Kearl Oil Sands Mine: Fluid Tailings Management Report for 2022

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Submitted to: Alberta Energy Regulator

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Table of Contents

List of Figures

List of Tables

Executive Summary

Throughout 2022, Imperial Oil Resources Limited (Imperial) continued to execute Kearl's *Tailings Management Plan* (TMP), in alignment with Imperial's long-term tailings management objectives:

- minimize long-term environmental effects;
- minimize the accumulation of fluid tailings (FT) to ensure timely progress to closure;
- maximize water recovery from tailings to minimize fresh water import; and
- minimize the land footprint required for tailings management and storage.

To achieve these objectives, the strategies employed by Kearl continue to be:

- design with the end in mind, to create a sustainable closure landscape;
- treat tailings, including flotation tailings (FLT) and fluid fine tailings (FFT), prior to accumulating large volumes of fluid tailings;
- deposit fluid tailings in their final landscape position to facilitate progressive reclamation; and
- construct a single external tailings area.

In July 2018, Imperial received *Oil Sands Conservation Act* (OSCA) Commercial Scheme Approval No. 10829H in response to the OSCA amendment application (number 1872083) submitted as required by Directive 085. This approval provided Imperial with an approved fluid tailings (FT) profile for Kearl and ready-to-reclaim (RTR) criteria for the East External Tailings Area (EETA).

Imperial submitted an integrated application (Application) to the Alberta Energy Regulator (AER) on March 31, 2022 consisting of a Mine Plan Amendement (MPA) and Tailings Management Plan (TMP) for approval under the OSCA, Environmental Protection and Enhancement Act (EPEA), and Water Act to allow for the continued development and operation of the Kearl Oil Sands Mine (Kearl). This application includes an updated proposed FT profile.

Imperial's 2022 results included managing its FT inventory below Kearl's approved FT profile (Approval 10829M, Appendix B, Figure 1) with a total 2022 year end FT inventory of 67 million cubic metres (Mm^3) versus a profile limit of 159 Mm^3. KFTT performance, lower than estimated mining and bitumen production rates, supplemental fines treatment, increased FFT densification, increased fines capture in the West ETA, and less material not yet reaching RTR criteria were the contributing factors.

Overall, the thickened tailings (TT) deposit is currently performing as expected with some variations observed across the deposit. The deposit was delineated into three zones identified as the subaerial deposit, a transition zone and the subaqueous, each with typical and ranges of characteristic properties. Through ongoing sampling and analysis it was observed that most of the the subaerial area of the deposit and parts of both the transition and subaqueous zones achieved the subobjective 1 RTR criteria of 65% solids content.

To date, approximately 25 Mm^3, which is about 90% (by volume) of the total TT volume deposited in the TT deposit area, has achieved RTR criteria.

1.0 Introduction

Imperial Oil Resources Limited (Imperial) operates the Kearl Oil Sands Mine (Kearl) located approximately 70 km north of Fort McMurray and approximately 42 km northeast of Fort MacKay. Imperial has prepared this *Fluid Tailings Annual Management Report* for 2022 in accordance with the requirements of the Alberta Energy Regulator's (AER) *Directive 085: Fluid Tailings Management for Oil Sands Mining Projects* (Directive 085*)* (AER, 2017*)* that requires operators to submit annual management reports in electronic format to the AER by April 30 for the previous year's performance (January to December).

This report summarizes Imperial's 2022 fines treatment and treated tailings performance and fulfils the reporting requirement as stated in Imperial's (OSCA) approval.

The fines treatment process proposed in the 2016 TMP has been fully implemented. A brief summary of Imperial's 2022 operations are described in the following paragraphs.

In 2022, FLT and Tailings Solvent Recovery Unit (TSRU) tailings from both Kearl Plants (K1 and K2) continued discharging into the West External Tailings Area (WETA). Coarse Sand Tailings (CST) from either plant is discharged in both the WETA and the EETA.

Imperial's primary fines treatment technology is thickening. TT are produced by flocculating FLT and FT in the thickeners and re-flocculating the stream using a second chemical injection (secondary chemical treatment) before it is discharged to the TT deposition area.The thickener overflow water (clarified water from thickener facility, due to thickening process) and underflow density were monitored to control TT quality. Thickener operation and the TT deposit generally met expectations. Continuous improvement activities will be undertaken in 2023 to improve equipment reliability and fines treatment performance as described in Table 6-1.

Comprehensive survey and sampling campaigns were completed in Q3 of 2022 in the ETAs, including WETA and EETA FT and the treated tailings material in the deposition area within EETA.

Table 1-1 summarizes the concordance of OSCA sections to the corresponding sections of this report, and Table 1-2 summarizes the concordance of Directive 085 to the corresponding sections of this report.

Table 1-1: Concordance Table: OSCA Approval Number 10829M

Regulatory Requirements	Section Within Annual Tailings Management Report
29. The Operator shall monitor: *(a) on a quarterly basis, or such other basis as the AER may stipulate in writing, the solids content and sands to fine ratio of the thickened tailings after secondary chemical treatment;* *(b) on an annual basis, or such other basis as the AER may stipulate in writing, the sands to fine ratio, effective stress, deposit consolidation, pore water pressure, and particle size distribution in each treated tailings deposit; and* *(c) any other parameter on the basis as specified in writing by the AER.*	Section 4.4 – Quarterly Monitoring

Regulatory Requirements	Section Within Annual Tailings Management Report
30. The Operator shall, in addition to any reporting requirements under Directive 085, provide in the annual fluid tailings management report:	
(a) for each treated tailings deposit, monitoring data including representative cross-sections to illustrate the variation of the following:	Section 4.3 – Treated Tailings Characteristics
i) sands to fine ratio;	Figure 4-5: A Cross Section and Three Dimensional View of SFR Variation in the East TT deposit area
ii) effective stress;	Figure 4-6: Effective Stress Versus Depth
iii) deposit consolidation;	Figure 4-7: Deposit Consolidation BAW and BBW
iv) pore water pressure;	Figure 4-8: Pore Pressure
v) particle size distribution plot;	Figure 4-9: Particle Size Distribution BAW and BBW
vi) any other parameter considered relevant by the Operator; and	Figure 4-10: A Cross Section Illustrating Solids Content Variation in TT deposit area
vii) any other parameter specified by the AER.	
(b) a summary of quarterly monitoring results for the solids content and sands to fine ratio of thickened tailings after secondary chemical treatment;	Section 4.4 – Quarterly Monitoring
(c) the available storage capacity of each tailings deposit or tailings pond that contains water or tailings at the end of the reporting period;	Table 4-1– 2022 Year End Storage Capacity
(d) annual storage capacity and volume requirements for the five years following the end of the reporting period; and	Table 4-2 – 5 Year Annual Storage Capacit and Requirement
(e) description of any implications to the tailings management plan resulting from resource sterilization due to avoidance of the Pleistocene Channel Aquifer, including but not limited to impacts to storage capacity changes	Section 4.3.1 – Storage Capacity

Table 1-2: Concordance Table - Directive 085 Reporting Requirements

Regulatory Requirements	Section Within Annual Tailings Management Report
Include a project site summary of all annual fluid tailings volumes, as per the accounting table in appendix 3.	Section 3.0 – Fluid Tailings Volume Reporting
Show in a figure the approved new and legacy profiles with the actual fluid tailings volume and the three thresholds (profile deviation, total volume, and total volume limit).	Figure 3-2: Fluid Tailings Profile Showing Approved Profile, Triggers and Limits
Describe if and how activities have deviated from the fluid tailings management plan and any modifications made to improve performance.	Section 3.1.2 - Fluid Tailings Profile
Identify the management level (as described in the TMF) that the operation's performance falls within.	Section 3.1.2 - Fluid Tailings Profile
If the operation is deemed level 2 or higher, describe the circumstances that led to the increased fluid accumulation and any actions that are being taken to improve fluid tailings management performance.	Section 3.1.2 - Fluid Tailings Profile
Provide a site-wide water balance or provide the reference to another AER report and location where this information can be obtained.	Section 3.2 – Water Volume, Quality and Site Wide Balance
Provide a water volume (in tabular form) or provide the reference to another AER report and location where this information can be obtained. The table must include, for each treated tailings deposit and fluid tailings pond,	
a) total volume of water at the beginning of the reporting period,	Table 3-5: Volume of Free Water for the 2022 Reporting Period
b) total volume of water at the end of the reporting period,	
c) characterization of the quality of water, and	Table 3-6: Water Quality Testing Key Parameters
d) the volume and quality of water recovered from fluid tailings and runoff from RTR tailings.	Table 3-7: Volume and Quality of Water Recovered from Fluid Tailings

Regulatory Requirements	Section Within Annual Tailings Management Report
Provide information about fines that were not captured, which form fluid tailings, including *a) quantity of fines in the ore processed during the reporting period, and* *b) quantity of fines in fluid tailings.*	Section 3.3.2 – Fines in Ore and Fluid Tailings
Estimate the change in fluid tailings volume inventory as a result of settling and consolidation and provide an explanation if inconsistent with the predictions.	Section 3.1.4 – Fluid Tailings Volume in Each Deposit and Composition
Provide a status map of the current locations and sizes of all fluid tailings ponds and treated deposits for the project.	Section 3.4 – Status Map
Provide tables indicating the volume and composition of each deposit containing fluid tailings (including the volume of fluid tailings, of treated and placed fluid tailings meeting RTR status, and of water).	Section 3.1.4 – Fluid Tailings Volume in Each Deposit and Composition
Provide tonnage of ore processed and average composition (bitumen, water, solids) or provide the reference to another AER report and location where this information can be obtained.	Section 3.3.1 – Ore Tonnage and Composition
For each fluid tailings treatment technology, *a) provide volume of fluid tailings treated and where they were placed;* *b) provide chemical and physical properties of the treated fluid tailings and the water recovered from treatment; and* *c) if the technology is not performing as predicted, provide mitigation measures to rectify performance (address any impacts on the deposit performance).*	Section 3.4 – Status Map Figure 3-7: 2022 ETA Status Table 3-9: Tailings Treatment Summary Table 3-11: Properties of the Treated Tailings Section 3.4 – Status Map
Monitoring Reporting Data Requirements	
For each monitoring dataset required in the annual fluid tailings management report, *a) identify any uncertainties and* *b) explain the dataset adequacy.*	Section 4,1: Dataset Accuracy
For each treated tailings deposit and fluid tailings ponds and their surrounding environment provide monitoring results, including the following: *a) a map and tabular data showing the survey locations of tailings deposits;* *b) representative cross-sections to illustrate the variation of tailings characteristics;* *c) for each deposit containing treated and placed fluid tailings,* *i) the measured data on the chosen indicators and confirm performance against the chosen performance criteria;* *ii) for those fluid tailings deposits that have met RTR status, data to support that it is trending appropriately; and* *iii) confirmation that indicator and performance criteria are still appropriate or justify the need to modify them; and* *d) verification that the tailings deposit is meeting the milestones in the fluid tailings management plan.*	Section 4.2 – Survey Locations Figure 4-1: Pond Bottom Sounding Locations Figure 4-2: Solid Sampling Locations Figure 4-3: Fluid Sampling Locations Figure 4-4: Sonar Sounding Path and Swath Sonar Area Section 4.3 – Treated Tailings Characteristics Figure 4-5: Cross Section and Three Dimensional View of SFR Variation in the East TT deposit area Figure 4-6: Effective Stress Versus Depth Figure 4-7: Deposit Consolidation BAW and BBW Figure 4-8: Pore Pressure Figure 4-9: Particle Size Distribution BAW and BBW Figure 4-10: A Cross Section Illustrating Solids Content Variation in TT deposit area Section 4.3.1 – Storage Capacity

<table>
<tr><th>Regulatory Requirements</th><th>Section Within Annual Tailings Management Report</th></tr>
<tr><td>Inadequate Deposit Performance:
If the deposit is under-performing so as to impact the fluid tailings volume accumulation, then
a) describe the contributing causes to under-performance;
b) describe mitigation and contingency plans from the fluid tailings management plan that have been implemented to manage performance;
c) identify any risks that could result from additional fluid fine tailings placement in a deposit;
d) confirm that the indicators, measures, and performance criteria are still acceptable in light of new factors introduced by the mitigation and contingency plans; and
e) describe the impacts that tailings performance is having on the mine plan, water management plan, mine reclamation plan, and life-of-mine closure plan.
f) For tailings previously identified as RTR that are no longer following the trajectory or meeting performance criteria, confirm that the volume has been added to the fluid tailings volume inventory and describe the actions taken to address under-performance.</td><td>Section 5.0 – Deposit Performance</td></tr>
<tr><td colspan="2">Technology: Continuous Improvement and Development</td></tr>
<tr><td>To assess continuous improvement and innovation, to confirm that fluid tailings treatment technologies are operating as expected, and confirm that operational issues are being managed, the fluid tailings management report must include the following:
a) Description of the treatment technologies' operation over the reporting period, including issues that were encountered and a summary of continuous improvement activities
b) Confirmation that technology development was implemented as proposed in the approved fluid tailings management plan by summarizing relevant activities in the reporting year. Confirm that technology development will continue to be implemented as stated in the approved fluid tailings management plan
c) A technical report, within the constraints of proprietary information, on the progress of any pilots, prototypes, or demonstrations of fluid tailings technologies
d) An assessment, within the constraints of proprietary information, of performance, successes, challenges, and implications for net environmental effects for all treatment technologies. The assessment may incorporate information references to other required reports, such as the tailings research report and groundwater monitoring report submitted under EPEA</td><td>Section 6.1 - Summary Of Continuous Improvement Activities

Section 1.0 - Introduction

Section 6.2 – Pilots or Prototypes

Section 4.3 – Treated Tailings Characteristics
Section 7.0 -Environmental Monitoring Results

There have not been any observed implications on net environmental effects.</td></tr>
<tr><td colspan="2">Environmental Monitoring Results</td></tr>
<tr><td>To ascertain that environmental benefits and risk trade-offs anticipated by operators for their tailings technology justification continue to be accurate, and to assess operator performance in managing and minimizing environmental effects and implications associated with fluid tailings management activities, the annual management report must provide a summary of the results from environmental performance monitoring reports related to fluid tailings management activities.</td><td>Section 7.0 -Environmental Monitoring Results</td></tr>
</table>

2.0 Indigenous and Stakeholder Engagement

For more than a decade and a half Imperial has worked closely and collaboratively with the seven Indigenous communities in the Athabasca region whose traditional territories overlap with Kearl operations. Imperial's long-standing collaborative relationships with Athabasca Chipewyan First Nation (ACFN), Fort Chipewyan Métis (FCM), Fort McKay First Nation (FMkFN), Fort McKay Métis Nation (FMMN), Fort McMurray 468 First Nation (FMFN 468), McMurray Métis (MM 1935) and Mikisew Cree First Nation (MCFN) are core to Imperial's responsible oil sands development and the operation of Kearl.

Supported by Imperial's Indigenous Relations Guiding Principles and Guidelines (Appendix B) and underpinned by comprehensive long-term agreements with each of the Indigenous communities identified above, Imperial's approach is one of early and ongoing engagement. This approach enables Imperial to understand potential impacts on Imperial's neighbours' Indigenous Harvesting and Treaty Rights, to develop appropriate mitigations, and to steward Kearl's performance in areas of environmental interest. Imperial endeavors to do this through open dialogue and transparent sharing of information to provide common understanding and develop the best outcomes for all parties involved. Imperial acknowledges that its communications around the identification of discolored water near the Kearl lease boundary in May 2022, and the subsequent investigation, fell short of community expectations. Imperial has committed to taking the necessary steps to improve its communications, so this does not happen again.

In addition to the company's engagement on a technical level, Imperial's regular engagement with community members strengthens Imperial's relationships and enables the company to share information about Imperial's projects and operations and learn specifically from the community members' views as traditional knowledge holders and land users. Imperial also works closely with each of the Indigenous communities' business arm to strategically plan contracting opportunities and business capability development plans. Overarching direction is provided through joint leadership committees Imperial has with each of the local Indigenous communities to ensure that Imperial's work is focused on priority areas of interest and achieving the objectives we have established together.

Imperial hosted the annual tailings forum virtually on June 20, 2022, to discuss Kearl's Tailings Management, including the Annual Fluid Tailings Management Report for 2021, with the seven Athabasca Indigenous communities and their technical consultants. Imperial and the Indigenous communities refined the agenda for the annual tailings forum to focus on tailings performance as reported in the 2021 Directive 085 Report. The agenda and attendee list for the annual tailings forum are provided for reference in Appendix C. Imperial's long-term agreements with each of the Indigenous communities include a confidentiality clause which allows both Imperial and the communities to have much more in-depth sharing and meaningful conversations. In respect of these agreements, Imperial provided copies of materials at the annual tailings forum; they have not been provided on account of their confidential nature. Imperial provided capacity funding to allow technical consultants to participate in the annual tailings forum in 2022. Technical representatives included:

- Megan Thompson, Management and Solutions in Environmental Science (water support, representing FMkFN, FCM and MCFN);
- Monique Dube, Cumulative Effects Environmental (project and technical support, representing FMMN);
- Martin Grygar, Breakwater Vantage (project and technical support, representing FMFN 468);
- Shanti Berryman, Integral Ecology (closure and reclamation support, representing ,FMkFN, FCM and MCFN); and
- Eber Araujo, GeoRoots (geology and tailings support, representing FMkFN, FCM and MCFN).

In 2021 and 2022, following our review of the 2020 Imperial Kearl Tailings Management Report, the communities and Imperial have developed a Tailings Management Multi-year Workplan (Tailings Workplan).

The Tailings Workplan is in response to the input received from the Indigenous communities on multiple topics, and in some cases over multiple years, related to tailings management and the need for integration with end land use. It is also in response to the 'expectations' that we provided at the annual tailings forum that included improving understanding, sharing knowledge, and to resolve our most significant concerns.

The Indigenous communities have met with Imperial to prioritize those significant concerns as topics on which we would work together, including, but not limited to:

- RTR Subobjective 2
- reclamation planning (including Subobjective 2)
- seepage interception/ Groundwater Monitoring Plan (GMP) Performance
- water capped tailings alternatives
- Groundwater Monitoring and Management, including SIS and RTR Subobjective 2
- pit lakes
- terrestrial capping of treated tailings - review of research plan
- Tailings Management Report (operations activities; KFTT and deposit performance; tailings performance)
- tailings treatments technology research
- tailings management (incl. commercialization of new treatments)
- water balance
- dam integrity

The Tailings Workplan allows the parties to work these issues more fully and allows the Community Representatives to come together to select subject matter experts to support each of the Tailings Workplan components that singly and collectively inform tailings management for Kearl.

Starting in 2022 the annual tailings forum focused on the Directive 085 report review and informed the Tailings Workplan. Through regular engagement, Imperial and the Indigenous communities have agreed to schedule discussions on tailings issues throughout the year as agreed upon in the Tailings Workplan, which focuses on working together to find solutions, as identified in the list above.

In addition to the annual tailings forum, Imperial has continued to look for opportunities to address and incorporate feedback. Key examples include:

- Kearl Environmental Stewardship Presentation: In June 2022, Imperial delivered an environmental stewardship presentation to review Kearl's 2021 environmental monitoring results. The presentation was delivered through a joint virtual meeting (established as part of Imperial's long-term agreements) with the seven Indigenous communities. Presentation materials included discussion of tailings management and performance, including topics related to surface water, groundwater and seepage monitoring, again based on feedback provided by the communities at the annual tailings forum and in the associated technical reviews. Imperial will continue to use this annual environmental stewardship presentation to discuss environmental monitoring and performance with Indigenous communities.
- Kearl Tailings Management Plan: Similarly, Imperial worked collaboratively with Indigenous communities on the TMP. Imperial and Indigenous communities met in November 2021 to identify a process for community feedback for incorporation into the TMP update, due March 2022, prior to submission. In Q1 2022, a series of Mine Plan Amendment (MPA) and TMP technical reviews were provided to Imperial on behalf of the communities. Imperial held multiple working sessions to discuss the technical reviews with the communities and their consultants.
- Imperial has also engaged with the communities in relation to the Environmental Protection Order (EPO) issued by the Alberta Energy Regulator on February 6, 2023. These engagements have taken the form of Leader-to-Leader discussions, site visits, town halls, technical discussions and the sharing of remedial action plans and sampling data, to name a few, with communities and are ongoing.

- Indigenous involvement in research projects has been identified by communities as a focus area for Imperial. Imperial will continue to look for opportunities to engage communities in research projects as well as sharing results and data when possible. Imperial intends to identify research projects led by Imperial (under Canada's Oil Sands Innovation Alliance or otherwise) where Indigenous communities can be involved directly. Imperial continues to look for opportunities for communities to influence research program design.

Imperial will continue to use regular committee meetings, monitoring tours, environmental stewardship presentation, the annual tailings forum, and review of regulatory plans to engage with Indigenous communities and develop solutions to tailings management collaboratively.

3.0 Fluid Tailings Volume Reporting

As per the FT volume reporting requirements outlined in Section 6.2 and Appendix 3 of Directive 085, Imperial is required to submit FT management details in an accounting table. The 2022 annual report presents the data collected, results obtained and the analysis performed regarding Imperial's FT inventory and management.

3.1 Fluid Tailings Volume and Profile

3.1.1 Accounting Table

As per *Decision 20180716A: Imperial Oil Resources Limited; Application for Kearl Mine's Tailings Management Plan*, Imperial does not have any legacy FT and as such all FT are considered to be new FT at Kearl. Therefore, throughout this report any references to FT inventory and FT profile means new FT inventory and new FT profile, respectively. Table 3-1 provides a detailed accounting table (as per Directive 085) of annual FT volumes. As shown in Table 3-1, Imperial's FT inventory is below the approved FT profile (Approval 10829M, Appendix B, Figure 1).

Table 3-1: Accounting Table

Year		Previous Year New FT Inventory (Mm^3)	Previous Year Legacy FT Inventory (Mm^3)	FT Inventory (Mm^3)	Change in New FT Inventory (Mm^3)	Change in Legacy FT Inventory (Mm^3)	New FT Inventory (Mm^3)	Legacy FT Inventory (Mm^3)	Approved Profile New FT Inventory (Mm^3)	Approved Profile Legacy FT Inventory (Mm^3)	New FT Rolling Profile Deviation (%)	Legacy FT Rolling Profile Deviation (%)
2014	0.0	0	0.0	4.7	0	0.0	4.7	0.0	5.0	0.0	-	-
2015	1.0	4.7	0.0	13.6	8.9	0.0	13.6	0.0	20.0	0.0	-32%	n/a
2016	2.0	13.6	0.0	24.1	10.5	0.0	24.1	0.0	46.0	0.0	-40%	n/a
2017	3.0	24.1	0.0	41.0	16.9	0.0	41.0	0.0	66.0	0.0	-39%	n/a
2018	4.0	41.0	0.0	50.1	9.1	0.0	50.1	0.0	87.0	0.0	-40%	n/a
2019	5.0	50.1	0.0	62.1	12.0	0.0	62.1	0.0	113.0	0.0	-41%	n/a
2020	6.0	62.1	0.0	65.8	3.7	0.0	65.8	0.0	130.0	0.0	-44%	n/a
2021	7.0	65.8	0.0	70.1*	4.3	0.0	70.1*	0.0	147.0	0.0	-45*%	n/a
2022	8.0	70.1	0.0	67.0**	-3.1	0.0	67.0**	0.0	159.0	0.0	-49%	n/a
2023	9.0		0.0			0.0		0.0	170.0	0.0		
2024	10.0		0.0			0.0		0.0	177.0	0.0		
2025	11.0		0.0			0.0		0.0	180.0	0.0		

*Updated 2021 initial reported FT volume in alignment with the July 2022 SIR response (ie. added ILF volume).

**FT inventory includes FT volume in WETA and EETA ponds, TT which has not yet achived RTR status and treated tailings produced from pilot treatment technologies.

3.1.2 Fluid Tailings Profile

Figure 3-2 shows the approved FT profile (Approval 10829M, Appendix B, Figure 1) with actual FT inventory volumes and threshold limits. This demonstrates that Imperial's FT inventory is currently below the AER approved FT profile and thresholds. The reasons for having lower cumulative FT inventory are: KFTT performance, lower than estimated mining and bitumen production rates, supplemental fines treatment through pilot treatment technologies, increased FFT densification, increased fines capture in the West ETA, and less material not yet reaching RTR criteria were the contributing factors.

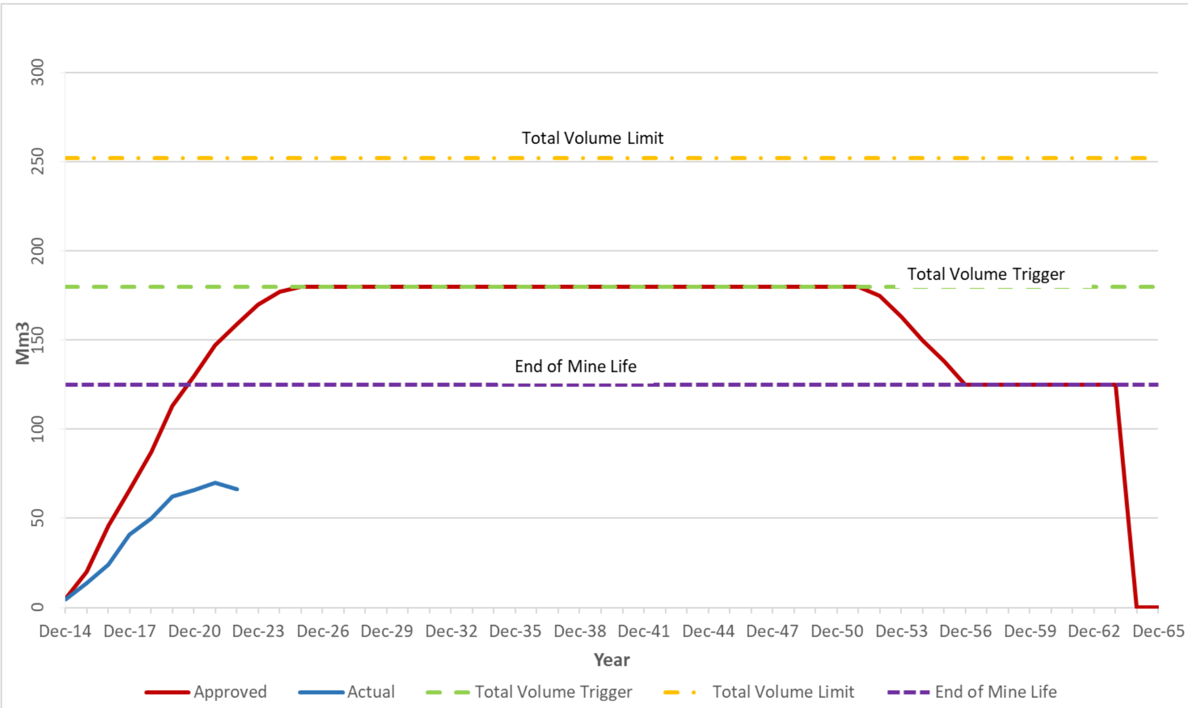

Figure 3-2: Fluid Tailings Profile Showing Approved Profile, Triggers and Limits

In addition to lower than estimated mining tonnage (since 2014), Kearl's tailings treatment process has produced tailings which have predominantly met the current subobjective 1 RTR criteria (additional details in Section 4.3). Ongoing performance evaluation and continuous improvements of the overall fines treatment system is focused on demonstrating sustained performance over a wider operational envelope. Further details on the challenges experienced, work completed, and current planned improvements can be found in the Section 6.1.

Kearl's performance falls within management level 1, as defined by the TMF, as its FT inventory was below the approved FT profile.

3.1.3 RTR Criteria

FT are considered RTR when "they have been processed with an accepted technology, placed in their final landscape position, and meet performance criteria" (AER, 2017). According to Commercial Scheme Approval No. 10829M, Imperial is currently required to meet the following RTR criteria for the EETA TT deposits (AER, 2018):

- 65% solids content by weight, based on deposit sampling, within one year of treated FT placement for the EETA TT deposit (subobjective 1)

- Groundwater is monitored in accordance with the *Environmental Protection and Enhancement Act* (EPEA) approval (subobjective 2)

Groundwater was monitored as required by EPEA Approval No. 46586-01-00, as amended, during 2022. Details are added in the section 'Environmental Monitoring Results' (Section 7.0). Therefore, all tailings material that has been treated and placed in the EETA is deemed to have met RTR subobjective 2 criteria. Throughout the remainder of this report, treated tailings referred to as having met RTR criteria also means material having met RTR subobjective 1 criteria, and material not meeting RTR criteria refers to material that hasn't been proven to have met RTR subobjective 1 criteria.

3.1.4 Fluid Tailings Volume in Each Deposit and Composition

Table 3-2 shows measured FT inventory based on July 2022 field investigation and estimated FT inventory at the end of the reporting period of 2022. The year end projection was developed from extraploting from 2021 and 2022 measured FT value. The data suggested FT volume in ETA stayed steady between the time of measuremt in July to the year end of 2022. Possible reasons for that is explained above in Section 3.1.2. TT was not projected to year-end as change in TT not reaching RTR for the remainder of the year would not be significant. This is also to be consisntent with the strategy that, reported TT volumes are based on applying subobjective 1 criteria on actual field investigation data and analysis. Table 3-3 provides information on the TT deposit and material which met the RTR criteria. TT volumes are estimated using July 2022 field investigation data and analysing those data using Imperial's TT block model.

Table 3-2: FT Inventory

Pond	FT Inventory (measured, July 2022 Field Investigation) (Mm^3)	FT Inventory (projected Year End) (Mm3)
West ETA (WETA)	59	59
East ETA (EETA)	2	2
TT deposit area	6*	6*
Total	67	67

*Includes ILF and eILF treated tailings, excludes TT which has met RTR per Table 3-3,

Table 3-3: Thickened Tailings Volume

Pond	Volume of TT (Mm^3)	Volume of TT determined to be RTR (Mm^3)	Volume of TT (Not yet achieved RTR) in FT Inventory (Mm^3)
TT Deposit	28	25	3

The cross sections of solids content of the FT in the WETA, EETA and TT deposits area are shown in Figure 3-3, Figure 3-4 and Figure 3-5, respectively.

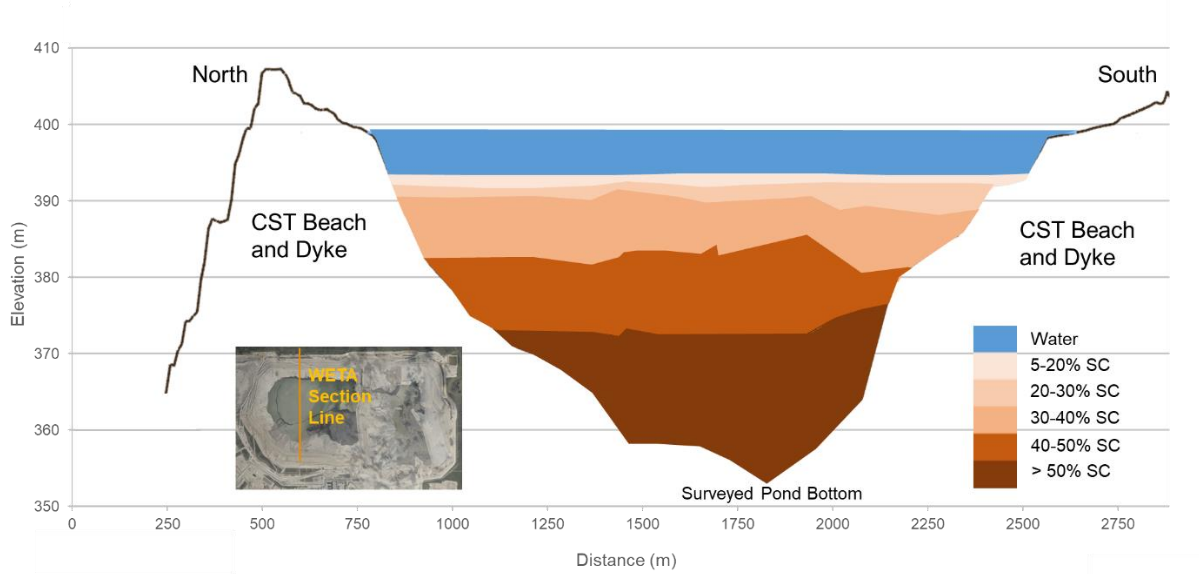

Figure 3-3: WETA FT Cross Section

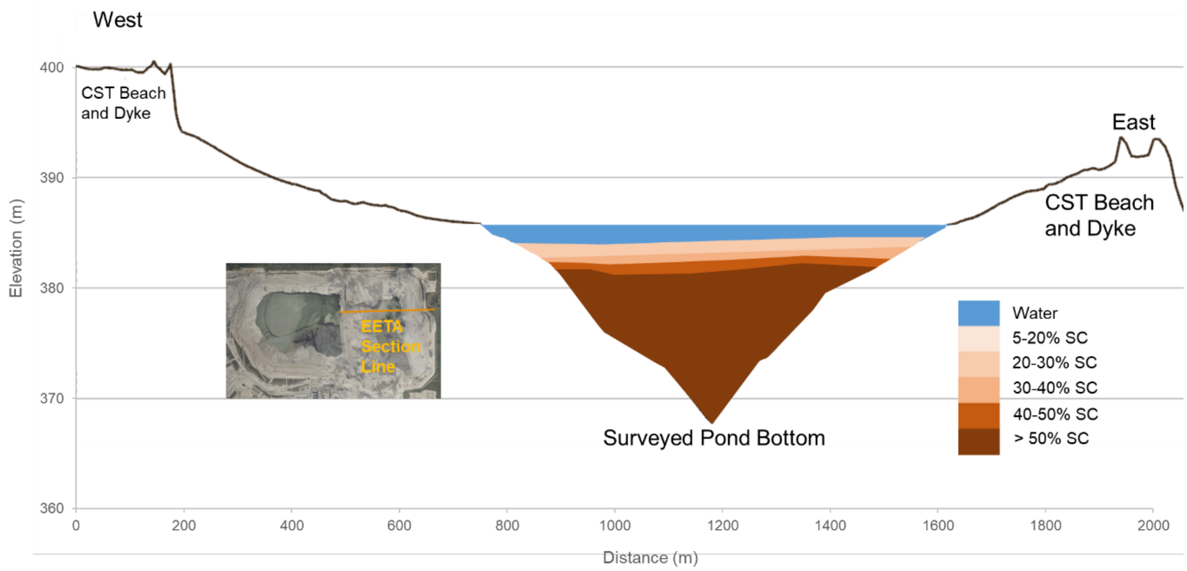

Figure 3-4 EETA FT Cross Section

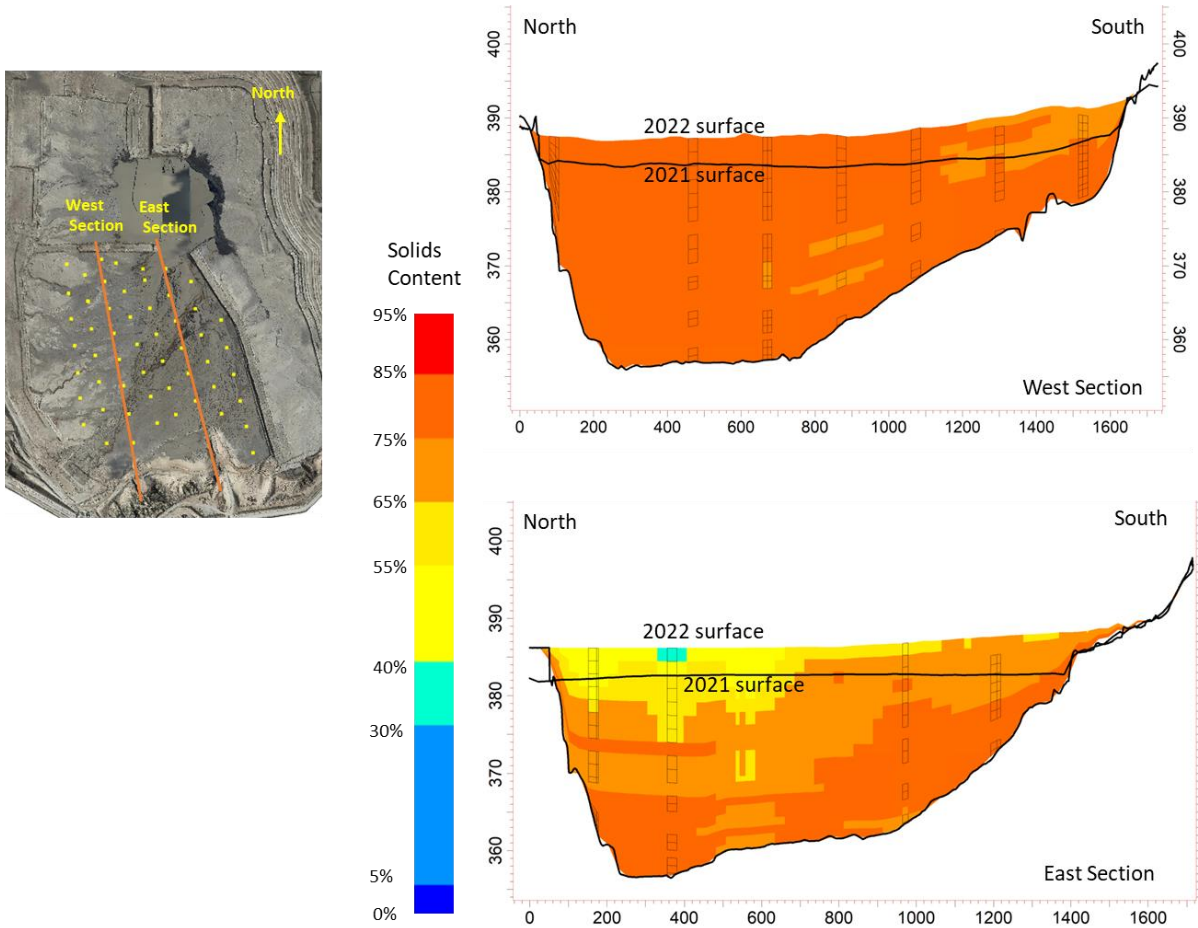

Figure 3-5: Solid content distribution in TT deposit

A 3D block model was developed to calculate the amount of material that achieved the RTR subobjective 1 criteria and to analyze the distributions of other properties within the deposit. Figure 3-5 illustrates solids content distribution within TT deposit. The block model volume estimation demonstrates that approximately 24.6 Mm^3, which is over 3/4 of total volume of the TT deposit, satisfies the RTR subobjective 1 criteria (RTR material).

During the last three years CST intermittently flowed into the treated tailings area mainly from the west side of the deposit due to dyke construction.The SFR value of the material in the treated tailings deposition area was used to estimate the volume of CST within the treated tailings deposit. The reported RTR volume was calculated excluding the estimated CST volume in the TT deposition area. Based on previous years TT properties, it was observed that the SFR value of TT can vary up to 5 within the deposit, which was used to delineate CST from TT. Tailings material with an SFR less than 5 was considered as TT and material higher than 5 was considered as CST. Using this criteria, a volume of approximately 9.8 Mm^3 of CST(in total from the beginning of CST flowing into TT deposit) was estimated within the TT deposition area and excluded from the total estimated TT volume.

As illustrated in Figure 3-5, CST co-deposition andminimizing the sub aqueous zone at the northeast corner of the deposit) helped to improve TT performance. Based on deposit sampling results, approximately 89% of the TT material in the deposit satisfied the RTR subobjective 1 criteria. The solids content of the material which has met the RTR criteria (65%+) is ranging between 65% to 80%,with SFR and clay content ranging from 0.5 to 5.0 and 10% to 40% respectedly. The remaining material (about 3.0 Mm^3) within the TT deposit area does not yet satisfy the RTR subobjective 1 criteria of 65% solids content. All of this material is currently at 40% to 65% solids content and has potential to reach the 65% solids content without additional mitigations. Allmost all of the material with less than 40% solids content flow down from the TT deposit area to the EETA pond. This material is considered runoff and has less potential to achieve RTR criteria on its own, which is added to the FT inventory for the treatment cycle.

3.2 Water Volume, Quality and Site Wide Balance

Figure 3-6 shows a simplified diagram of the site wide water balance while Table 3-4 shows an estimated site-wide water balance for Kearl.

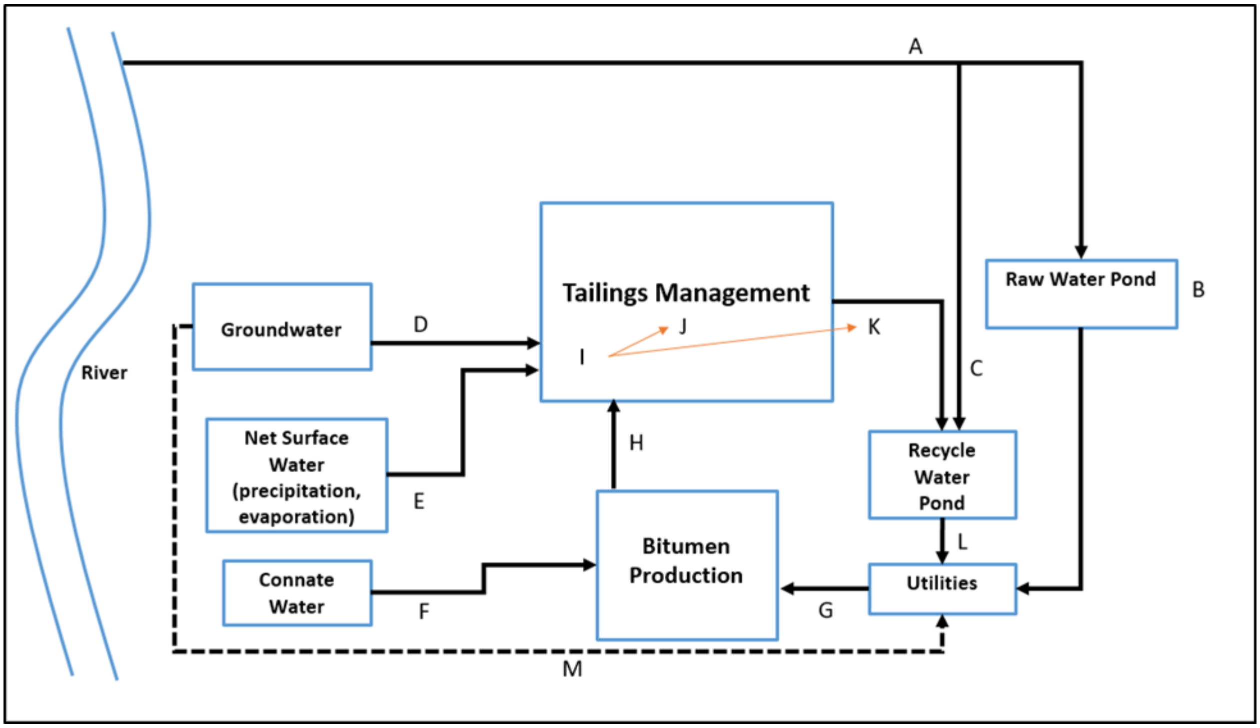

Figure 3-6: Site Wide Water Balance Schematic

Table 3-4: Estimated Site-Wide Water Balance Table for 2022 Reporting Period

	Activity	Mm^3
A)	River water taken from the Athabasca River to raw and recycle water pond	13.4
B)	River Water to Raw Water Ponds and to Utilities	6.1
C)	River Water to Recycle Water Pond	9.2
D)	Overburden, Basal, and Devonian groundwater to Tailings Management	3.5
E)	Surface water runoff (net precipitation including rain, snow, and evaporation) to tailings management	7.4
F)	Connate water from within ore body to bitumen production	6.1
G)	Utilities to bitumen production	162.3
H)	Bitumen Production to Tailings Management	168.4
I)	Water into Tailings Management (D + E + H)	179.3
J)	Storage in Tailings Management (I - K)	31.4
K)	Tailings Management to Recycle Water Pond	147.9
L)	Recycle Water to Bitumen Production via Utilities (heat added)	156.3
M)	Basal Well Groundwater to Bitumen Production via Utilities (heat added)	0.0

The total volume of free water for each treated tailings deposit and FT pond at the beginning and end of the 2022 reporting period is shown in Table 3-5. Free water is defined as water volume in the pond between mudline and water surface.

Table 3-5: Volume of Free Water for the 2022 Reporting Period

Volume of Free Water (Mm^3)		
Pond	**Start of 2022**	**End of 2022**
WETA	16.0	14.0
EETA	1.0	1.0
Total	17.0	15.0

The characterization of the quality of the water is shown in Table 3-6. Three samples were collected from the centre dyke in the WETA and from the barge in the EETA in June, August and September of 2022.

The majority of polycyclic aromatic hydrocarbons are usually measured below the detection limit and where detections are present, they are in low concentrations.

Table 3-6: Water Quality Testing Key Parameters

Key Parameters	WETA **Annual Average (WETA)**	EETA **Annual Average (EETA)**
Dissolved Chloride (mg/L)	79	39
Dissolved Sulphate (mg/L)	315	490
Total dissolved solids (measured) (mg/L)	1040	1150
Dissolved Calcium (mg/L)	50	41
Dissolved Magnesium (mg/L)	24	22
Dissolved Potassium (mg/L)	16	19.5
Dissolved Sodium (mg/L)	230	275
PpH	8.33	8.45
Bicarbonate (mg/L)	375	260
Carbonate (mg/L)	7.1	3.0
Total suspended solids (mg/L)	3.3	8.8

The water quality results of the additional constituents are included in Appendix D.

The estimated volume and quality of water recovered from treated tailings are shown in Table 3-7.

Table 3-7: Volume and Quality of Water Recovered from Treated Tailings

Water Recovered	Volume (Mm^3)	Solids Content (%)
Thickener*	31.5	<1.0%
TT deposit**	5.9	<1.0%

*Volume of recovered water from thickener is based on flow data. Solids content of overflow water is obtained from samples from the stream analyzed at the Kearl laboratory

** Volume of recovered water from TT deposit derived from mass balances (inflow less water remaining within the TT deposit)

Table 3-7 shows water recovered from the thickening process in the thickener and that recovered water is pumped back to WETA for recycle/use for extraction process. Water further recovered from the treated tailings deposit after the reflocculation at the second chemical injection when it is deposited to the deposition area.

3.3 Ore Processed

3.3.1 Ore Tonnage and Composition

Table 3-8 shows the 2022 total tonnage of ore processed and its average composition.

Table 3-8: Ore Processed in 2022

Year	Ore Tonnage (Mt)	Bitumen (%)	Water (%)	Solids (%)
2022	143.0	11.7	4.2	84.1

3.3.2 Fines in Ore and Fluid Tailings

In 2022, Kearl processed approximately 19.2 Mt of fines within the ore. Since its start up, the total (cumulative to date) fines estimated to be in FT is approximately 31.1Mt (representing the 66.5 Mm^3 of FT identified in Table 3-2).

3.4 Status Map and Thickener Feed

3.4.1 Status Map

The External Tailings Area (ETA) status at the end of 2022 is shown in Figure 3-7 overlayed on an aerial photo taken in October 2022. The blue outline shows the estimated extents of the pond at the end of the year.The red outline shows the boundary of the ETA. The white outline shows the estimated extents of the TT placed area.

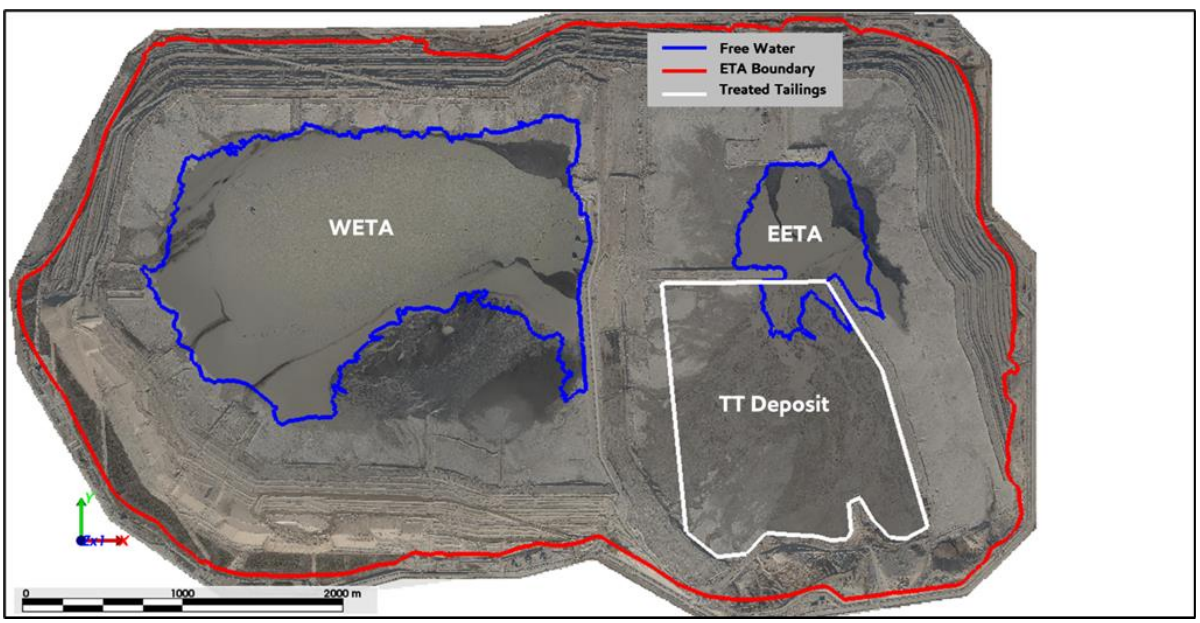

Figure 3-7: 2022 ETA Status

3.4.2 Volume of Fluid Tailings Treated and Where They were Placed

A summary of the tailings treatment during 2022 is shown in Tables 3-9 and Table 3-10. The volume of thickener feed is splited between FLT and FT. The thickener underflow (TT) after passing through second chemical system was placed in the EETA. The volumes are based on flows measured in the streams feeding and leaving the thickener.

Table 3-9: Thickener Feed

Tailings Treatment Slurry (Mm^3)	
FLT	29.3
FT (WETA barge)	5.4

Table 3-10: Thickener Underflow

Tailings Treatment Slurry (Mm^3)	
TT	14.3

Based on process surveillance, deposit monitoring, the Q3 2022 survey and sampling campaign, the thickeners regularly produced underflow in the expected range of 40% to 50% solids content with overflow water solids content less than 1%, as shown in Table 3-11. The addition of additional flocculant through the secondary chemical injection system results in further dewatering once deposited into the TT deposit area.

Table 3-11: Properties of the Treated Tailings

	Solids Content (%)	
Solids Content (%)	Expected Properties	Actual Properties
Thickener Underflow	40%-50%	Avg. 39.3%
Thickener Overflow	<1%	<1%

Thickener overflow solid content results (%) in 2022 were within the expected properties range. Thickener underflow solid content results were however slightly under target (~39.3% vs. 40%). The latter was due to a combination of running at lower U/F densities to manage thickener bed levels and mechanical equipment challenges as well as maintaining stable operations with a lower than expected solids loading rate from the primaryprimary separation cells. Though average thickener underflow densities were slightly below expected properties, the performance of samples taken after secondary chemical injection (one day and seven day solids content) continued to demonstrate expected overall thickener and system performance. Additionally, the performance of the overall system was further corroborated by evaluating actual deposit performance from the annual sampling campaign.

4.0 Monitoring Reporting Data

4.1 Dataset Accuracy

The sampling programs provided key information and understanding of the overall FT inventory levels and the performance of the thickened tailings. A detailed campaign to categorize and measure the FT within the ETA was used to estimate the current reported inventory. The sampling intervals and detailed analysis, coupled with satellite imagery at the time is considered to be adequate for documenting the inventory levels for FT.

An extensive sampling program was carried out within the TT deposit area to characterize fluid tailings which satisfy RTR subobjective 1 criteria.

4.2 Survey Locations

The following figures show the locations of all the survey activities used to assess the FT volume and properties.

Figure 4-1 shows the pond bottom sounding locations, conducted with a CT09 instrument. Figure 4-2 shows the solids sampling locations in the TT deposit area. Figure 4-3 shows the fluid sampling locations (in green) and fixed interval sampling locations (in red). Figure 4-4 shows the path traveled in conducting the sonar survey of the ponds in the EETA and the WETA. Tables containing coordinates of all the sampling locations are shown in Appendix A.

The testing frequency and locations were finalized prior to the execution of the tailings measurement field program based on site conditions, historical trends, and safety considerations. Sample spacing was increased or decreased depending on the variability of the pond bottom and the deposit observed over time.

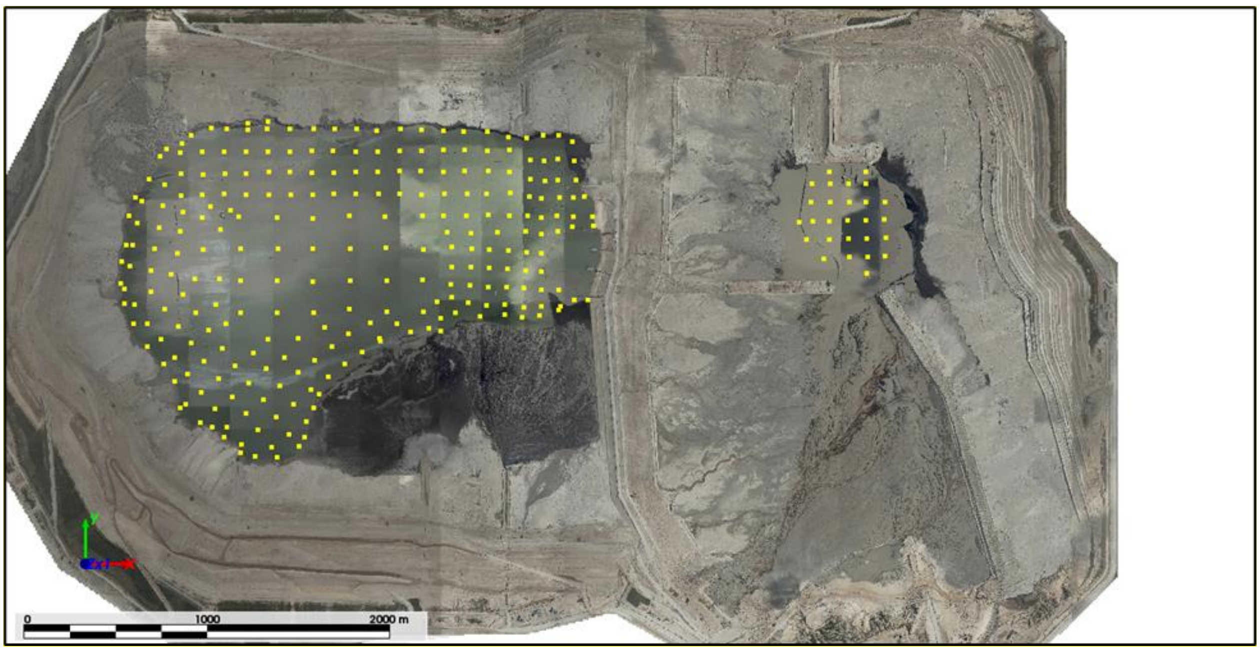

Figure 4-1: Pond Bottom Sounding Locations

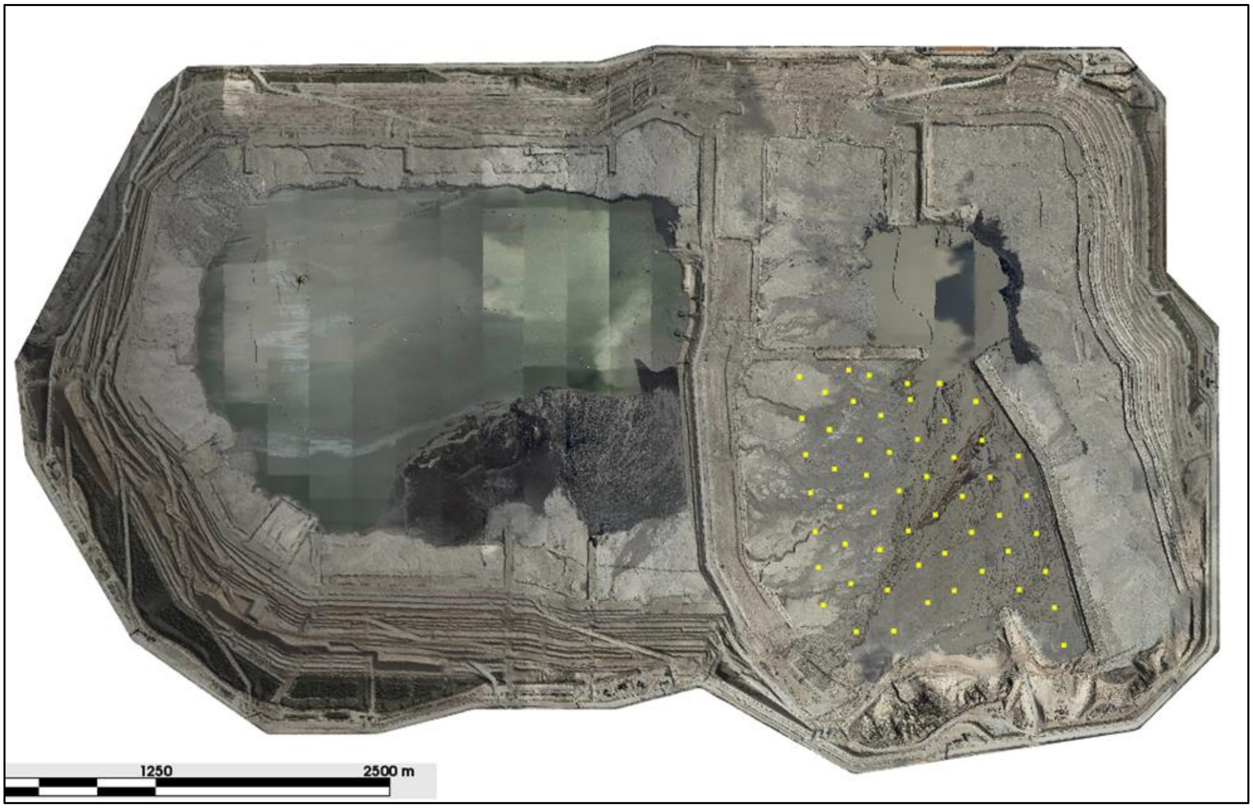

Figure 4-2: Solid Sampling Locations

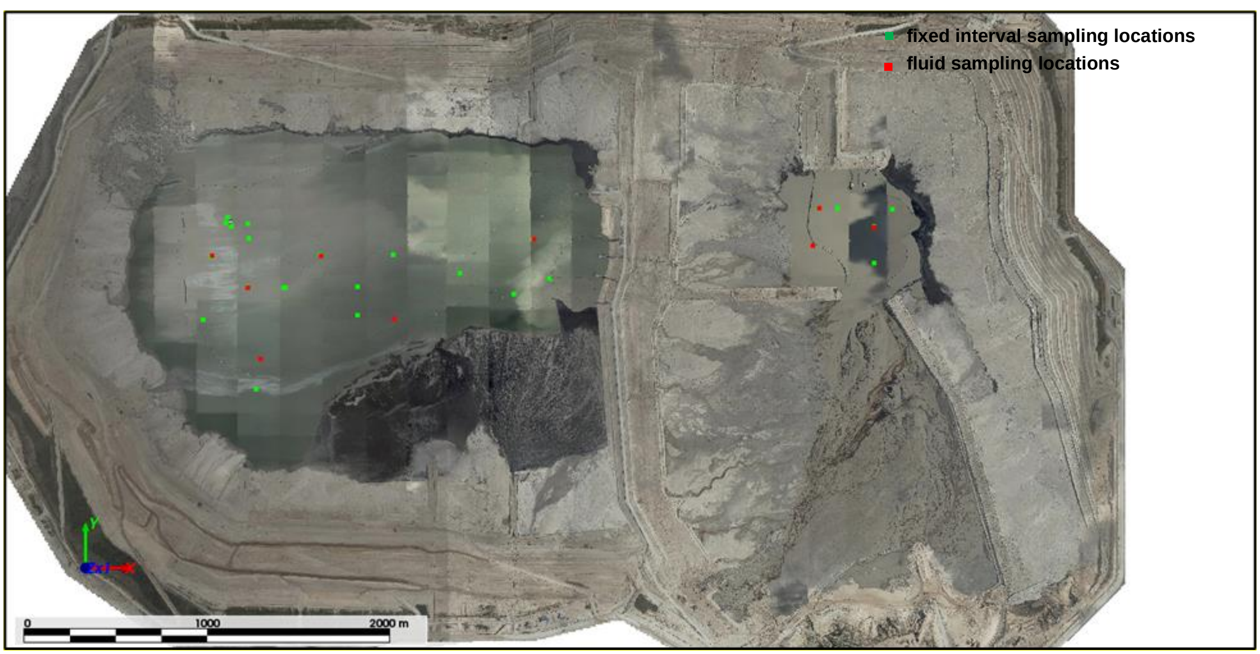

Figure 4-3: Fluid Sampling Locations

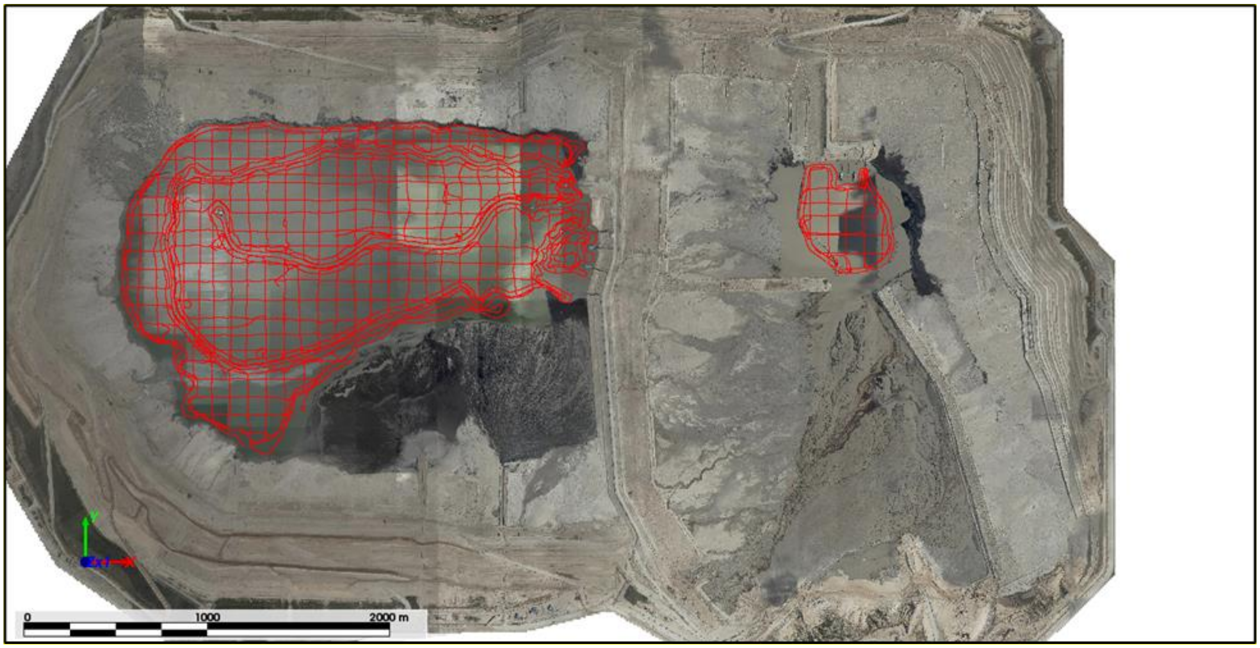

Figure 4-4: Sonar Sounding Path and Swath Sonar Area

4.3 Treated Tailings Characteristics

Imperial developed a block model of the TT deposit to determine variation of characteristics and to estimate volumes of RTR material. The following charts were prepared from the TT deposit block model.

Figure 4-5 shows the SFR variation in the west and east side of the deposit. Measured SFR was used to delineate CST from treated tailings. Blocks consisting of material with a SFR of greater than 5 is considered as CST dominant regions and blocks consisting of material with a SFR of less than 5 was identified as treated tailings. A SFR of 5 was selected to separate sand tailings and treated tailings as previous data has demonstrated that TT SFR can vary up to 5.

CST deposited from the west side of the TT deposition area appears to be mixed with TT deposited in the west side of the deposit to create a favourable composition for dewatering. This deposition environment, with an increased SFR and subaerial deposition, might have contributed to most of the material on the west side of the deposit achieving RTR status. In addition, on the west side, the majority of the CST material (SFR>5) created a cap on top of the TT deposit, with some CST material sinking into soft TT deposit areas. Accumulation of the low SFR material is concentrated in the northeast side of the deposit. Most of the bottom layers material on the east side met the RTR criteria, but the upper low SFR layers have not yet reached the RtR criteria.

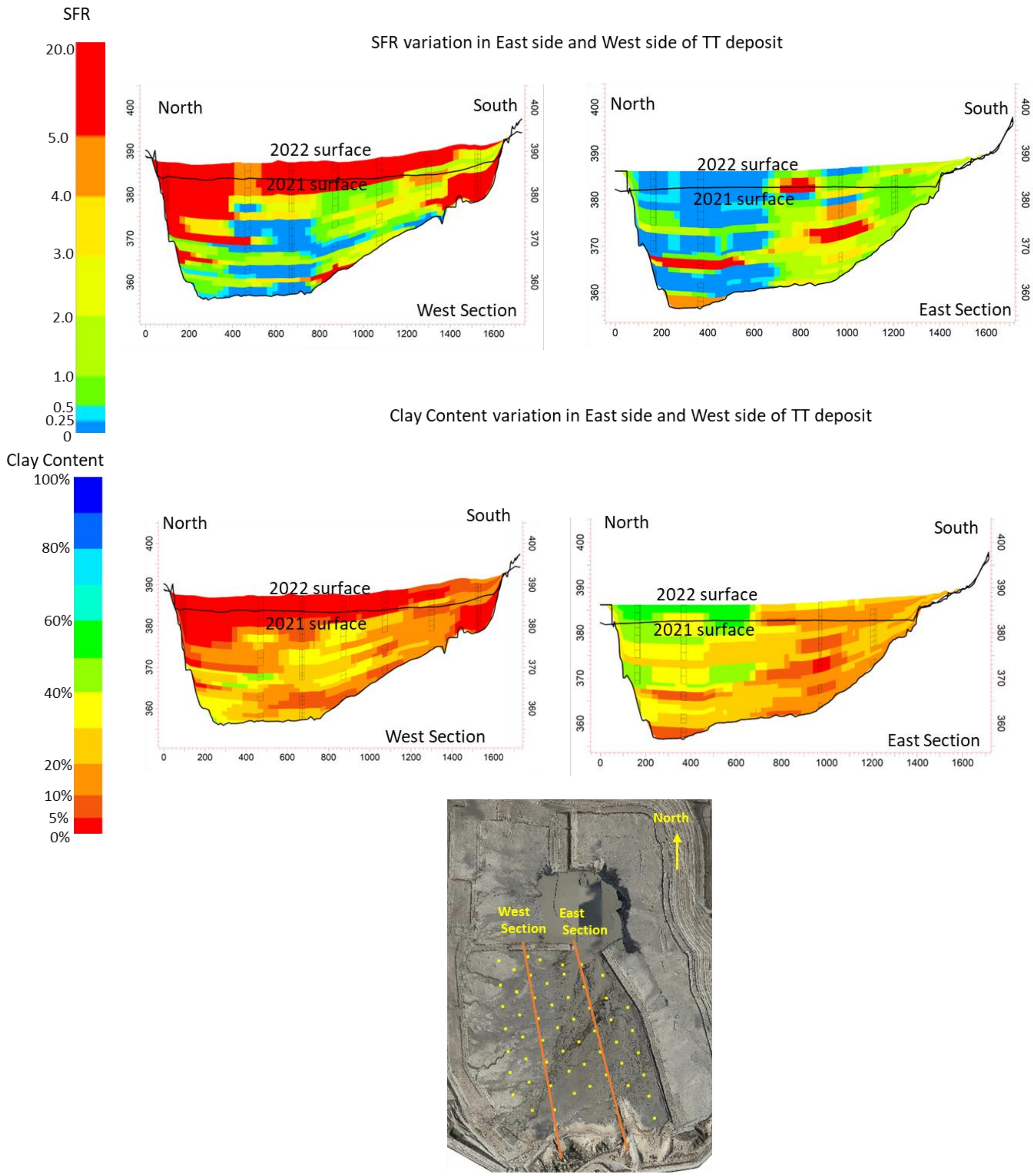

Figure 4-5: Cross Sections of SFR Variation in the West side and East side of TT deposit

Figure 4-6 shows that the effective stress increases with depth and is higher for the subaerial material than the subaqueous / transition zone material. This effective stress chart indicates that the TT performance is trending towards being able to meet final capping requirements.

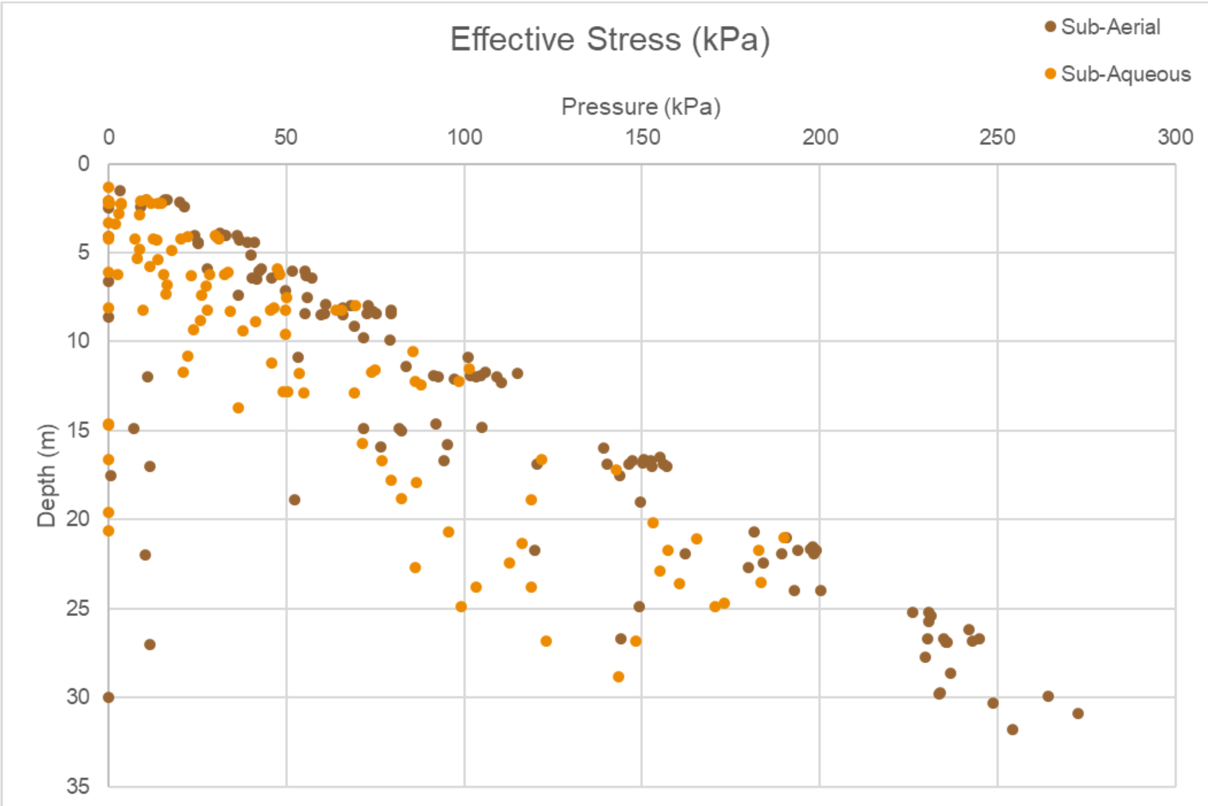

Figure 4-6: Effective Stress versus Depth

Figure 4-7 shows solids content data for west and east side of the deposit for both 2021 and 2022.

On the west side of the deposit, CST deposition and the subaerial environment might have contributed to improving the solids content of the material. Some of the low solids material identified during the 2022 tailings field investigation, appears to have mixed with higher SFR material. The combination of this material mixing, enhanced drainage and consolidation could have contributed to the improvement of the solids content in the west side of the deposit.

On the east side of the deposit, the lower solids material located on top of the subaqueous zone identified during the 2021 tailings field investigation has also seen an improvement in solids content during the 2022 field investigation, and is likely a result of consolidation and/or displacement of this material. This indicates the subaqueous zone is trending towards achieving the RTR criteria in subsequent years.

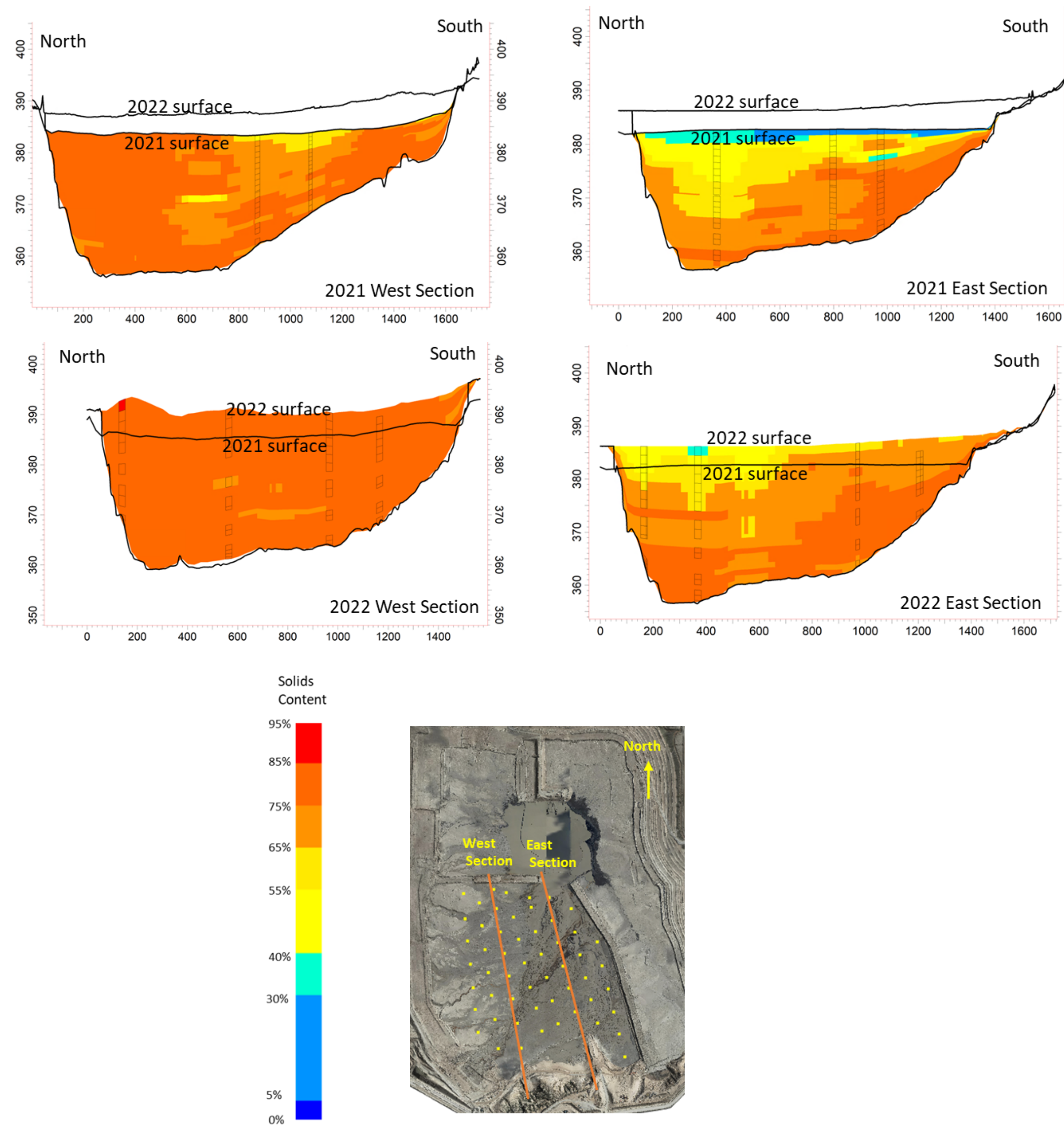

Figure 4-7: Deposit Consolidation in Subaerial and Subaqeous Zones

Figure 4-8 shows measured in-situ excess pore pressure data, calculated by subtracting insitu pore pressure from expected hydrastatic pore pressure. As expected, excess pore pressure increases with depth. An overall reduction of excess pore pressure is observed compared to last year. This excess pore pressure dissipation illustrates that the deposit is consolidating as expected and trending towards a reclaimable deposit.

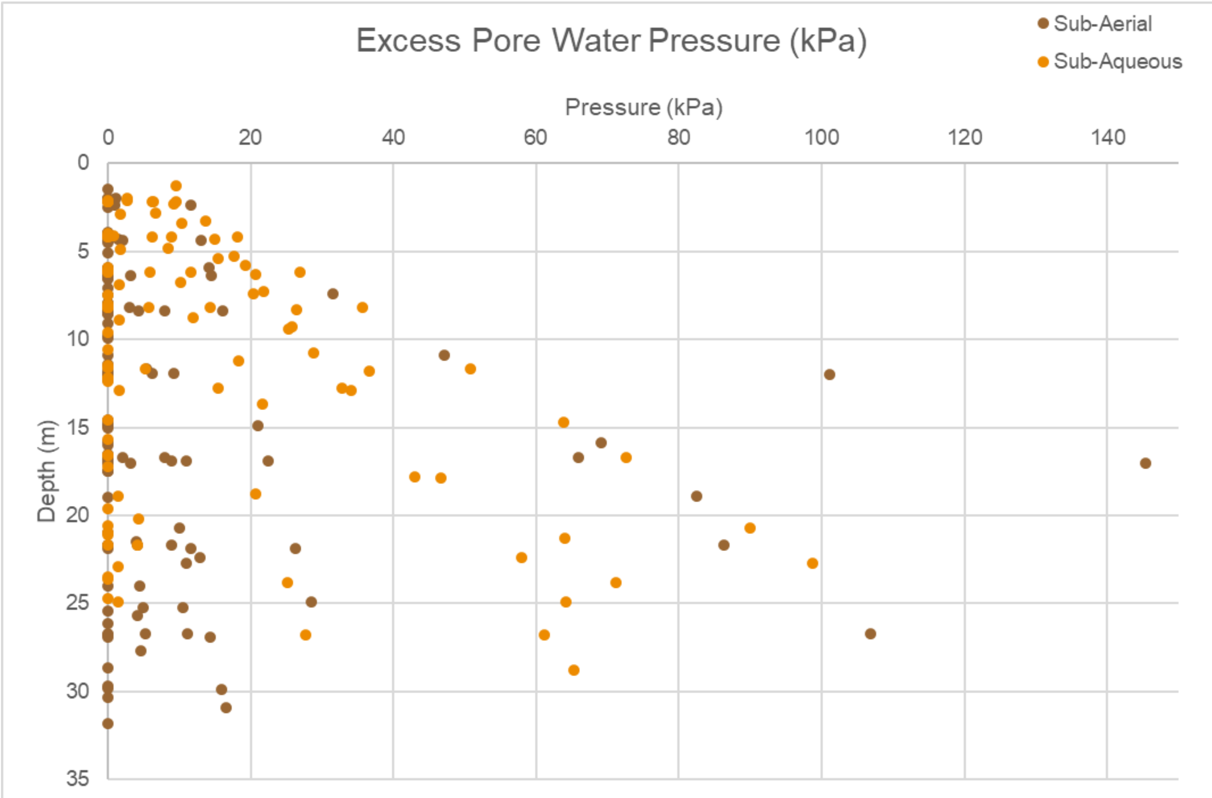

Figure 4-8: Excess Pore Water Pressure

Figure 4-9 illustrates finer particles in the subaqueous zone and relatively coarser particles in the subaerial zone. Figure 4-9 also shows gradual transition of particle size distribution from subaerial to subaqueous / transition zones.

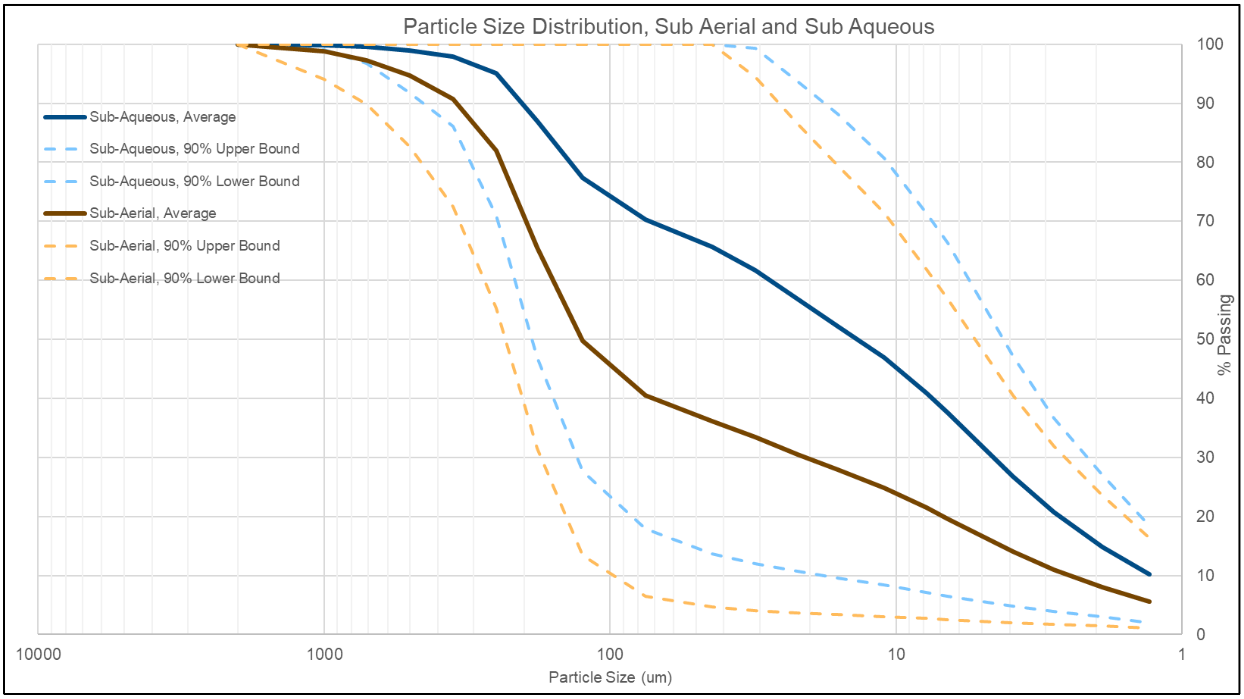

Figure 4-9: Particle Size Distribution in Subaerial and Subaqueous Zones

Figure 4-10 illustrates solids content variation of the TT deposit with depth. Solids content measurement results are illustrated for both subaerial zone and subaqueous / transition zones.

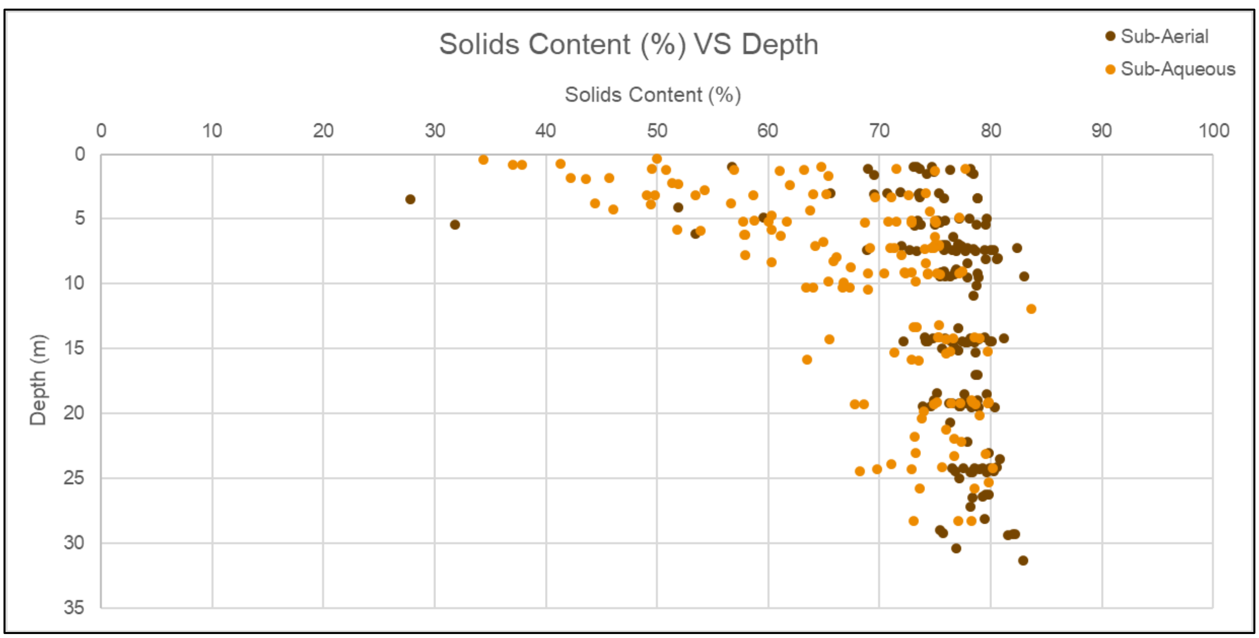

Figure 4-10: Cross Section Illustrating Solids Content Variation in TT deposit area

The above figures (Figures 4-5 to Figure 4-10) depict treated tailings characteristics as sampled. It was found that most of the subaerial zones of the deposit met expected performance and achieved RTR subobjective 1 criteria. Part of the transition and subaqueous zone material also achieved RTR status and illustrate pore pressure dissipation and consolidation.

During the last two years, Imperial has carried out a few changes in deposition area to enhance performance of the deposit. The planned changes were communicated to the AER before implementation. CST was allowed to flow into the TT area by discontinuing construction of some of the divider causeways around the treated tailings deposit. The initial locations that CST was entering the TT deposit were planned and observed in order to understand and minimize any potential unintentional impacts to the TT deposit. The sampling results revealed that CST improved the SFR of the material in west side of the deposit, which in turn contributed to improving the solids content and strength of the deposit. Sampling results also demonstrated that a majority of the CST material created a cap on top of the TT deposit and helped to consolidate the TT, increasing the overall solids content. This exercise also demonstrated that TT was sufficiently strong enough to maintain a sand cap on top of the TT deposit.

Changes were also made to the release water transfer mechanism of the TT deposit to optimize operation efficiency and overall deposit performance. An opening in the divider causeways was created in 2020 to facilitate gravity drainage of released water from the TT deposit area to the north into the EETA pond; previously this water was transferred using mechanical pumps. Gravity drainage has helped to minimize the subaqueous area in the TT deposit and avoid accumulation of runoff FT within the treated tailings deposit.

During the last two years, inline flocculated FT was also co-deposited into the treated tailings deposit as part of the ILF field pilots to increase fines treatment capacity. This ILF treated FT material demonstrated satisfactory properties during field scale deposition. Performance of these pilots are discussed in detail in section 6.2 and performance of these pilots will continue to be monitored in future tailings field investigation programs.

The treated tailings deposit was divided into subaerial and subaqueous / transition zones for interpretation. The western and southern portion of the deposit is defined as the subaerial zone and the northeast corner is defined as subaqueous / transition zone. The characterization of each zone is summarized below:

- Subaerial zone: The zone makes up approximately 75% of the deposit and consists of mainly RTR material with the exception of the top 1 to 2 meters and a few isolated pockets as shown in the block model section. Average solids content of the material in this zone is about 75% and consists of less than 30% clay content with an average SFR of approximately 1.4. This zone exhibited increased effective stress with depth (up to about 200 kPa) and excess pore pressure dissipation.
- Subaqueous / transition zone: This zone is now restricted to north east corner of the deposit and is approximately about a quarter of the overall deposit area. As illustrated in the cross section (Figure 3-5), the bottom 10-20 m of this zone satisfies the RTR subobjective 1 criteria. Approximately, the top 10 m of the deposit contains material with a solids content of less than 65%. Solids content in this zone increases with the depth. Material in this zone consists of on average 42% clay content and approximately 0.1 SFR. This zone also exhibited increased effective stress with depth (up to about 150 kPa), but lower overall than the subaerial zone. Similarly, excess pore pressure in this zone increased with depth but relatively higher than subareal zone. Limited areas of this zone demonstrate pore pressure dissipation from top and bottom of the deposit and in most of the other areas, excess pore pressure increases with depth.

The above cross sections (Figure 4-5 to Figure 4-10) indicates that the area of the FT deposit that has met RTR status is trending appropriately towards achieving expected final deposit properties and performance to enable future deposit capping.

4.3.1 Storage Capacity

Available storage capacity of each tailings deposit or tailings pond that contains water or tailings at the end of the 2022 reporting period is shown in Table 4-1.

Table 4-1: 2022 Year End Available Fluid Storage Capacity

Pond	Storage Capacity (Mm³)
WETA	1
EETA	0.4

FT annual storage capacity and volume requirements forecast for five years following the end of the 2022 reporting period are shown in Table 4-2. These all reflect the end of reporting period (December 31 of each year) volumes, identifying the FT storage capacity that is planned to be created and how much FT storage will be required as per the current plan.

Table 4-2 values demonstrate that expected FT storage volumes can be contained within the available capacity of ETA and ITA1. Table 4-2 also shows that without ITA1 storage capacity there will not be enough FT storage to meet storage requirement. The storage requirement is defined as total water and FFT expected to be stored in the facility at year end. Storage capacity is defined as the available fluid storage at the maximum expected pond elevation. While this could be defined by freeboard, tailings modeling suggests that beach lengths are almost always the driver behind maximum allowable pond elevations.

Table 4-2: 5 Year Annual Fluid Storage Capacity and Fluid Volume Storage Requirement Forecast

Pond	2023		2024		2025		2026		2027	
	Storage Capacity (Mm³)	Storage Requirement (Mm³)	Storage Capacity (Mm³)	Storage Requirement ((Mm³)	Storage Capacity (Mm³)	Storage Requirement (Mm³)	Storage Capacity (Mm³)	Storage Requirement (Mm³)	Storage Capacity (Mm³)	Storage Requirement ((Mm³)
WETA	79	72	74	72	71	69	68	66	65	63
EETA	6	3	5	3	5	3	5	3	4	3
ITA1	52	10	42	10	32	10	24	10	46	10

Any implications to the tailings management plan resulting from resource sterilization due to avoidance of the Pleistocene Channel Aquifer, including but not limited to impacts to storage capacity changes are described below.

In accordance with the Tailings Management Framework and Directive 085, Imperial submitted a TMP on November 1, 2016. This plan was aligned with the approved Pleistocene Channel Aquifer (PCA) offset scenario for areas A/B/C, where the resource is sterilized within and up to a 50 m offset from the PCA edge. It also included sterilization of areas D/E on the basis that leaving the ore in-situ within and up to a 50 m offset from the PCA edge was considered to be the most likely path forward. The ore that is proposed to be sterilized within areas D/E is of average fines content, therefore no impact to the FT generation rate in this area of the mine is anticipated.

The proposed sterilization of ore to keep all infrastructure within Kearl's existing regulatory approval boundaries was not included in the 2016 Directive 085 TMP. This volume and area is a small increase from that proposed within PCA areas D/E. Also, given that the ore in this area is of average fines content, no impact to the FT generation rate is anticipated. The sterilization of this ore will accelerate the availability of in-pit tailings area 2, which improves the robustness of the TMP.

4.4 Quarterly Monitoring

Table 4-3 shows the average quarterly TT solids content and SFR from process samples after the secondary chemical injection point. The TT is initially achieving 41% to 46% solids content, which then increases to approximately 56% (averaged over the year) after seven days. The results indicate that the process is currently meeting initial expectations.

Table 4-3: Average Quarterly Monitoring Results for Solids Content and SFR

Months	Initial (%)	24 hours (%)	7 days (%)	SFR
Jan - Mar	41.2	48.3	53.1	1.6
April - June	41.8	47.5	52.6	1.5
July - Sep	45.0	52.8	57.7	1.5
Oct - Dec	46.4	54.5	58.9	1.8

5.0 Deposit Performance

Currently the TT deposit is performing largely as expected. To date, approximately 90% of the TT deposit (by volume) within the TT deposit area has achieved RTR subobjective 1 criteria.

Continuous improvement initiatives are being developed to enhance the overall TT deposit. Ongoing operational improvements continue to be addressed and improved upon to maintain and sustain the treatment of FT from the KFTT facility. Such operational improvements include: CST-TT co-deposition, ILF-TT co-deposition, ongoing freezing and desiccation of the TT through normal operation (summer/winter), and gravity drainage of low solids content material to the north side of EETA into the EETA pond. As illustrated in this section, Imperial is also conducting operational continuous improvement measures and initiatives such as maintaining smaller pond within the TT deposit. An evaluation of several other mitigation options identified within the 2016 TMP Directive 085 supplement information request responses is ongoing, including chemical additions to the CST stream to further improve beach capture.

Section 3.1 demonstrates that Imperial's FT inventory is within the approved FT profile. Therefore, 2022's tailings performance had no significant or unexpected impact on the mine plan, water management, progressive reclamation and life-of-mine closure plan.

Solids content and pore pressure measurements demonstrated that previously identified or reported RTR material located towards the bottom of the deposit have increasing solids content.

6.0 Technology: Continuous Improvement and Development

6.1 Summary of Continuous Improvement Activities

Over the 2022 reporting period, issues encountered related to the operation of the treatment facility at Kearl are summarized in Table 6-1. Challenges were primarily physical availability of specific pieces of equipment due to a variety of factors.

Thickener operation and the TT deposit performance generally met expectations.

Table 6-1: Treatment Technologies' Operations During 2022

Operational Challenges	Continuous Improvement Activities
Lower solids throughput from the Floatation system to KFTT	• Kearl Fine Tailings Treatment (KFTT) Plant in 2022 was able to match 2021 performance in terms of volumes of fines treated despite lower amount of fines in the Flotation Tailings (FT) Feed. When treatment is considered as a percentage of total fines available in FT, this represents ~10% increase in fines treated in 2022 vs 2021. • This improvement was achieved through more frequent higher FFT flow rates to thickener when FT fines are available.
Physical availability of the KFTT system challenged by underflow pump and piping challenges. Much higher flows through underflow system led to multiple pump and packing failures in the second half of 2022.	• Engineering studies were initiated to modify the gland water control scheme developed in 2021 to match the new operating regime and more frequent higher flows in the underflow system. This work will continue in 2023. • Completed Engineering to upgrade section of the underflow piping system with Chromium Carbine Overlay (CCO) and planned to be implemented during 2023 and 2024 plant shutdown and outages.
Significant start-up and commissioning issues during enhanced in-line flocculation (eILF) technology roll-out	• Successfully built and commissioned the enhanced In-Line Flocculation (eILF) pilot demo. Despite start-up issues, the eILF technology accounted for ~8% of 2022 fines treatment volumes.
Poor FFT barge reliability reduced availability of FFT feed to the thickeners and eILF. Reliability issues mainly driven by frequent damage to barge pumps from debris ingested during FFT processing. Pump repairs has been severely impacted by supply chain issues related to material availability.	• Hydraulic study and trials were completed in the field to modify barge pump backpressure and ensure they run within design curves at current pond elevation. Based on these results, engineering design was initiated to add instrumentation (flow meters and restriction orificies) for implementation in 2023 • Engaged with pump vendor to improve parts inventory. This continues to be an ongoing challenge due to global supply chain limitations. • Initiated a study to supplement the barge system with a more reliable dredge technology in 2023.
Passing valves leading to isolation challenges, frozen lines, and thickener downtime	• Trialed a new valve design (oracle valves) to replace current design (endurance valves) with promising results. Initial results show that trial valves hold and last longer. Two additional valves are planned for change out in 2023
Thickener overflow water pump (pumps take clarified water recovered from thickening process	• Ordered new pumps designed for slurry service. Pumps installation delayed into 2023 due to supply chain delays.

Operational Challenges	Continuous Improvement Activities
in the thickener to WETA for recycling) failures.	• Completed cleaning of the upstream BST tank to reduce solids excursion into the overflow system. • Initiated install of a tank recirculation system to reduce solids accumulation upstream of the overflow water pumps.
FFT material behaviour – potential coning	• Installed seals on pump caissons to reduce plugging and density loss. • Engaged external support to better understand coning challenges and options to mitigate.
Opportune CST co-deposition in TT deposition area	• Continue to demonstrate consolidation and overall deposit performance through improved drainage and loading of the deposit with CST sand.

6.2 Pilots or Prototypes

Imperial has several ongoing approved pilots:

- Inline Flocculation On-site Fluid Tailings Pilot Phase 3 Extension;
- Inline Flocculation On-Site Fluid Talings Pilot Phase 4/5 Extension; and
- Enhanced Beach Fines Capture Field Pilot Extension

These pilots allow for continuous improvement and operational learnings on the existing Kearl Fluid Tailings Treatment (KFTT) and development of supplemental treatment options. Out of the above pilot projects, Pilot phase 4/5 extention was operated during 2022. Thethe following sections provide an overview of the pilots and some available results.

6.2.1 Inline Flocculation Onsite Fluid Tailings Field Pilot Phase 5 Extention

Imperial requested authorization from the AER on April 13, 2021 and received approval April 21, 2021 to carry out a field pilot called Inline Flocculation Onsite Tailings Field Pilot Phase 5. An extension request for the ILF Phase 5 field pilot was submitted on July 28, 2021 and approved on December 20, 2021. The pilot focused on conducting inline flocculation (ILF) of FT and evaluating performances of ILF treated FT co deposited with TT at field scale.

ILF technology has been used in the oil sands industry since 2008. The ILF treatment of FT was identified as an opportunity to continue to increase overall fines treatment when the primary fines treatment facility (thickener) is not operational or when there is excess FT available from the WETA FT reclaim barge.

The objective of the pilot is to evaluate performance of ILF which has been co-deposited / interlayered with relatively high SFR TT and / or CST within the TT deposition area. The co-deposition / interlayering of ILF and TT is expected to follow a similar trajectory of solids content increase as TT, thereby meeting the D085 RTR requirements.

The treatment consists of minimum modifications as it leverages existing infrastructure of the primary treatment process. In addition, the ILF process does not introduce any new chemicals. ILF will be using the same approved flocculent used in the secondary chemical treatment process of KFTT.

Imperial intends to conduct the ILF trial only during planned or unplanned shutdowns of the thickener or extraction plant, to continue FT treatment. During 2022, 2022, ILF was intermittently operated between April and Septermer during periods of downtime. During ILF operation, FT was extracted from the WETA tailings pond using the FT barge and directly pumped to the inline polymer injection location. After polymer injection, ILF treated FT is sent to TT deposition area in the EETA. ILF deposition was mainly directed to west side of TT deposit. Figure 6-6 illustrates the active ILF deposition in the TT area.

Figure 6-6: ILF deposition in EETA TT deposit

A surveillance plan was developed to monitor the key performance indicators (KPIs) of the process during the pilot and leveraged readily available inline instrumentation. The deposit KPIs were evaluated by in-situ testing and field sampling methods combined with laboratory testing of the samples.

The key process indicators that were monitored during the commissioning and operation include:

- FT solids rate, flowrate and density;
- Flocculent dosage;
- Capillary suction time of treated FT;
- 24 hour and 7 day solids content
- Sands to fines ratio (SFR) / fines content
- Clay content

During 2022, ILF Phase 5 extention pilot produced 1.6 Mm^3 of ILF treated tailings, which is equivant to 4.5% of total produced total thickened tailings volume during the same time period. During ILF operations, dosage was maintained around 1000 g/t and fluctuated between 800 g/t and 1200 g/t. Figure 6-7 illustrates initial solids content and 7 day solids content measured from process data. As expected, initial solids content was maintained around 20%, and 7 day solids content tended to reach 30-40%. High solids content values (above 40%) in the chart are suspected to be from a mix of TT and ILF, which could happen at the transition period when operating mode switches to ILF from TT as it uses the same TT infrastructure. Note that days shown on Figure 6-7 are multiple ILF operation periods. Figure 6-8 shows clay content and SFR information determined from lab testing of ILF process samples. Over 80% clay content and around 0.2 SFR demonstrated the fines and clay dominant nature of this FT material and confirmed that treated material is targeted high fines , high clay FT.

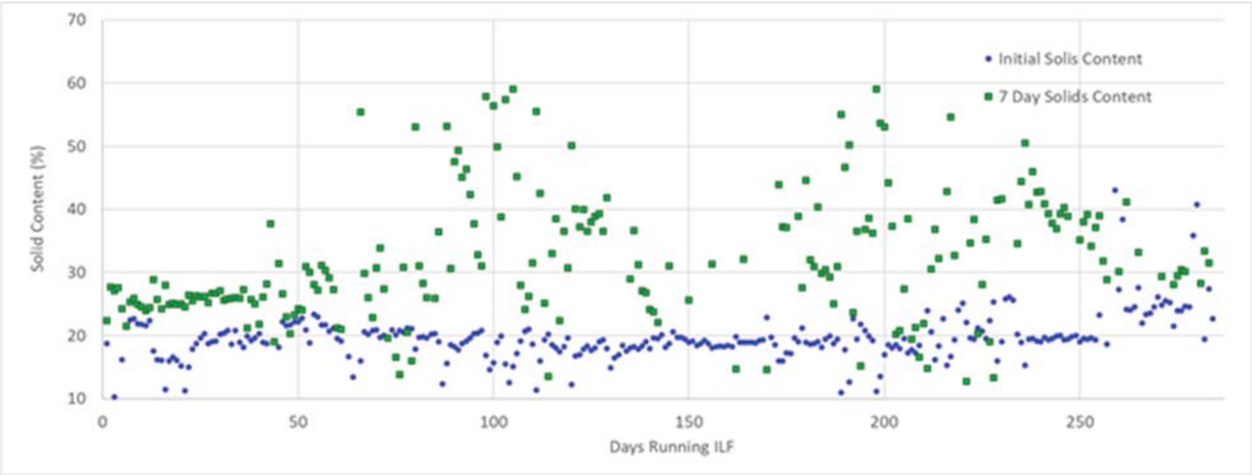

Figure 6-7: Initial and 7 day solids content from process data

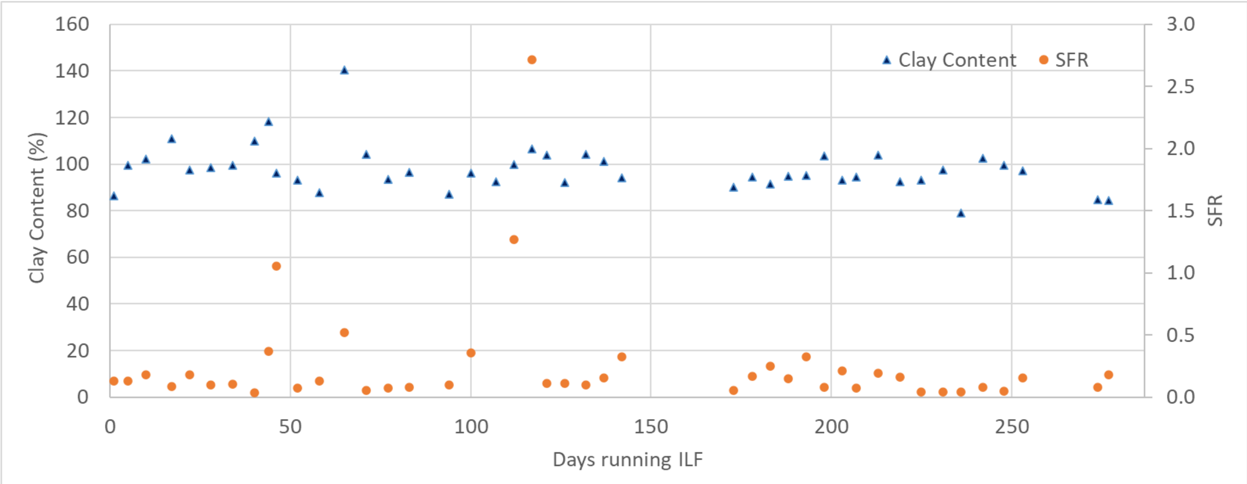

Figure 6-8: Measured Clay Content and SFR of ILF material from process samples

It was difficult to identify ILF in the deposit separately from regular TT as both were deposited into the same deposition area. The objective of the co-deposition is to let two streams mix in the deposit and improve ILF material quality, without degrading TT deposit quality. Based on overall deposit properties, it appears that ILF is mixed with TT or CST, satisfying the objective of co-deposition.

In summary, ILF process data demonstrated expected ILF treatment performance. Compared to the lab estimates, the results of the field pilot deposit surveillance demonstrated satisfactory performance from ILF treated FT material. Co-deposition/interlayering of ILF product with relatively high SFR / low clay, TT and/or CST appeared to improve overall deposit performance. The field pilot is expected to continue over future years, and will continue to be an area of investigation.

The ILF treatment of FT is an excellent opportunity to use excess capacity of the current treatment system to increase overall fines treatment capacity.

6.2.2 ILF Pilots – eILF treated FFT and TT co-deposition

Imperial submitted an extension request for the ILF Phase 5 field pilot on July 28, 2021 and received approval on Dec. 20, 2021. As part of Imperial's continuous improvement efforts, the long-term deposition strategy for the EETA is co-deposition of ILF or eILF treated FFT from all sources (WETA pond, EETA pond and TT runoff) with TT and CST. It is also expected that some CST will be inter-layered/co-deposited into the pilot deposition area due to proximity to the causeways and Centre Dyke.

Part of the ILF Phase 5 extension field pilot focused on evaluating enhanced inline flocculation (eILF) treatment of fluid tailings from WETA pond and its co-deposition with TT. The eILF process utilizes three chemicals for treatment of fluid tailings: a flocculant (polyacrylamide), a binder (colloidal silica) and a coagulant (aluminum sulphate) [under clause 4.3.19 of EPEA Approval No. 46586-01-00, as amended]. The polyacrylamide (PAM) polymer used during the eILF and TT co-deposition trial was Kemira E4993 (E4993), and its use was approved by AER in response to the 2021 extension request.

The objective of the pilot is to evaluate performance of eILF treated FFT co-deposited / interlayered with TT within the TT deposition area. Figure 6-9 shows the pilot location and layout of separate pipelines directing eILF treated FFT and TT streams (from KFTT plant) towards the southern boundary of TT deposition area. Five distinct discharge locations were devised, each purposed for creation of a specific deposit composition, as listed below:

- Discharge Location OB-A; for co-deposition of eILF and TT (i.e., simultaneous pour of both streams).
- Discharge Location OB-B; for intermittent deposition of eILF and TT (i.e., consecutive eILF and TT layers).
- Discharge Location OB-C; for pouring eILF only during the first few months of pilot to create a thick (~4 m) layer of eILF treated FFT; and then will be used for co-deposition of TT and eILF treated FFT. The objective of creating a deep sufficiently thick eILF layer is to measure its strength and dewatering characteristics for closure planning.
- Discharge location OB-D; to direct off-spec eILF treated FFT and to deposit TT when TT is not in the pour plan for locations OB-A, OB-B and OB-C.
- Discharge location OB-E; to direct TT stream when it is not in the pour plan for locations OB-A, OB-B and OB-C.

The proportion/duration of eILF and TT streams poured at locations OB-A and OB-B is managed by targeting an average SFR of 1 for the resultant deposit. The co-deposition / inter-layering of eILF and TT at an average SFR of 1 is expected to follow a relatively similar trajectory of strength gain as TT.

Commissioning of the eILF treated FFT pour started in September 2022 followed by more eILF deposition during October and November 2022. The eILF pour was temporarily paused due to operational challenges after November 26, 2022 and was resumed in 2023.

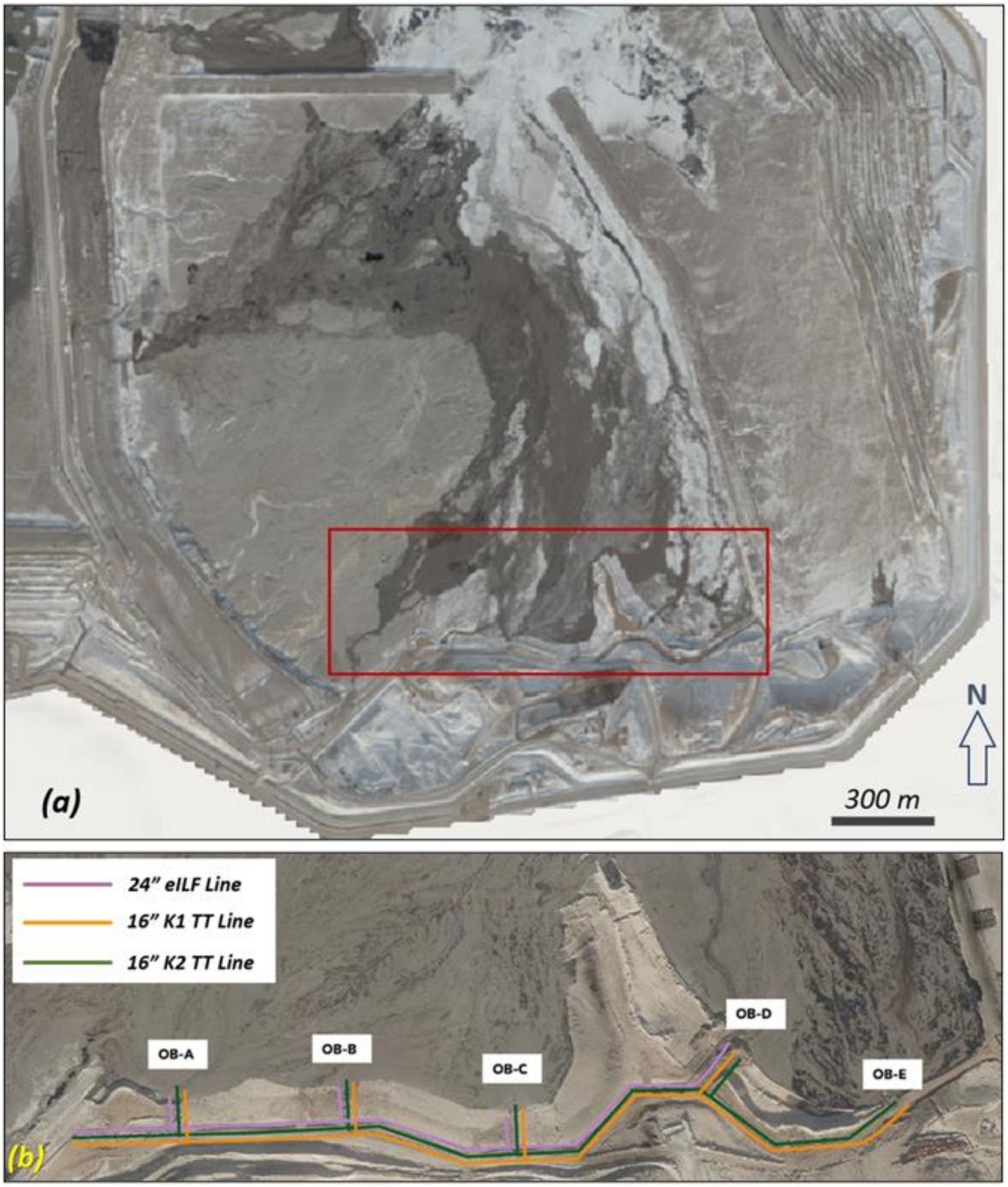

Figure 6-9: (a): Co-deposition pilot location. (b): Layout of eILF and TT pipelines

A surveillance plan was developed to monitor the KPIs of the treated slurry during the pilot and leveraged readily available inline instrumentation combined with laboratory testing of samples collected from the pipeline. Geotechnical investigation of the deposit was postponed to 2023; as duration of the pour was limited in 2022 and the resultant eILF/TT deposit was not thick enough to allow collection of representative samples and in-situ strength measurements.

The KPIs that were monitored during the commissioning and operations include:

- Untreated FFT flowrate, density/solids content, average SFR and MBI
- Dosage of chemical additives
- Capillary suction time of treated FFT and release water
- 24 hour and 7-day solids content of treated FFT

Figure 6-10 shows example photos of treated FFT collected at different stages of treatment (post chemical addition, during transport and at the end of pipeline), in the pail and on a strainer, and the yield stress and CST values measured for each sample. The results indicate good flocculation and dewatering of FFT by eILF treatment.

Post treatment	**During transport**	**End of pipeline**
		
		
Undermixed	Good Flocculation	Good Flocculation
CST: 36.9 s	CST: 19.3 s	CST: 9.9 s
Yield Stress: 124 Pa	Yield Stress: 269.6 Pa	Yield Stress: 532 Pa

Figure 6-10: Observations and Measurements for eILF Samples Collected on Nov. 3, 2022

During 2022, eILF-TT co-deposition pilot produced 0.89 Mm^3 of eILF treated tailings. The targeted flocculant dosage was 1500 g/t and fluctuated due to variation in FFT density. The targeted dosage for Alum and Colloidal Silica were 200 ppm and 40 ppm respectively. Based on the limited samples that were collected during the trial, Figure 6-11 illustrates variations of solids content after one day and 7 days, also variations of yield stress at 1 hour, 1 day and 7 days for the eILF treated samples. For on-spec samples (i.e., CST < 60 seconds), the average yield stress increased from ~400 Pa to >1500 Pa after 7 days, and the average solids content increased to ~42% from the initial FFT slurry (~20% solids content), indicating good dewatering.

A site investigation program is planned for Q3 2023 to collect samples from the eILF-TT deposit and to conduct in-situ strength measurements. The results of this investigation program will be provided in the next Fluid Tailings Management Report.

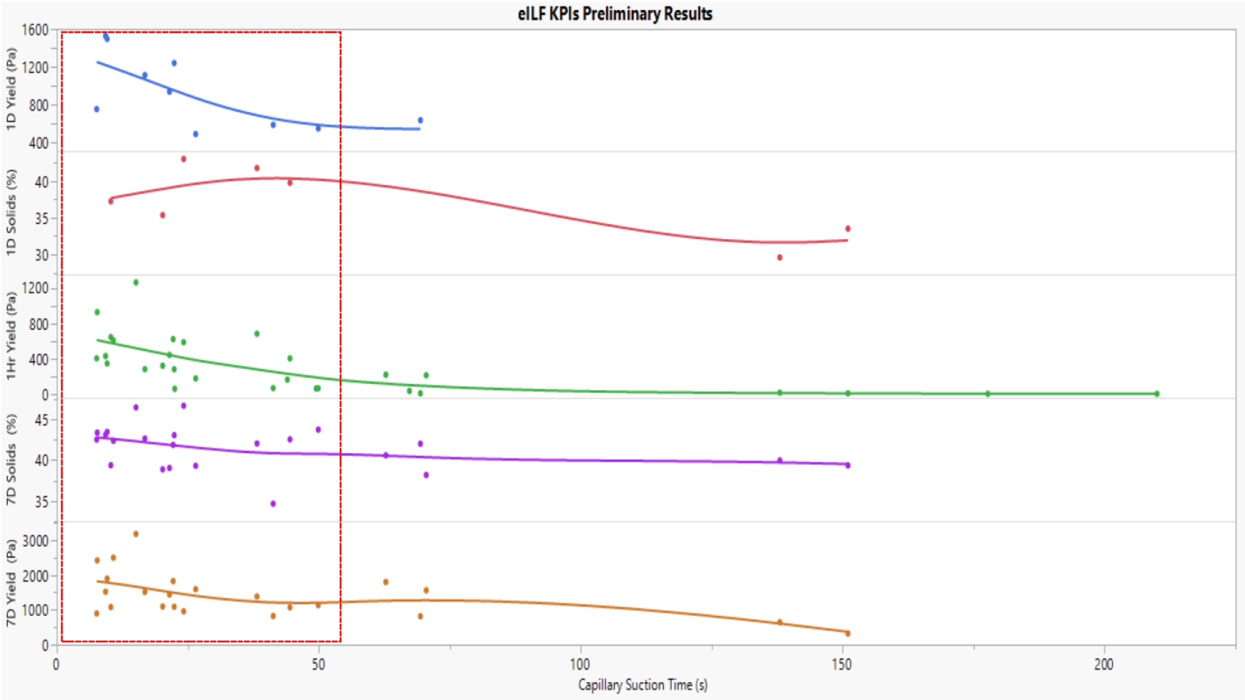

Figure 6-11: Variations of Solids Content, Yield Stress and Capillary Suction Time

7.0 Environmental Monitoring Results

As per Appendix C to Approval No. 10829M, Imperial's RTR Subobjective 2 criteria is 'groundwater is monitored in accordance with the Environmental Protection and Enhancement Act (EPEA) Approval No. 46586-00-00, as amended or renewed'.

Imperial uses the following to determine if treated fluid tailings material is achieving subobjective 2 RTR status:

1. Groundwater, during the reporting year, is monitored in accordance with the Environmental Protection and Enhancement Act (EPEA) Approval No. 46586-00-00, as amended or renewed.
2. The results of the groundwater monitoring program were reported in accordance with the Environmental Protection and Enhancement Act (EPEA) Approval No. 46586-00-00, as amended or renewed.

If both these conditions are met, all treated fluid tailings material will be deemed to have achieved subobjective 2 RTR status. Groundwater at Kearl continued to be monitored under the Kearl Groundwater Monitoring Plan (GMP), as required by EPEA Approval No. 46586-01-00, as amended, in 2022. Results of the groundwater monitoring program was reported in accordance with the EPEA Approval No. 46586-00-00, as amended or renewed. Imperial considers the deposits as meeting RTR criteria with respect to the 2022 groundwater conditions.

Surface water runoff and seepage through the perimeter dykes of the ETA was managed through a closed-circuit system. Runoff from the ETA was collected in toe ditches and collection ponds and was returned to the West ETA for use in the plant.

The Groundwater Monitoring Plan (GMP, 2018) details all groundwater monitoring programs across the Site. The intent of the GMP is to facilitate the understanding of potential effects of oil sands mining, bitumen extraction, and associated operations (including tailings management activities) on local groundwater quality and down-gradient receptors. Groundwater management and monitoring falls under four programs:

- Regulatory Groundwater Monitoring
- Basal and Devonian Depressurization
- Lined Pond Monitoring and Response; and
- External Tailings Area (ETA) Seepage Interception System (SIS) Monitoring and Response.

The Groundwater Response Plan (GRP), which is part of the GMP, outlines the actions required in response to changing water quality triggers. The ETA SIS Monitoring and Response Plan leverages the GRP to inform action required when control objectives (COs) are exceeded or increasing trends are observed.

This section focuses on the 2022 groundwater monitoring results associated with the ETA SIS Monitoring and Response program. In 2022, eight additional SIS pumping wells were activated in response to Process Affected Water (PAW) seepage observed at select monitoring wells. Results regarding the water quality that triggered activation of the SIS are discussed further below.

Groundwater Elevations

The groundwater elevations in the monitoring network have increased since the operation of the ETA. The groundwater elevations north of the WETA appear to be increasing at a faster rate compared to those north and east of the EETA. The noted increasing groundwater elevations are due to active works in this area, including loading of material due to dyke construction and the filling of the WETA. Since activation of the ETA SIS pumping wells in 2021 and 2022, groundwater elevations have decreased in areas where active pumping is occurring.

Groundwater Quality

Groundwater monitoring under the ETA SIS monitoring program is conducted monthly, quarterly, and semi-annually, depending on the water quality results for each monitoring well. New monitoring wells are typically sampled for a baseline analytical suite and, once sufficient baseline data are collected, monitoring suites are refined to key indicator parameters (KIPs), which are used to identify a potentially significant change in groundwater chemistry. Groundwater KIP concentrations are compared to control objectives (COs; site-specific thresholds) to determine if mitigation is required. In an effort to improve efficiency and manage large volumes of analytical data and comparison with their respective limits, the ETA SIS monitoring wells are grouped into water quality zones using the following criteria:

- Similar control limits defined by the background groundwater quality of the major ions and local lithology;
- Location of pumping and monitoring wells; and
- Groundwater flow patterns.

In 2022, CO exceedances were identified in KIP concentrations/values at 21 ETA SIS network wells. Observed CO exceedances were interpreted to be caused by one or more of the following:

- PAW seepage;
- Sulphide mineral oxidation (SMO); and
- A combination of PAW seepage and SMO.

Groundwater monitoring results are summarized in Table 7-1.

As outlined in the ETA Monitoring and Response Plan (Imperial 2015), CO exceedances would result in the installation and activation of pumping wells to capture and return PAW back to the ETA. In 2022, eight additional pumping wells were activated.

In May 2022, an investigation was initiated in areas near Waterbody 3 (WB3), north of WETA, north of Drainage Pond 4 (DP4), and north of the North Overburden Disposal Area (NODA) in response to the identification of orange precipitate and pooled surface water. The investigation included measuring water levels and collecting samples at existing monitoring wells that are not routinely sampled as part of the existing groundwater programs. Additional monitoring wells and drive point piezometers were installed in summer 2022 in support of the investigation with the purpose of investigating the source of the orange precipitate and understand the pathway and water quality upgradient of the groundwater seep areas. Monitoring in these areas is ongoing and is reported under separate cover.

In alignment with Environmental Protection Order (EPO) issued in February 2023, Imperial is currently advancing work to address seepage and collect water at Kearl ahead of spring melt. Pumping systems are operating at all four seep locations described in the EPO, and work is continuing to complete seep mitigations. Trenching work is well advanced and continuous monitoring is also in place to ensure mitigations are working as intended. Imperial has shared the mitigation and monitoring plans with communities and has offered for them to complete their own independent reviews of the technical work. Imperial is also seeking input from communities on the plans to improve communications going forward.

Table 7-1: Summarized Results of ETA SIS Monitoring

Zone	No. of Monitoring Wells Exceeding CO	Parameters Exceeding CO	No. of Active Pumping Wells	Pumping Wells Activation Month	GRP Stage(s)	Comments
1	6	TDS-c, sulphate, naphthenic acids, EC, Pyrene, PHC F2, BTEX*	6	June 2021 (1) July 2022 (4) August 2022 (1)	Verification, Delineation, Evaluation, Mitigation	Two monitoring wells require confirmatory sampling to confirm elevated KIP concentrations. One compliance well at the north lease boundary in Zone 1 exceeded AB Tier 1 guideline for TDS-c and total ammonia (as N).
2	7	ED, TDS-c, sulphate, naphthenic acids, boron, sodium,	6	June 2021 (1) July 2021 (2) July 2022 (2) Oct 2022 (1)	Evaluation, Mitigation	Mitigation was ongoing throughout 2022 with a total of six pumping wells operating at the end of 2022. Five compliance wells along the north lease boundary in Zone 2 exceeded AB Tier 1 guidelines for one or more KIPs.
3	1	EC, TDS-c, sulphate	0	n/a	Evaluation	The sulphate exceedance to be confirmed in 2023.
4	1	pH, EC, TDS-c,, total ammonia (as N)	0	n/a	Evaluation	In addition to the CO exceedances, the monitoring well had elevated concentrations of sodium, chloride, sulphate, PHC F2, and naphthenic acids, and toluene and ethylbenzene detections.
5	4	EC, TDS-c, total ammonia (as N), sulphate, naphthenic acids, boron, sodium	0	n/a	Delineation, Evaluation	Four monitoring wells installed in the shallow fill exceeded CO for several KIPs. Vertical delineation was achieved in the deeper wells that were paired with each shallow well. Several drive point wells were installed downgradient of the shallow wells and upgradient of WB3 to collect additional data and further delineate.
6	0	n/a	0	n/a	n/a	n/a
7	2	EC, TDS-c, total ammonia (as N)	0	n/a	Confirmation	One monitoring well had EC and TDS-c CO exceedances, along with a visually increasing trend in sulphate. The second monitoring well exceeded the CO for total ammonia (as N) and all other KIPs remained within baseline range. Confirmation of the total ammonia (as N) CO exceedance is required in 2023.

8.0 Acronyms

Acronym	Definition
AER	Alberta Energy Regulator
BAW	beach above water
BBW	beach below water
BST	Bitumen Separation Tank
COSIA	Canadian Oil Sands Innovation Alliance
CST	coarse sand tailings
Directive 85	*Directive 085 Fluid Tailings Management for Oil Sands Mining Projects.*
EETA	East External Tailings Area
ETA	External Tailings Area
EPEA	*Environmental Protection and Enhancement Act*
FFT	fluid fine tailings
FLT	flotation tailings
FT	fluid tailings
ILF	inline flocculation
Imperial	Imperial Oil Resources Limited
g/t	gram/ton
K1	Kearl Plant 1
K2	Kearl Plant 2
Kearl	Kearl Oil Sands Mine
KFTT	Kearl fine tailings treatment
kPa	Kilopascal
MCFN	Mikisew Cree First Nation
m	Metres
MBI	Methylene Blue Index
mg/L	milligram per liter
Mm^3	million cubic metres
Mt	million tonnes
OSCA	*Oil Sands Conservation Act*
OSPW	Oil sand process-affected water
PCA	Pleistocene Channel Aquifer
PSD	particle size distribution
RTR	ready-to-reclaim
SFR	sand to fines ratio
SIS	Seepage Interception System
TDS	total dissolved solids
TMP	Tailings Management Plan
transition	transition zone
TRS	tailings recovery system

TSRU	tailings solvent recovery unit
TT	thickened tailings
WETA	West External Tailings Area

9.0 Closure and Limitations

This document has been prepared for the exclusive use of Imperial Oil Resources Limited and their agents, to meet the specific D085 annual reporting requirements for the Kearl Oil Sands Mine. Any use that a third party makes of this document, or any reliance on or decisions to be made based on this document are the sole responsibility of such third parties. Imperial cannot accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document. This document has been prepared in accordance with the current generally accepted engineering practices in the oil sands industry. No other warranty is made, either expressed or implied.

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PERMIT NUMBER: P000884
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10.0 References

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Appendix A Sampling Locations

Table A-1: Fluid Only Samples

Easting	Northing
494470	6364956
494498	6364935
494482	6364982
494596	6364870
494588	6364950
496154	6364866
495388	6364778
494986	6364778
494392	6364771
495751	6364679
496242	6364648
495192	6364606
494794	6364601
494787	6364597
494592	6364602
496046	6364566
495390	6364428
495189	6364448
494344	6364422
494660	6364208
494636	6364043
497716	6365034
497821	6365035
498119	6365030
498021	6364934
497687	6364829
498021	6364734

Table A-2: Fixed Interval Samples

Easting	Northing
496155	6364865
494991	6364776
494393	6364774
494591	6364597
495392	6364429
494658	6364208
497721	6365032

Easting	Northing
498018	6364929
497682	6364828

Table A-3: CT09 Samples

Easting	Northing
494431	6365437
494737	6365431
494860	6365433
494992	6365433
495105	6365433
495225	6365433
495467	6365433
494515	6365432
495337	6365424
495582	6365427
494631	6365426
495702	6365424
495811	6365418
495943	6365419
496060	6365390
496332	6365397
496409	6365361
496158	6365381
496247	6365399
494322	6365400
494268	6365353
496061	6365317
495942	6365314
495817	6365315
495701	6365315
495583	6365314
495461	6365314
495341	6365306
495221	6365306
495098	6365311
494980	6365312
494863	6365306
494740	6365308

Easting	Northing
494623	6365308
494502	6365306
494379	6365309
494260	6365303
494149	6365280
496329	6365266
496180	6365261
496251	6365258
496420	6365257
496061	6365196
495948	6365201
495820	6365203
495700	6365195
495578	6365203
495464	6365200
495342	6365198
495220	6365195
495101	6365193
494983	6365192
494863	6365197
494744	6365195
494621	6365186
494504	6365189
494385	6365183
494265	6365186
496176	6365159
494089	6365158
496326	6365152
496259	6365148
494177	6365125
496066	6365080
495939	6365077
495835	6365078
495706	6365078
495581	6365072
495464	6365077
495347	6365075
495223	6365078

Easting	Northing
495104	6365076
494986	6365074
494867	6365072
494744	6365072
494623	6365070
494502	6365075
494382	6365071
494267	6365067
496173	6365063
496338	6365057
496413	6365057
496240	6365052
494049	6365037
494164	6365010
494426	6365005
494534	6364985
494273	6364977
496162	6364959
496061	6364959
495946	6364962
495828	6364957
495704	6364959
496325	6364958
495585	6364958
495383	6364953
495186	6364956
496236	6364949
496415	6364950
494986	6364944
494789	6364948
494583	6364952
494382	6364945
494025	6364919
496411	6364897
494145	6364893
494481	6364882
496330	6364874
494262	6364874

Easting	Northing
496155	6364870
496000	6364866
495851	6364861
495721	6364865
496238	6364858
493967	6364799
493998	6364798
495591	6364771
495385	6364782
495746	6364787
495192	6364778
494121	6364778
494986	6364779
494794	6364775
495856	6364777
494589	6364778
494386	6364772
495952	6364771
496059	6364765
496156	6364756
494246	6364752
496237	6364750
493941	6364705
493984	6364682
495749	6364678
495851	6364677
495951	6364671
496053	6364667
496151	6364658
494101	6364657
496240	6364653
494211	6364637
494342	6364612
494476	6364612
495589	6364604
495393	6364602
495191	6364603
494988	6364597

Easting	Northing
494793	6364601
494590	6364599
495745	6364579
495849	6364577
495949	6364567
496048	6364566
493955	6364558
496143	6364559
496240	6364550
496335	6364552
494102	6364542
493937	6364587
494277	6364527
495746	6364510
496421	6364494
495665	6364484
494456	6364473
495839	6364479
495937	6364468
494008	6364471
496039	6364473
496236	6364462
496345	6364463
496141	6364458
494177	6364444
495590	6364430
495391	6364429
495189	6364448
494989	6364424
494793	6364427
495768	6364425
494591	6364424
494346	6364426
493955	6364476
495686	6364398
496037	6364417
495902	6364404
495301	6364370

Easting	Northing
494081	6364364
494511	6364367
495449	6364364
496135	6364399
496226	6364409
494251	6364353
495621	6364342
495052	6364348
494414	6364329
495183	6364311
494006	6364364
494492	6364229
495352	6364286
494742	6364283
494906	6364288
494153	6364279
495520	6364319
494322	6364259
495092	6364239
494493	6364229
495257	6364212
494660	6364206
494829	6364183
494229	6364182
494996	6364164
494391	6364161
495162	6364144
494563	6364136
494733	6364119
494908	6364101
494301	6364089
495074	6364075
494473	6364068
494636	6364039
494805	6364026
494975	6364005
494377	6363992
495021	6363983

Easting	Northing
494545	6363968
494715	6363948
494291	6363927
494882	6363927
494991	6363904
494450	6363902
494620	6363874
494787	6363857
494951	6363831
494369	6363824
494517	6363802
494687	6363783
494858	6363758
494942	6363747
494434	6363802
494595	6363705
494763	6363688
494913	6363695
494670	6363639
496474	6365061
496427	6365154
496518	6364952
496523	6364903
496495	6364497
494739	6365473
494630	6365462
494184	6365323
494017	6365057
493979	6364957
494792	6363634
494592	6363662
494501	6363747
494258	6363907
494232	6364051
494171	6364146
494082	6364239
495358	6364273
495689	6364328

Easting	Northing
496333	6364442
497817	6365197
498017	6365197
497720	6365134
497820	6365132
497923	6365134
498018	6365132
497714	6365032
497819	6365032
497925	6365032
498015	6365033
498121	6365033
497648	6364924
497723	6364928
497817	6364928
497915	6364933
498018	6364931
498114	6364935
497690	6364826
497817	6364829
497921	6364831
498020	6364831
498127	6364835
497786	6364724
497927	6364731
498025	6364731
498121	6364735
498022	6364640

Table A-4: Solid Samples

Easting	Northing
6363912	497515
6364447	497530
6363615	497739
6364403	497906
6364405	497905
6364007	497983
6363698	498226

Easting	Northing
6364440	497156
6364439	497155
6364215	497169
6364218	497168
6364022	497190
6363818	497215
6363611	497240
6363420	497258
6363419	497256
6363218	497283
6364357	497293
6364158	497315
6364155	497318
6363947	497344
6363744	497372
6363744	497373
6363545	497401
6363332	497431
6363075	497460
6364475	497420
6364307	497444
6364102	497478
6363912	497515
6363715	497554
6363514	497584
6363513	497587
6363299	497627
6363080	497659
6363079	497661
6364447	497530
6364232	497593
6364036	497638
6363829	497690
6363615	497739
6363432	497794
6363231	497843
6364403	497733
6364317	497749

Easting	Northing
6364104	497787
6363906	497836
6363701	497884
6363495	497934
6363295	497984
6364403	497906
6364405	497905
6364202	497932
6364007	497983
6363800	498027
6363608	498078
6363399	498134
6364306	498099
6364307	498100
6364100	498133
6363900	498177
6363698	498226
6363506	498274
6363300	498332
6364014	498327
6363804	498371
6363601	498424
6363398	498473
6363205	498521
6363004	498571

Appendix B Indigenous Relations Guiding Principles and Guidelines

Indigenous relations

Principles and guidelines

Many of Imperial's operations and future development opportunities are located on the traditional lands of Indigenous Peoples. The company supports communities in areas where it explores, develops and operates, and Imperial's leadership strives to establish meaningful relationships built on mutual trust and respect.

Principles

Imperial builds relationships with Indigenous Peoples through collaboration on a common vision for progress, sustainable prosperity and environmental stewardship.

We engage Indigenous communities and their representatives in open and meaningful consultation and seek to understand their perspectives on issues of mutual interest and deal constructively with differing views.

Our recruitment and development programs support the participation and involvement of Indigenous Peoples.

The company recognizes that Indigenous Peoples want economic benefits from development. We work with Indigenous businesses and communities to identify mutually beneficial opportunities.

Imperial conducts its business in a manner that respects the land, environment, rights and cultures of Indigenous communities. We do this in accordance with the laws of Canada and corporate policies and guidelines that underlie the company's commitment to ethics, equity, environment and safety.

The company expects its contactors to conduct their business in accordance with these principles and guidelines.

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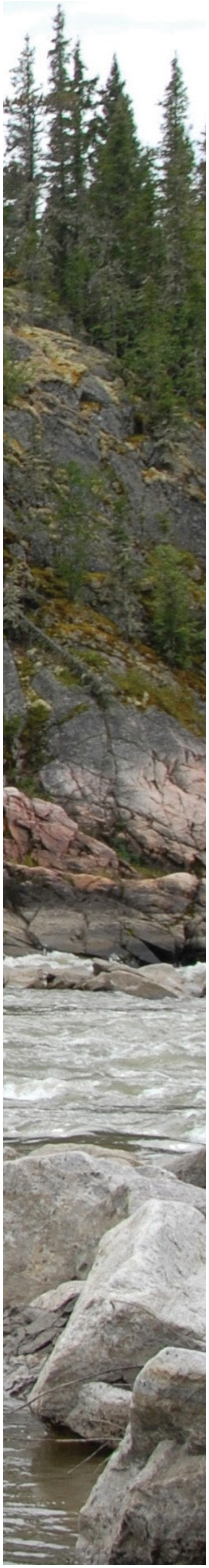

Indigenous relations guidelines

Imperial strives to build meaningful relationships with Indigenous Peoples through the following four pillars of engagement

Consultation

Imperial maintains ongoing dialogue with Indigenous leaders, community members and their representatives by:

- Respecting the legal rights of Indigenous People.
- Ensuring timely discussions when activities have the potential to impact the community.
- Supporting the identification of impacts to traditional uses and rights in order to appropriately avoid, minimize or mitigate.
- Treating all parties fairly.
- Respecting traditional practices, decision-making processes, cultural activities and language.
- Coordinating with Crown consultation and adhering to government requirements.

Workforce development

In accordance with Imperial's equal employment opportunity policy, the company's goal is to achieve a workforce that is representative of the available qualified Indigenous Peoples in the labour market. To this end, Imperial focuses on:

- Developing and supporting educational programs and recruiting practices that facilitate employment of qualified Indigenous People.
- Establishing internal training and development programs that enhance retention of Indigenous staff and provide opportunities for employees to further their understanding of Indigenous culture, history and traditions.
- Addressing workplace barriers that may exist.
- Honouring diverse backgrounds and supporting our employees by creating a culturally inclusive workplace.

Business development

Imperial fosters the development of Indigenous businesses in ways that benefit the company and the community by:

- Developing Indigenous content plans that address employment and business opportunities for Indigenous Peoples and including this content as a factor in evaluating and awarding contracts.
- Supporting the growth and development of Indigenous business through capacity building and shared learning.
- Using Indigenous suppliers of goods and services that are competitive and meet Imperial's safety, technical and quality standards and timing needs.
- Providing information and training on Imperial's procurement processes, safety standards and expectations of business conduct.

Community relations

Imperial builds meaningful relationships with Indigenous communities by:

- Working collaboratively in the design and implementation of programs that build capacity through leadership development and community initiatives.
- Being an active community participant in order to better understand and learn about Indigenous history, culture and traditions

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Appendix C Agenda and Attendee list for the 2022 Annual Forum

Kearl Tailings Management Forum

Meeting Agenda

Date	June 20, 2022 1:00 – 4:00 pm	**Location**	Zoom

Topic
Welcome and Introductions Opening Remarks
Fluid tailings management • Fluid tailings inventory • Fluid tailings characteristics

Treated tailings performance
 	
• Overview of deposition strategy in TT area
• Interpretation of measured properties with block model
• Deposit improvement compared to 2019
• TT deposit composition
  o Solids and fines content
  o Excess pore pressure
  o Effective Stress and shear strength

ILF field pilot results
Closing Discussion

Attendees	**Organization**
Carmen Wells	Fort Chipewyan Métis
Ryan Abel	Fort McKay First Nation
Godlove Ngeh	Mikisew Cree First Nation
Lindsay Wong	Mikisew Cree First Nation
Russell Noseworthy	McMurray Métis
Shanti Berryman	Integral Ecology
Megan Thompson	Thompson Aquatic
Lisa Schaldemose	Schaldemose & Associates Inc.
Martin Grygar	Breakwater Vantage
Mandy Olsgard	Fort Mackay Metis Nation

Monique Dube	Cumulative Effects Environmental Inc.
Eber Araujo	GeoRoots
Rhiannon Davies	Imperial
Rita Karrel	Imperial
Jennifer Haverhals	Imperial
Anu Saini	Imperial
Sidantha Weerakone	Imperial
Asfaw Bekele	Imperial
Manoj Biswas	Imperial
Sarah Theberge	Imperial
Allan Linegar	Imperial

Appendix D Water Quality Results of the Additional Constituents

DESIKA

MIKISEW GROUP + FORT MCKAY FIRST NATION + ADVISIAN

Monitoring Station	Date (dd-mmm-yyyy)	Sample Name	Field Parameters: Specific Conductivity (uS/cm)	Field Parameters: Dissolved Oxygen (%) (%)	Field Parameters: pH (pH units)	Field Parameters: Temperature (deg C)	Field Parameters: Dissolved Oxygen (mg/L)	Field Parameters: Conductivity (uS/cm)	Conventional Parameters: Specific Conductivity (uS/cm)	Conventional Parameters: pH (Laboratory) (pH Units)	Conventional Parameters: Turbidity (ntu)	Conventional Parameters: Total Hardness as CaCO3 (mg/L)	Conventional Parameters: Total Alkalinity as CaCO3 (mg/L)	Conventional Parameters: PP Alkalinity as CaCO3 (mg/L)	Conventional Parameters: Chloride:D (mg/L)	Conventional Parameters: Sulphate:D (mg/L)	Conventional Parameters: Dissolved Sulphide (mg/L)	Conventional Parameters: Total Sulphide (mg/L)	Conventional Parameters: Sulphide (as H2S) (mg/L)	Conventional Parameters: Total Dissolved Solids (mg/L)	Conventional Parameters: Total Dissolved Solids - Calculated (mg/L)	Conventional Parameters: Total Suspended Solids (TSS) (mg/L)	Conventional Parameters: Bicarbonate (mg/L)	Conventional Parameters: Carbonate (mg/L)
UNSPECIFIED																								
EETA-TL	27-Jun-2022	EETA-TL	1695	68.3	8.66	21.1	5.73	1569	1500	8.35	30	200	220	2.0	37	430	< 0.0018	0.0044	0.0047	1100 [#1]	950	8.8	270	2.4
	27-Aug-2022	EETA-TL	---	---	---	---	---	---	1600	8.35	---	180	210	2.3	41	550	---	0.021	0.022	1200 [#1]	1100	---	250	2.7
	15-Sep-2022	EETA-TL	1650	91.1	8.21	19.1	8.33	1462	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
WETA-DD	26-Jun-2022	WETA-DD	1523	62.3	7.86	20.9	5.55	1402	1400	8.28	13	230	390	< 1.0	120	150	< 0.0018	< 0.0018	< 0.0020	980	810	3.3	470	< 1.0
	27-Aug-2022	WETA-DD	---	---	---	---	---	---	1500	8.40	---	220	240	5.9	38	480	---	0.0052	0.0055	1100	1000	---	280	7.1
	15-Sep-2022	WETA-DD	1559	85.6	7.98	20.4	7.56	1424	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

1. --- in detail data row(s) denotes parameter not analyzed.
2. Superscript [#1] - Detection limit raised based on sample volume used for analysis.
3. Superscript [#2] - Detection limits raised due to sample matrix.

DESIKA

MIKISEW GROUP + FORT MCKAY FIRST NATION + ADVISIAN

					Carbon			Nitrogen Parameters								Phosphorus	Dissolved Metals and Trace Elements								
Monitoring Station	Date (dd-mmm-yyyy)	Sample Name	Hydroxide (mg/L)	Fluoride:D (mg/L)	Dissolved Inorganic Carbon (DIC) (mg/L)	Dissolved Organic Carbon (DOC) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Nitrate plus Nitrite as N (mg/L)	Nitrate (NO3) (mg/L)	Nitrite (NO2) (mg/L)	Ammonia as N (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)	Nitrogen (mg/L)	Orthophosphate (P) (mg/L)	Dissolved Aluminum (ug/L)	Dissolved Antimony (ug/L)	Dissolved Arsenic (ug/L)	Dissolved Barium (ug/L)	Dissolved Beryllium (ug/L)	Dissolved Bismuth (ug/L)	Dissolved Boron (ug/L)	Dissolved Cadmium (ug/L)	Dissolved Calcium (ug/L)
UNSPECIFIED																									
EETA-TL	27-Jun-2022	EETA-TL	< 1.0	5.0	66	26 [#2]	26 [#2]	0.096	0.062	0.16	0.43	0.21	0.36	0.98	1.1	0.021	4.7	1.2	3.4	170	< 1.0	< 5.0	1700	< 0.020	42000
	27-Aug-2022	EETA-TL	< 1.0	6.2	---	---	---	---	---	---	0.41	0.29	0.54	---	---	---	6.5	1.6	3.5	190	< 1.0	---	2000	< 0.020	40000
	15-Sep-2022	EETA-TL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
WETA-DD	26-Jun-2022	WETA-DD	< 1.0	2.7	140	20	20	0.019	< 0.010	0.019	0.086	< 0.033	0.32	0.96	0.98	< 0.0030	4.9	1.2	2.2	200	< 1.0	< 5.0	1400	< 0.020	50000
	27-Aug-2022	WETA-DD	< 1.0	4.6	---	---	---	---	---	---	0.37	0.15	0.38	---	---	---	3.4	1.3	2.6	190	< 1.0	---	1700	< 0.020	50000
	15-Sep-2022	WETA-DD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

Dissolved Metals and Trace Elements

Monitoring Station	Date (dd-mmm-yyyy)	Sample Name	Dissolved Chromium (ug/L)	Dissolved Cobalt (ug/L)	Dissolved Copper (ug/L)	Dissolved Iron (ug/L)	Dissolved Lead (ug/L)	Dissolved Lithium (ug/L)	Dissolved Magnesium (ug/L)	Dissolved Manganese (ug/L)	Dissolved Mercury (ug/L)	Dissolved Molybdenum (ug/L)	Dissolved Nickel (ug/L)	Dissolved Phosphorus (ug/L)	Dissolved Potassium (ug/L)	Dissolved Selenium (ug/L)	Dissolved Silicon (ug/L)	Dissolved Silver (ug/L)	Dissolved Sodium (ug/L)	Dissolved Strontium (ug/L)	Dissolved Sulphur (ug/L)	Dissolved Thallium (ug/L)	Dissolved Tin (ug/L)	Dissolved Titanium (ug/L)	Dissolved Uranium (ug/L)	Dissolved Vanadium (ug/L)	Dissolved Zinc (ug/L)
UNSPECIFIED																											
EETA-TL	27-Jun-2022	EETA-TL	< 1.0	1.6	< 1.0	< 60	< 0.20	120	23000	29	< 0.0019	67	7.4	< 100	18000	0.20	5400	< 0.10	270000	960	180000	< 0.20	< 1.0	< 1.0	2.5	14	7.3
	27-Aug-2022	EETA-TL	< 1.0	1.6	< 1.0	< 60	< 0.20	130	21000	52	< 0.0019	78	8.1	< 100	21000	0.42	5200	< 0.10	280000	1100	170000	< 0.20	< 1.0	< 1.0	3.3	17	< 3.0
	15-Sep-2022	EETA-TL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
WETA-DD	26-Jun-2022	WETA-DD	< 1.0	2.2	1.7	< 60	< 0.20	100	24000	120	< 0.0019	68	8.0	< 100	14000	< 0.20	5400	< 0.10	220000	1000	150000	< 0.20	< 1.0	< 1.0	2.5	8.8	< 3.0
	27-Aug-2022	WETA-DD	< 1.0	1.7	< 1.0	< 60	< 0.20	120	24000	120	< 0.0019	64	7.1	< 100	18000	< 0.20	5400	< 0.10	240000	1100	160000	< 0.20	< 1.0	< 1.0	2.5	11	< 3.0
	15-Sep-2022	WETA-DD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

DESIKA

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				Total Metals and Trace Elements																								
Monitoring Station	Date (dd-mmm-yyyy)	Sample Name	Dissolved Zirconium (ug/L)	Total Aluminum (ug/L)	Total Antimony (ug/L)	Total Arsenic (ug/L)	Total Barium (ug/L)	Total Beryllium (ug/L)	Total Bismuth (ug/L)	Total Calcium (ug/L)	Total Cadmium (ug/L)	Total Boron (ug/L)	Total Chromium (ug/L)	Total Cobalt (ug/L)	Total Copper (ug/L)	Total Iron (ug/L)	Total Lead (ug/L)	Total Lithium (ug/L)	Total Magnesium (ug/L)	Total Manganese (ug/L)	Total Mercury (ug/L)	Total Molybdenum (ug/L)	Total Nickel (ug/L)	Total Phosphorus (ug/L)	Total Potassium (ug/L)	Total Selenium (ug/L)	Total Silicon (ug/L)	Total Silver (ug/L)
UNSPECIFIED																												
EETA-TL	27-Jun-2022	EETA-TL	< 3.0	2100	2.0	5.0	180	< 1.0	< 5.0	40000	0.031	1600	2.0	2.7	< 1.0	350	0.28	120	22000	64	< 0.0019	99	11	< 100	17000	0.39	9000	< 0.10
	27-Aug-2022	EETA-TL	---	2200	1.8	4.0	190	< 2.0	---	43000	< 0.040	2000	4.6	3.3	4.3	730	1.3	150	22000	120	< 0.019	89	11	< 100	23000	0.49	8600	< 0.20
	15-Sep-2022	EETA-TL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
WETA-DD	26-Jun-2022	WETA-DD	< 3.0	150	1.4	2.5	190	< 1.0	< 5.0	53000	0.020	1300	< 1.0	2.7	< 1.0	92	< 0.20	110	24000	140	< 0.0019	76	9.1	< 100	14000	0.23	5800	< 0.10
	27-Aug-2022	WETA-DD	---	1600	1.4	3.3	190	< 1.0	---	53000	< 0.020	1600	1.8	2.1	< 1.0	240	0.24	130	25000	130	< 0.0019	75	8.4	< 100	19000	< 0.20	7400	< 0.10
	15-Sep-2022	WETA-DD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

DESIKA

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			Total Metals and Trace Elements										BTEX						Select Hydrocarbons						PAHs			
Monitoring Station	Date (dd-mmm-yyyy)	Sample Name	Total Sodium (ug/L)	Total Strontium (ug/L)	Total Sulphur (ug/L)	Total Thallium (ug/L)	Total Tin (ug/L)	Total Titanium (ug/L)	Total Uranium (ug/L)	Total Vanadium (ug/L)	Total Zinc (ug/L)	Total Zirconium (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	m & p-Xylene (ug/L)	o-Xylene (ug/L)	Xylenes-Total (ug/L)	PHC F4 (C34-C50+) (ug/L)	PHC F1 (C6-C10) (ug/L)	PHC F1 (C6-C10) - BTEX (ug/L)	PHC F2 (C10-C16) (ug/L)	PHC F3 (C16-C34) (ug/L)	Naphthenic acids (mg/L)	2-Methylnaphthalene (ug/L)	1-Methylnaphthalene (ug/L)	Acenaphthylene (ug/L)	Acenaphthene (ug/L)
UNSPECIFIED																												
EETA-TL	27-Jun-2022	EETA-TL	250000	960	160000	< 0.20	< 1.0	62	3.9	22	< 3.0	3.6	< 0.40	< 0.40	< 0.40	< 0.80	< 0.40	< 0.89	< 200	< 100	< 100	< 100	150	50	< 0.10	< 0.10	< 0.10	< 0.10
	27-Aug-2022	EETA-TL	290000	1100	180000	< 0.40	< 2.0	22	3.8	25	73	---	< 0.40	< 0.40	< 0.40	< 0.80	< 0.40	< 0.89	---	< 100	< 100	< 100	---	29	< 0.10	< 0.10	< 0.10	< 0.10
	15-Sep-2022	EETA-TL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	< 0.10	< 0.10	< 0.10	< 0.10
WETA-DD	26-Jun-2022	WETA-DD	220000	1000	140000	< 0.20	< 1.0	2.0	2.9	9.9	< 3.0	< 3.0	< 0.40	< 0.40	< 0.40	< 0.80	< 0.40	< 0.89	< 200	< 100	< 100	< 100	160	40	< 0.10	< 0.10	< 0.10	< 0.10
	27-Aug-2022	WETA-DD	250000	1100	160000	< 0.20	< 1.0	31	2.8	14	< 3.0	---	< 0.40	< 0.40	< 0.40	< 0.80	< 0.40	< 0.89	---	< 100	< 100	< 100	---	21	< 0.10	< 0.10	< 0.10	< 0.10
	15-Sep-2022	WETA-DD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	< 0.10	< 0.10	< 0.10	< 0.10

NOTES:

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Monitoring Station	Date (dd-mmm-yyyy)	Sample Name	Polycyclic Aromatic Hydrocarbons																				
			Acridine (ug/L)	Anthracene (ug/L)	Benzo[a]anthracene (ug/L)	Benzo[a]pyrene (ug/L)	Benzo[a]pyrene equivalency (ug/L)	Benzo[b&j]fluoranthene (ug/L)	Benzo[c]phenanthrene (ug/L)	Benzo[e]pyrene (ug/L)	Benzo[g,h,i]perylene (ug/L)	Benzo[k]fluoranthene (ug/L)	Biphenyl (ug/L)	C1benzobjkfluoranthene/benzoapyrene (ug/L)	C1-Substituted Acenaphthene (ug/L)	C1-Substituted Benzo[a]anthracene/Chrysene (ug/L)	C1-Substituted Biphenyl (ug/L)	C1-Substituted Dibenzothiophene (ug/L)	C1-Substituted Fluoranthene/Pyrene (ug/L)	C1-Substituted Fluorene (ug/L)	C1-Substituted Naphthalene (ug/L)	C1-Substituted Phenanthrene/Anthracene (ug/L)	C2benzobjkfluoranthene/benzoapyrene (ug/L)
UNSPECIFIED																							
EETA-TL	27-Jun-2022	EETA-TL	< 0.040	< 0.010	< 0.0085	< 0.0075	< 0.010	< 0.0085	< 0.050	< 0.050	< 0.0085	< 0.0085	---	---	---	---	---	---	---	---	---	---	---
	27-Aug-2022	EETA-TL	< 0.040	< 0.010	< 0.0085	< 0.0075	0.010	0.013	< 0.050	< 0.050	< 0.0085	< 0.0085	---	---	---	---	---	---	---	---	---	---	---
	15-Sep-2022	EETA-TL	< 0.040	< 0.010	< 0.0085	< 0.0075	< 0.010	< 0.0085	< 0.050	< 0.050	< 0.0085	< 0.0085	< 0.020	< 0.0075	< 0.10	0.031	< 0.020	< 0.020	0.11	< 0.050	< 0.10	0.056	< 0.0075
WETA-DD	26-Jun-2022	WETA-DD	< 0.040	< 0.010	< 0.0085	< 0.0075	< 0.010	< 0.0085	< 0.050	< 0.050	< 0.0085	< 0.0085	---	---	---	---	---	---	---	---	---	---	---
	27-Aug-2022	WETA-DD	< 0.040	< 0.010	< 0.0085	< 0.0075	< 0.010	< 0.0085	< 0.050	< 0.050	< 0.0085	< 0.0085	---	---	---	---	---	---	---	---	---	---	---
	15-Sep-2022	WETA-DD	< 0.040	< 0.010	< 0.0085	< 0.0075	< 0.010	< 0.0085	< 0.050	< 0.050	< 0.0085	< 0.0085	< 0.020	< 0.0075	< 0.10	0.011	< 0.020	< 0.020	0.040	< 0.050	< 0.10	< 0.050	< 0.0075

NOTES:

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			Polycyclic Aromatic Hydrocarbons																						
Monitoring Station	**Date (dd-mmm-yyyy)**	**Sample Name**	**C2-Substituted Benzo[a]anthracene/Chrysene (ug/L)**	**C2-Substituted Biphenyl (ug/L)**	**C2-Substituted Dibenzothiophene (ug/L)**	**C2-Substituted Fluoranthene/Pyrene (ug/L)**	**C2-Substituted Fluorene (ug/L)**	**C2-Substituted Naphthalene (ug/L)**	**C2-Substituted Phenanthrene/Anthracene (ug/L)**	**C3-Substituted Benzo[a]anthracene/Chrysene (ug/L)**	**C3-Substituted Dibenzothiophene (ug/L)**	**C3-Substituted Fluoranthene/Pyrene (ug/L)**	**C3-Substituted Fluorene (ug/L)**	**C3-Substituted Naphthalene (ug/L)**	**C3-Substituted Phenanthrene/Anthracene (ug/L)**	**C4-Substituted Benzo[a]anthracene/Chrysene (ug/L)**	**C4-Substituted Dibenzothiophene (ug/L)**	**C4-Substituted Fluoranthene/Pyrene (ug/L)**	**C4-Substituted Naphthalene (ug/L)**	**C4-Substituted Phenanthrene/Anthracene (ug/L)**	**Chrysene (ug/L)**	**Dibenz[a,h]anthracene (ug/L)**	**Dibenzothiophene (ug/L)**	**Fluoranthene (ug/L)**	**Fluorene (ug/L)**
UNSPECIFIED																									
EETA-TL	27-Jun-2022	EETA-TL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	< 0.0085	< 0.0075	---	< 0.010	< 0.050
	27-Aug-2022	EETA-TL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	< 0.0085	< 0.0075	---	< 0.010	< 0.050
	15-Sep-2022	EETA-TL	0.074	< 0.020	0.13	0.19	0.13	< 0.10	0.25	< 0.0085	0.16	0.22	< 0.050	< 0.10	0.34	< 0.0085	0.10	0.056	0.15	0.097	< 0.0085	< 0.0075	< 0.020	< 0.010	< 0.050
WETA-DD	26-Jun-2022	WETA-DD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	< 0.0085	< 0.0075	---	< 0.010	< 0.050
	27-Aug-2022	WETA-DD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	< 0.0085	< 0.0075	---	< 0.010	< 0.050
	15-Sep-2022	WETA-DD	0.023	< 0.020	0.056	0.059	0.053	< 0.10	0.12	< 0.0085	0.051	0.061	0.11	< 0.10	0.13	< 0.0085	< 0.020	< 0.020	< 0.10	< 0.050	< 0.0085	< 0.0075	< 0.020	< 0.010	< 0.050

NOTES:

DESIKA

MIKISEW GROUP + FORT MCKAY FIRST NATION + ADVISIAN

			Polycyclic Aromatic Hydrocarbons							
Monitoring Station	Date (dd-mmm-yyyy)	Sample Name	Indeno(1,2,3-cd)fluoranthene (ug/L)	Indeno[1,2,3-cd]pyrene (ug/L)	Naphthalene (ug/L)	Perylene (ug/L)	Phenanthrene (ug/L)	Pyrene (ug/L)	Quinoline (ug/L)	Retene (ug/L)
UNSPECIFIED										
EETA-TL	27-Jun-2022	EETA-TL	---	< 0.0085	< 0.10	< 0.050	< 0.050	0.023	< 0.20	---
	27-Aug-2022	EETA-TL	---	< 0.0085	< 0.10	< 0.050	< 0.050	0.072	< 0.20	---
	15-Sep-2022	EETA-TL	< 0.0085	< 0.0085	< 0.10	< 0.050	< 0.050	0.046	< 0.20	< 0.050
WETA-DD	26-Jun-2022	WETA-DD	---	< 0.0085	< 0.10	< 0.050	< 0.050	< 0.020	< 0.20	---
	27-Aug-2022	WETA-DD	---	< 0.0085	< 0.10	< 0.050	< 0.050	0.025	< 0.20	---
	15-Sep-2022	WETA-DD	< 0.0085	< 0.0085	< 0.10	< 0.050	< 0.050	< 0.020	< 0.20	< 0.050

NOTES: