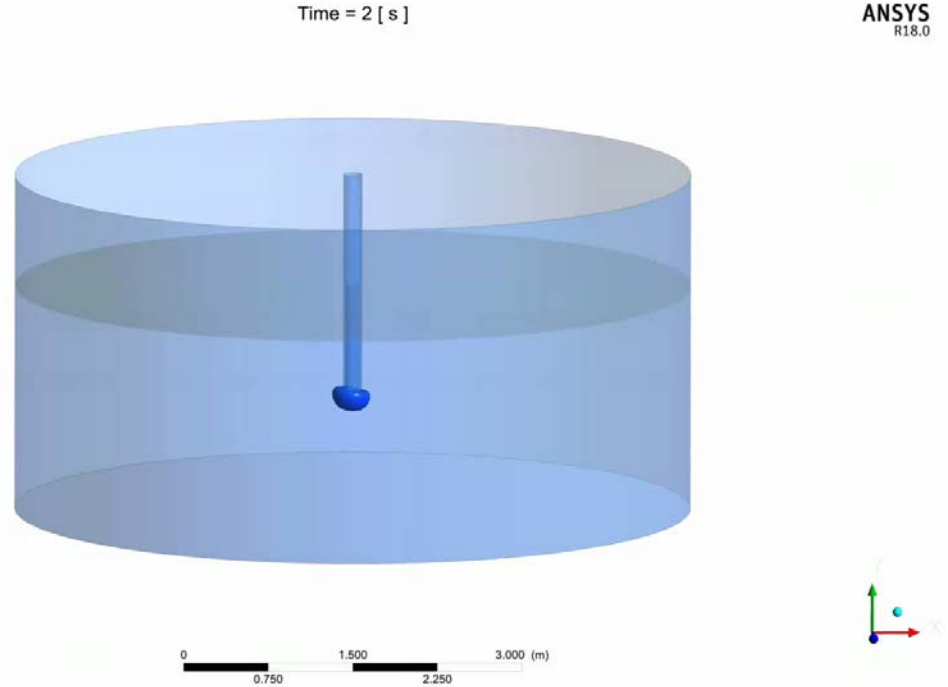
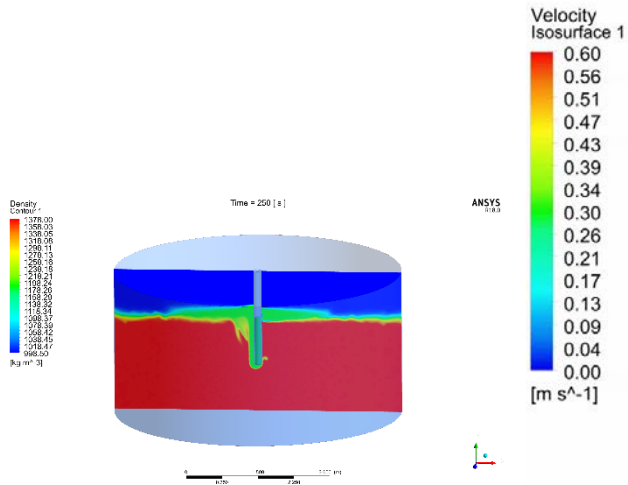


Deposition System & Considerations

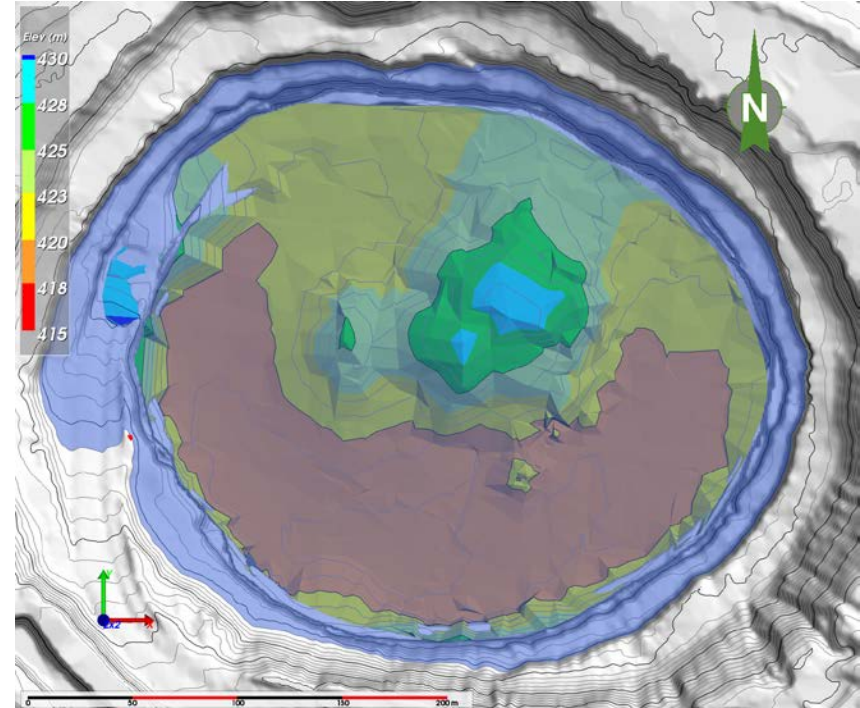
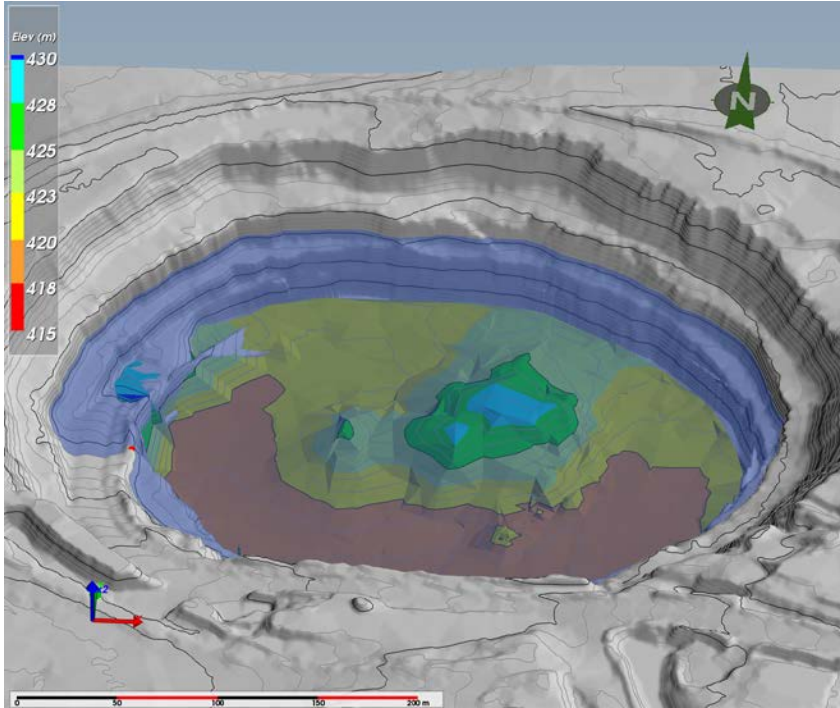
- Barge movement completed by:
 - Rigid walkway structure and manual winches
 - Wind, waves, wet conditions and safe use of walkway
- Access to deposition areas is needed to meet regulatory sampling requirements, tremie house is heated
- Quality of the reclaim may be impacted if deposition barge is too close



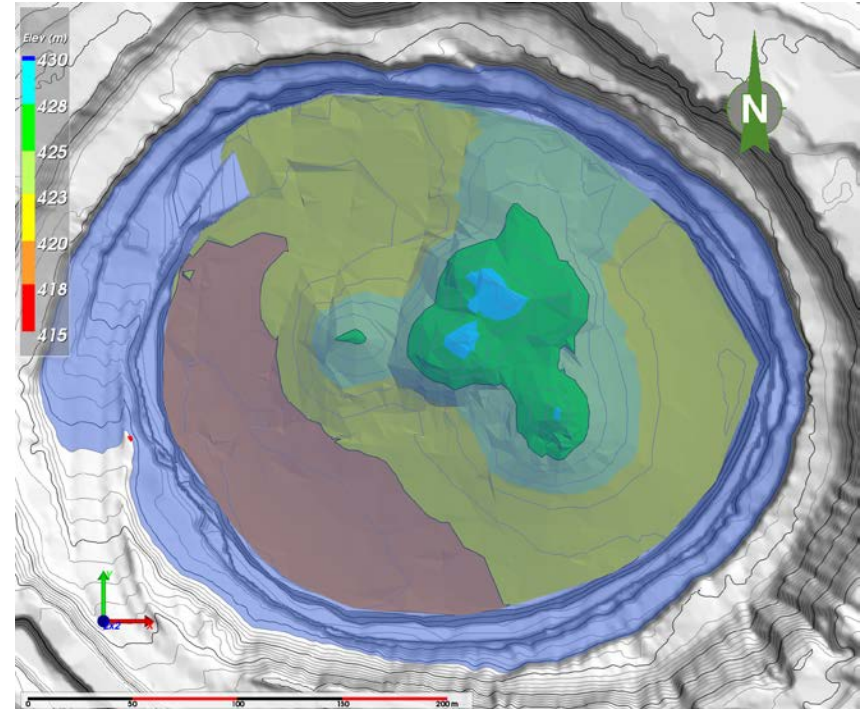
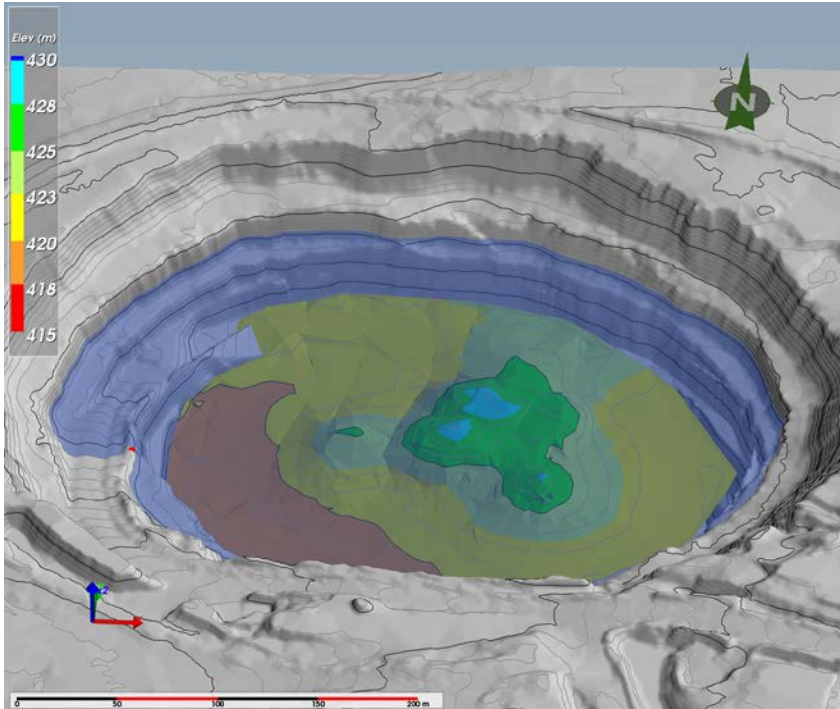
Tremie Deposition



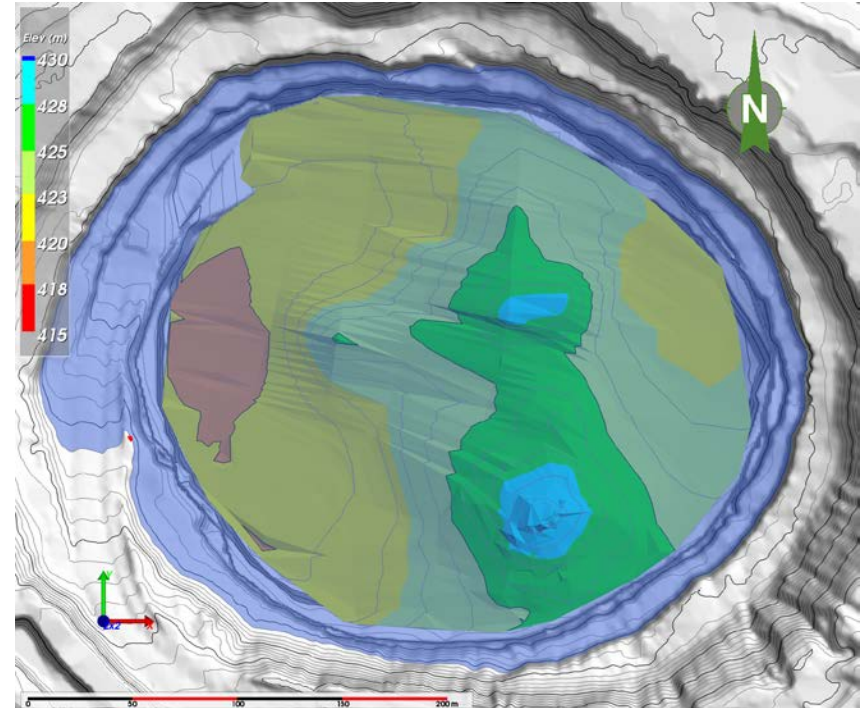
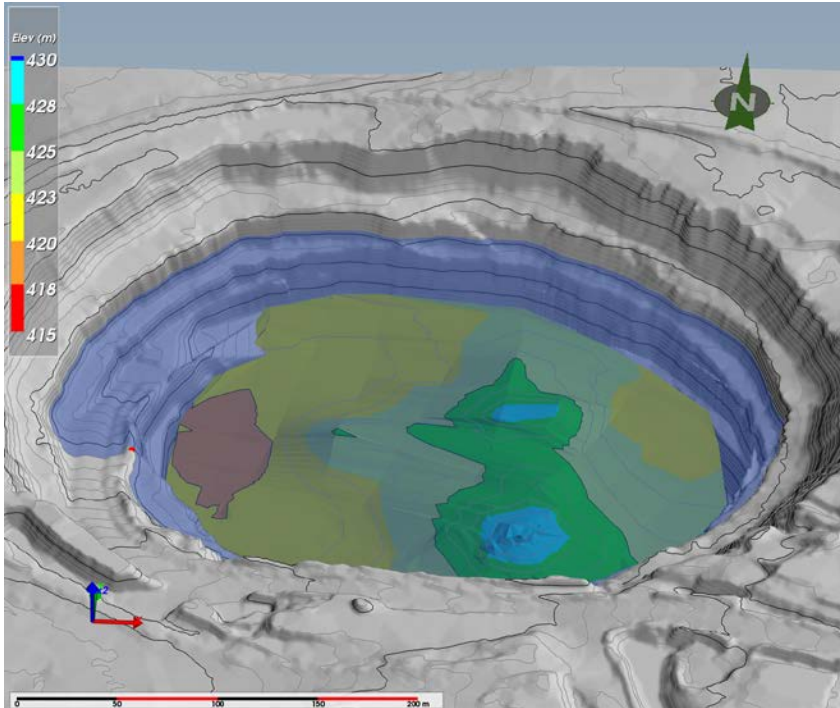
Tailings Surface Development - 2014



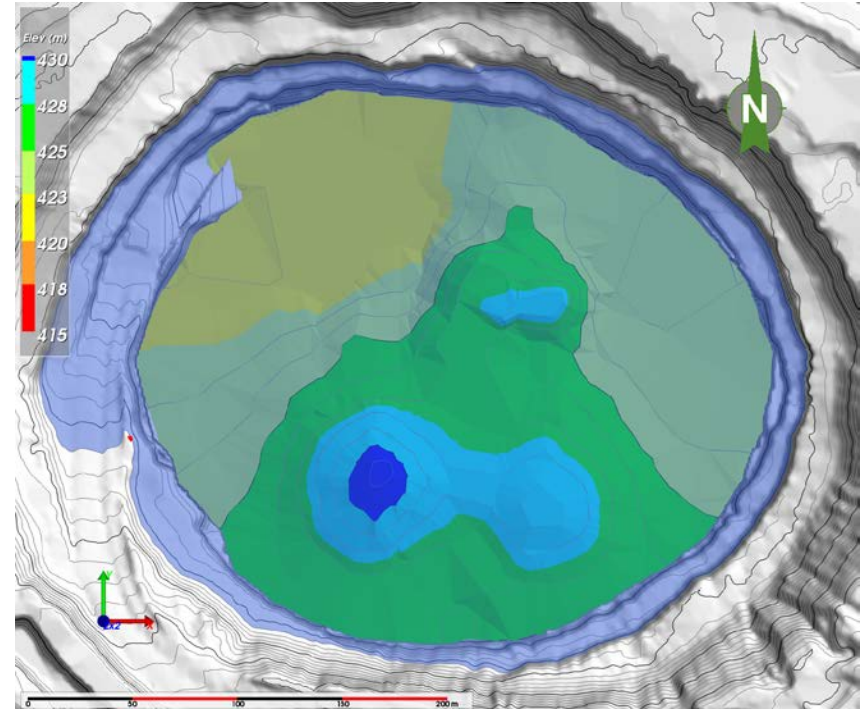
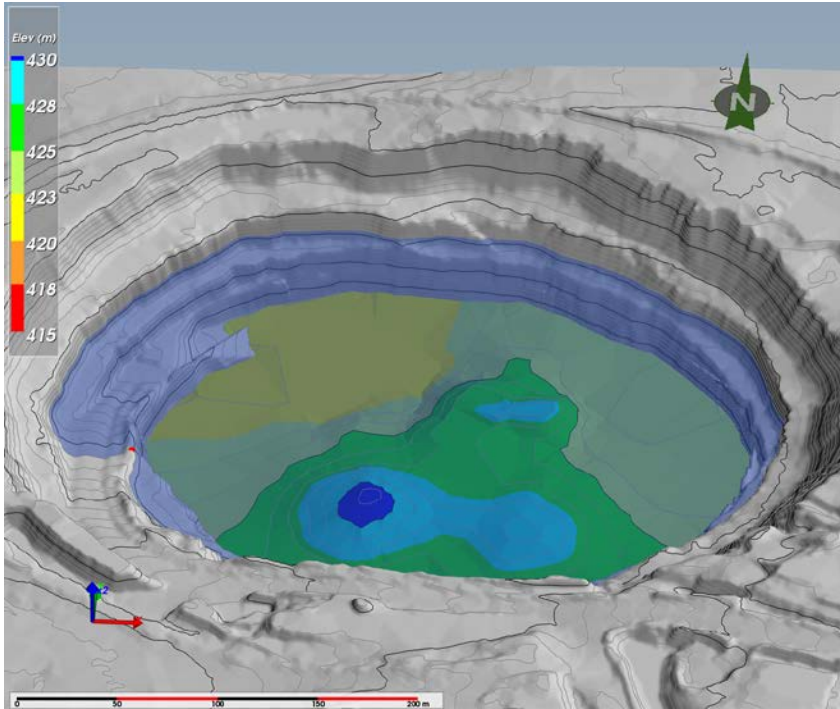
Tailings Surface Development - 2015



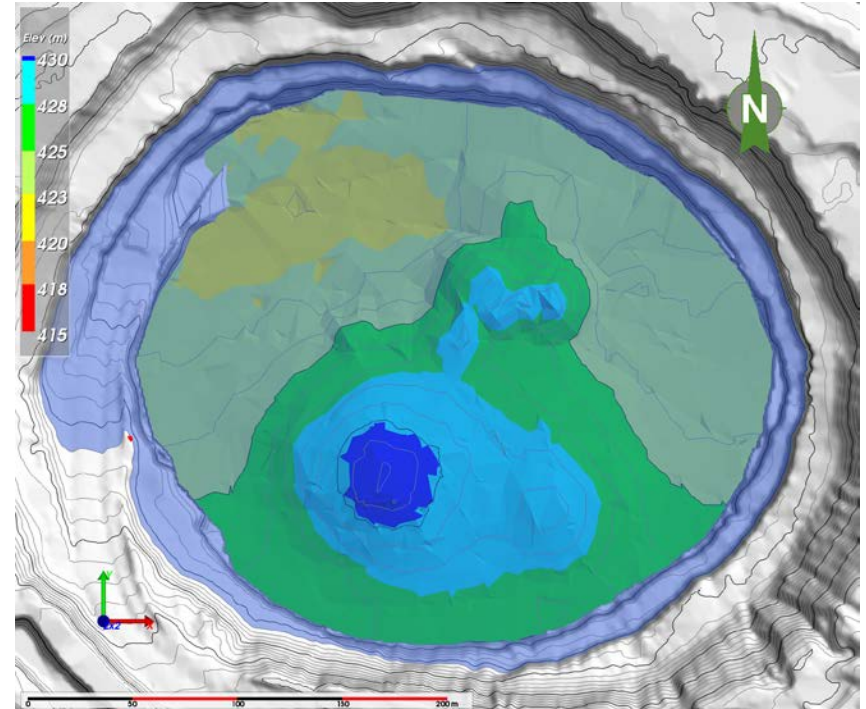
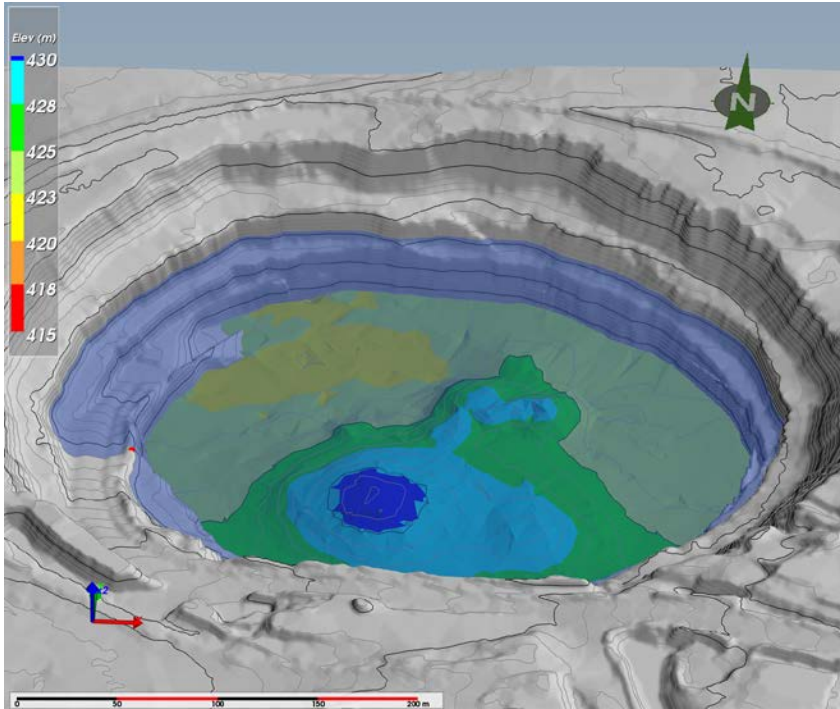
Tailings Surface Development - 2016



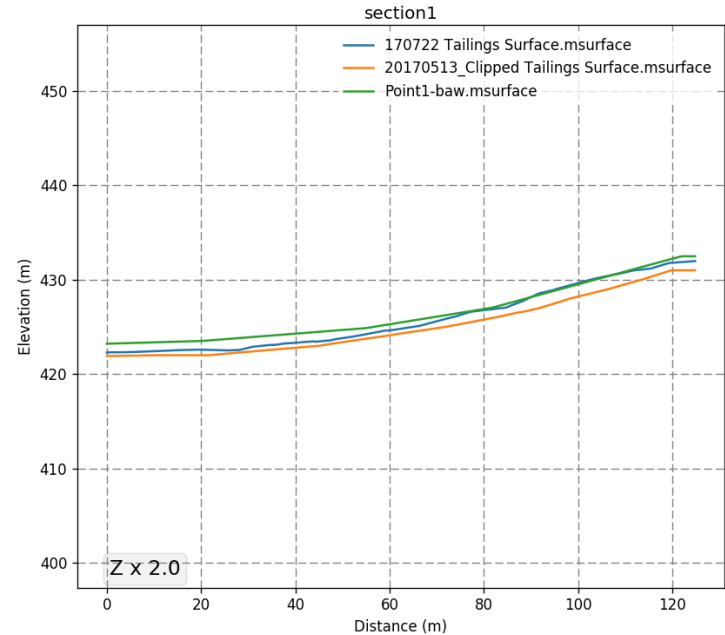
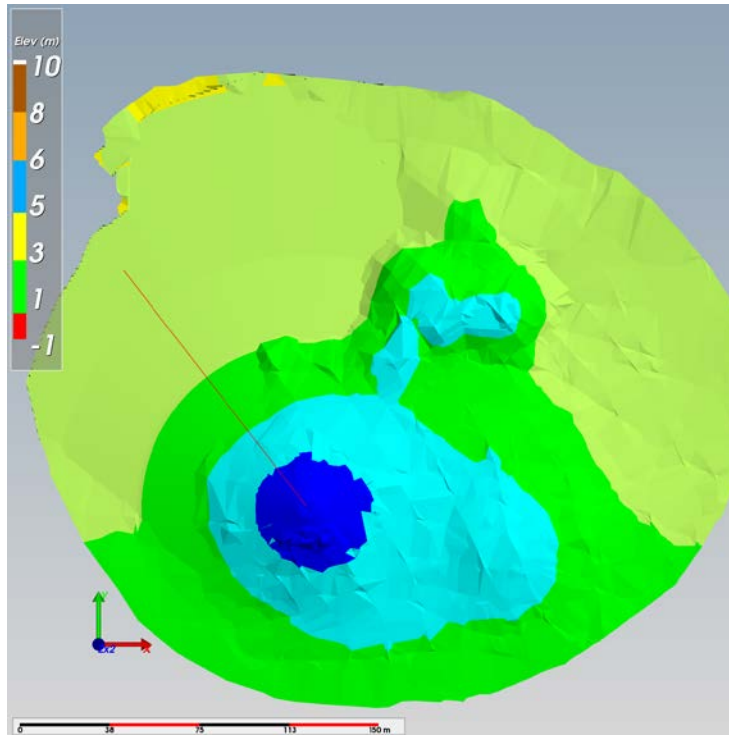
Tailings Surface Development - May 2017



Tailings Surface Development - July 2017

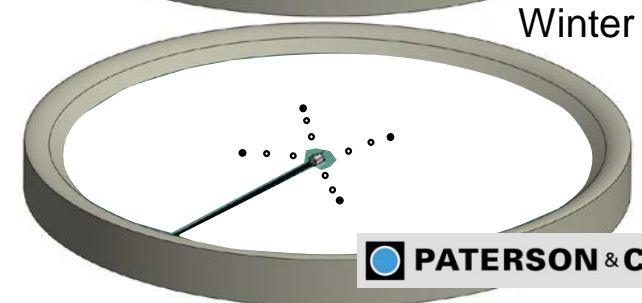
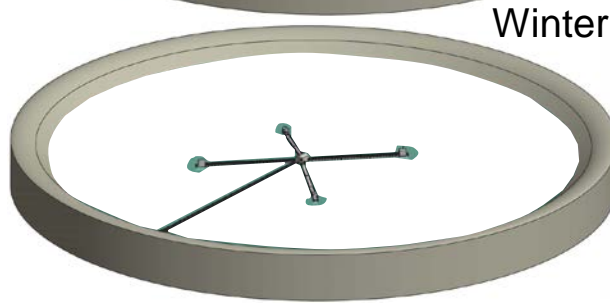
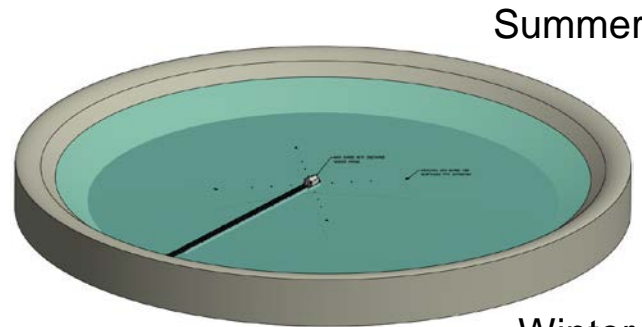
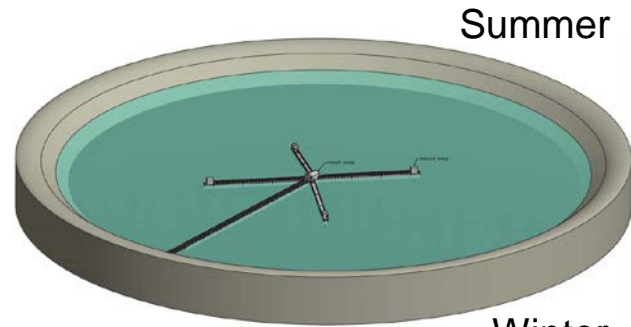


Deposition Planning – Post Modelling Comparison



Preferred Options

- Two Preferred Options
 - satellite deposition barges from the existing barge structures
 - subaqueous deposition from barge with radial pipes



Subaqueous Deposition Trial Criteria for Success

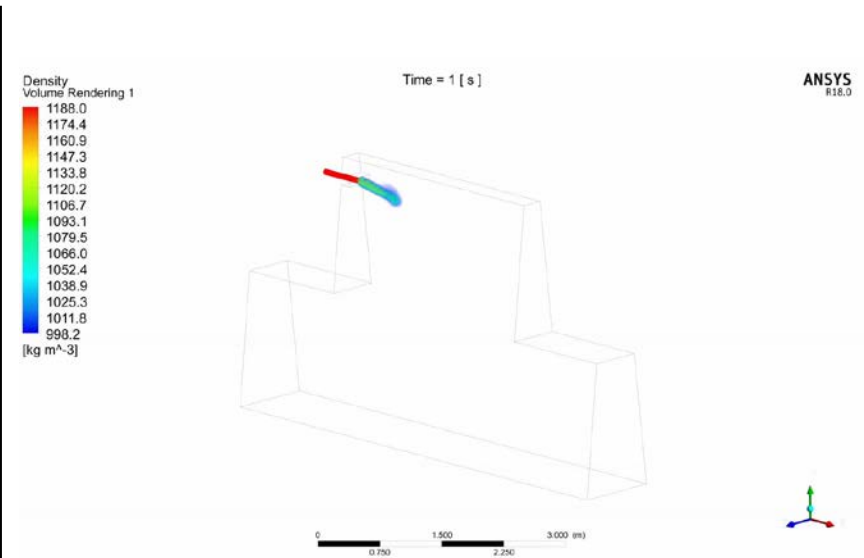
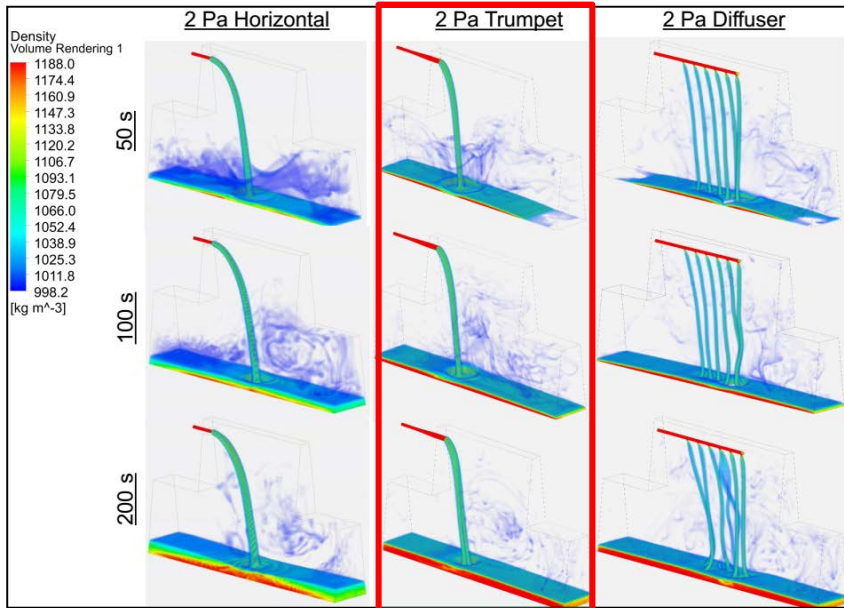
Concerns	Rational for Concern
Segregation of Deposited Tailings	<ul style="list-style-type: none">Any change in deposition method must not worsen segregation.
Prevent Blockages in the subaqueous Diffuser System	<ul style="list-style-type: none">Previous tremie design failed because it got stuck in tailings.Test work will assess if the subaqueous deposition method is at risk of becoming blocked, placing additional burden on operations.
Impacts to TMF volume <ul style="list-style-type: none">Deposition angleInitial placed density	<ul style="list-style-type: none">The volume in the TMF is a resource, we need to ensure that there are no negative impacts on that resource. Ineffective use of space may impact the construction schedule.



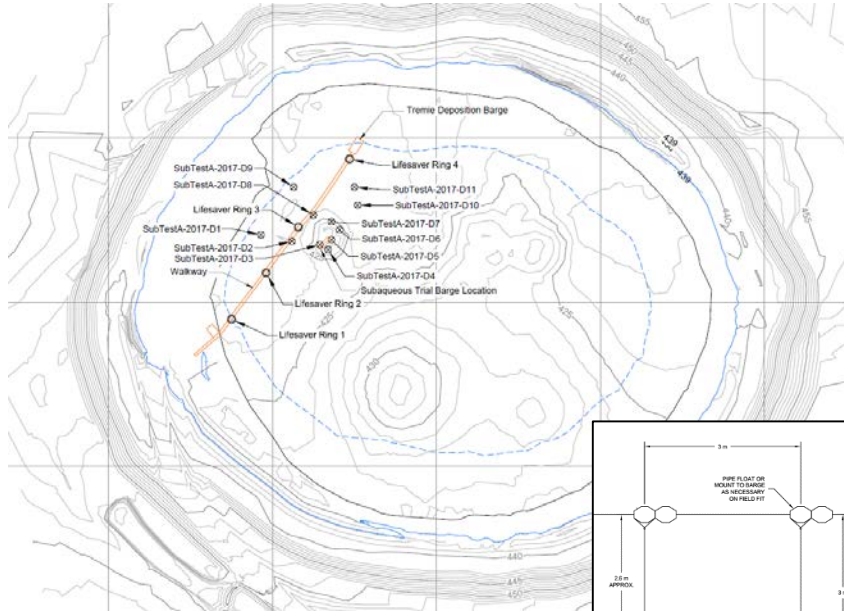
Subaqueous Deposition Planning

CFD Diffuser Evaluation Assuming a Solids Content of ~25%

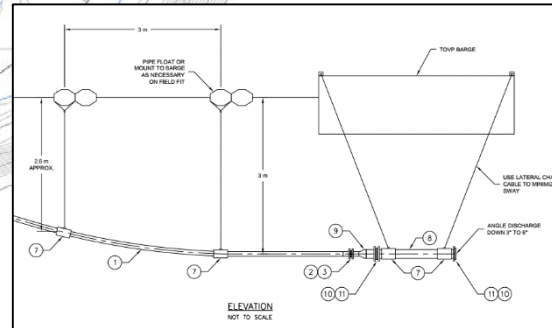
CFD Modelling – No Diffuser



Subaqueous Deposition Trial Monitoring



- Water Sampling
- Particle size sampling
- Bathymetric surveys
- Orthophotos
- Deposition Stream Videos



Field Trail Subaqueous Diffuser Concept



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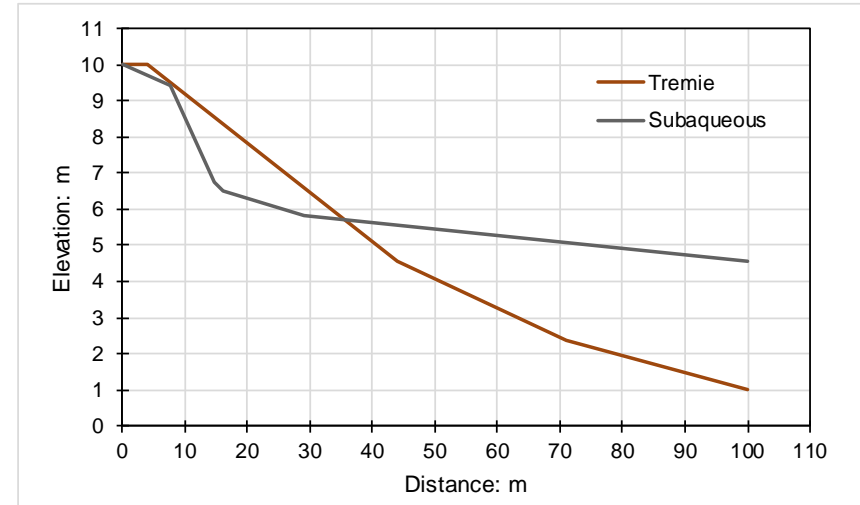
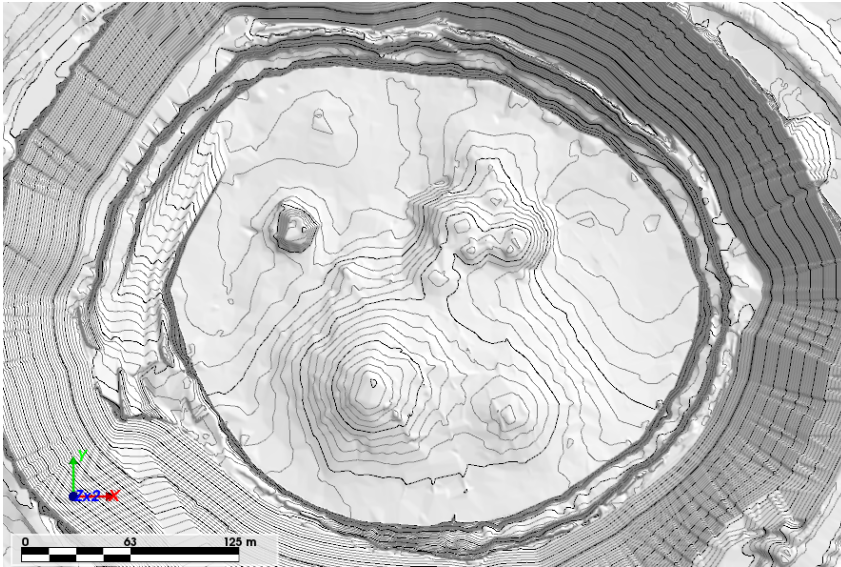
Subaqueous Deposition Trial

Trial Occurred September 24th to October 18th 2017



Subaqueous Deposition Trial - Results

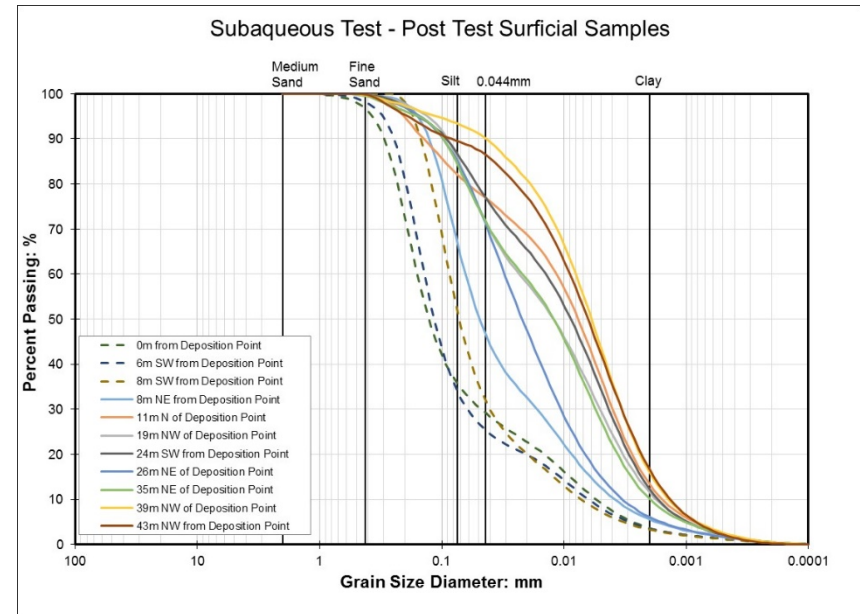
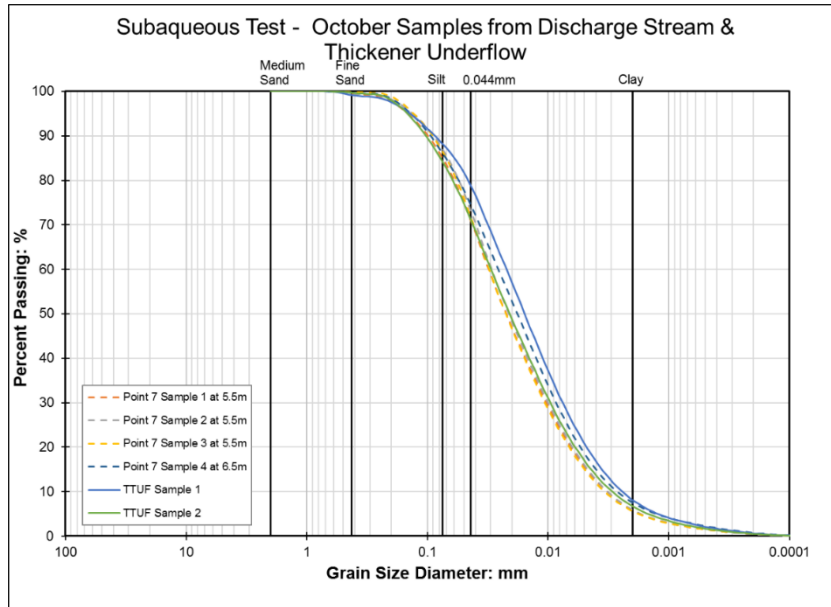
Comparison of Resulting Profile at a Fixed 10 m Deposit Height Considering Compound Slopes



Subaqueous Deposition Trial - Results

Samples Collected from the Deposition Point and Thickener Underflow between October 12 and October 18, 2017

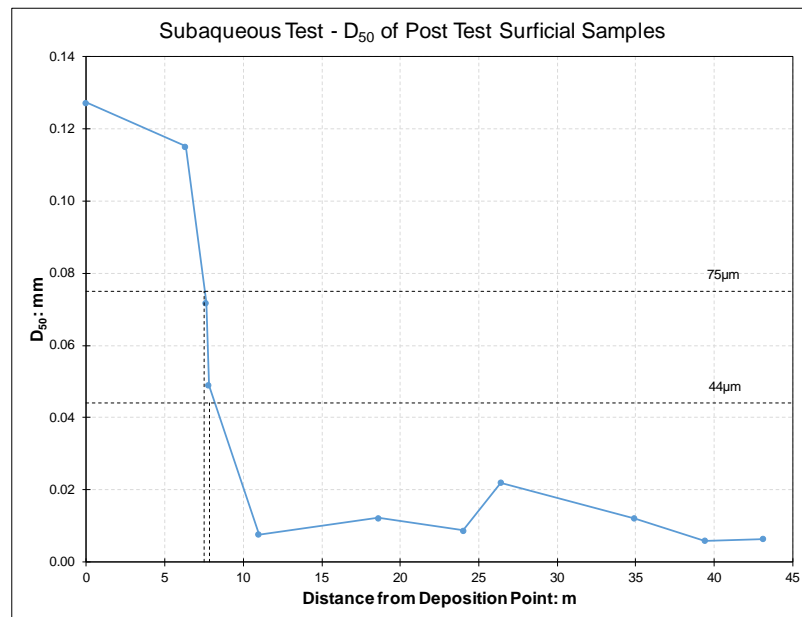
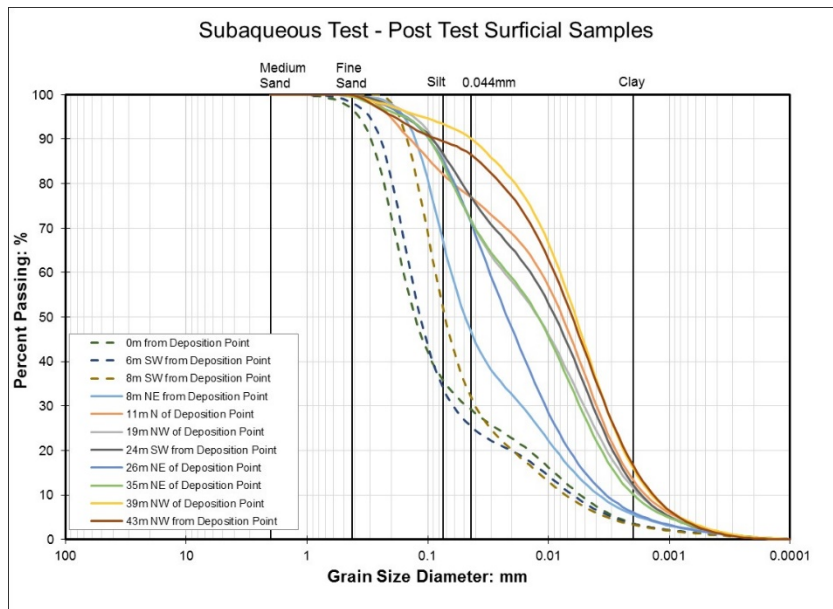
Surficial Samples Collected October 18



Subaqueous Deposition Trial - Results

Surficial Samples Collected October 18

D_{50} of the Surficial Samples Collected October 18



Flexible Walkway

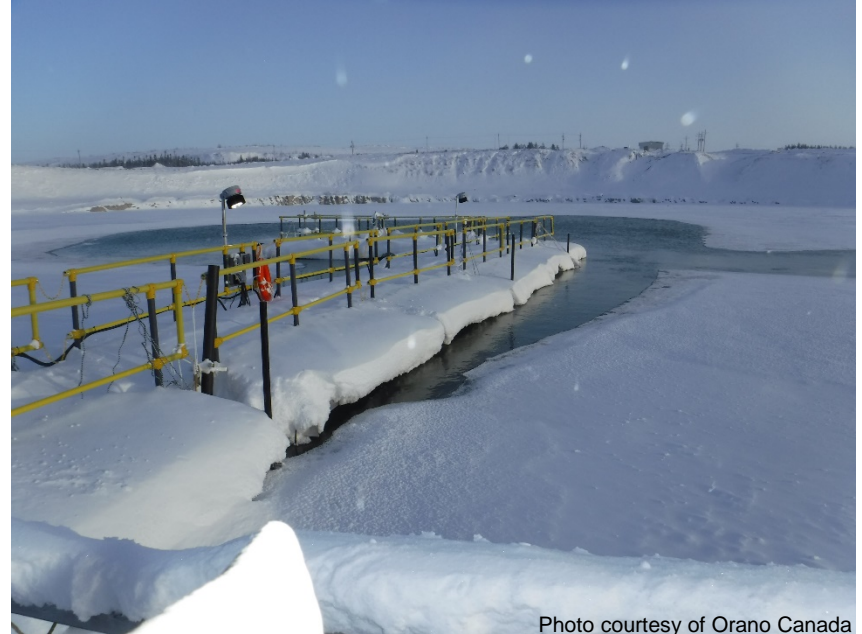


Photo courtesy of Orano Canada

Conclusions

- Subaqueous deposition:
 - provide more flexibility with deposition points
 - allows the ability to maximize the use of the available pit capacity
 - does not compromise the tailings objectives
- System was installed fall 2018 and is currently operational



Acknowledgements



Questions?



