

Syncrude Canada Ltd.

Mildred Lake Extension Project and Mildred Lake Tailings Management Plan

July 16, 2019

Alberta Energy Regulator

Decision 2019 ABAER 006: Syncrude Canada Ltd. Mildred Lake Extension Project and
Mildred Lake Tailings Management Plan

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Contents

Decision.....	1
Introduction.....	2
Resource Conservation and Mine Plan	10
Geotechnical and Dam Safety	11
Air Quality.....	16
Surface Water Quantity.....	27
Surface Water Quality	36
Groundwater	44
Devonian Geohazard	54
Effects on Fisheries and Fish Habitat	58
Wildlife.....	64
Noise	79
Human Health Risk Assessment	81
Wetland Policy	86
MLX Reclamation and Closure Plan	87
Terrain and Soils	90
Socioeconomic Effects.....	92
Treaty Rights, Traditional Land Use Activities, and Culture	101
Decision – Mildred Lake Extension Project.....	127
Mildred Lake Tailings Management Plan.....	130
 Table 1. Groundwater contribution for project phases at MLX west	 49
Table 2. Groundwater contribution for project phases at MLX east.....	50
 Figure 1. Approved profile for legacy fluid tailings	 165
Figure 2. Approved profile for new fluid tailings	165
 Appendix 1 Map	 176
Appendix 2 Hearing Participants	177
Appendix 3 Motion Decision.....	179
Appendix 4 OSCA Approval	180
Appendix 5 EPEA Approval.....	181
Appendix 6 Water Act Approval	182
Appendix 7 Water Act Licence	183
Appendix 8 Mineral Surface Lease	184

2019 ABAER 006

Syncrude Canada Ltd. Mildred Lake Extension Project and Mildred Lake Tailings Management Plan

Applications 1820856, 034-00000026, 001-00363203, 005-00263298, MSL170423, MSL170430, MSL352; and Tailings Management Plan

Decision

[1] The panel finds the Syncrude Ltd. Mildred Lake Extension project is in the public interest. The Alberta Energy Regulator (AER) therefore approves, subject to conditions made by the hearing panel and which are contained in the approvals attached to this report:

- *Oil Sands Conservation Act (OSCA)* Application No. 1820856 to construct, operate and reclaim the Syncrude MLX project. Syncrude is required to comply with the terms of the approval during the life cycle of the MLX project.
- *Environmental Protection and Enhancement Act (EPEA)* application No. 034-00000026 to construct, operate and reclaim the Mildred Lake Extension project. Syncrude is required to comply with the terms of this approval during the life of the project.
- *Water Act* applications No. 005-00263298 and No. 001-00363203 for activities and the diversion and use of water for the MLX project. Syncrude is required to comply with the terms of this approval and licence during the life of the project.
- *Public Lands Act* application (MSL 352) to amend an existing mineral surface lease. The panel requires Syncrude to comply with the Public Lands approval (disposition) during the life of the project.

[2] With respect to *Public Lands Act* applications MSL 170423 and MSL 170430, the panel cannot approve those applications. This is because an assessment of the adequacy of the Crown's consultation with Aboriginal peoples respecting these applications has not been provided to the panel. This is the case despite the panel's conclusion that those applications meet all of the applicable requirements and that the impacts of these dispositions will be mitigated by various conditions imposed by the panel. MSL 170423 and MSL 170430 are remitted back to the AER. Consultation was not required with regard to MSL 352.

[3] We find that several elements of Syncrude's Tailings Management Plan do not meet the intent of *Directive 085: Fluid Tailings Management for Oil Sands Mining Projects*. Syncrude is required to submit to AER for approval an updated Tailings Management Plan on or before January 31, 2023. The updated

Tailings Management Plan must be aligned with the intent of the *Tailings Management Framework for the Mineable Oil Sands (TMF)* and *Directive 085* and must address the issues raised by the panel in this decision report.

[4] To reach these decisions, we considered all relevant materials on the record of this proceeding, including the evidence and argument provided by Syncrude and Athabasca Chipewyan First Nation. Accordingly, references in this decision to specific parts of the record are intended to help the reader understand our reasoning on a particular matter and do not mean that we did not consider all relevant parts of the record with respect to that matter.

Introduction

Applications

[5] The Syncrude Canada Ltd. (Syncrude) Mildred Lake Extension Project (MLX project) is a proposed open-pit mining project consisting of two open-pit mining areas in and beside its existing Mildred Lake operations. A map of the Mildred Lake oil sands project is provided as appendix 1. The east mine extension (MLX east) would be west of the Athabasca River, and the west mine extension (MLX west) would be west of the Mackay River. Development at the MLX west area requires construction of a bridge across the MacKay River for development and operations.

[6] The MLX project is designed to sustain bitumen production levels after the current Mildred Lake North mine pit is depleted. The mineable resource is estimated at 738 million barrels of recoverable bitumen. The MLX project would use conventional shovel and truck mining technology and would extend the duration of mining activity by about 14 years.

[7] Development of the MLX project area would begin towards the end of 2019. Oil sands mining would begin at MLX west in 2024, followed by MLX east in 2028.

[8] The MLX project would use the existing Mildred Lake upgrader, extraction facilities, mining equipment, processing plants, and tailings facilities to process the mined ore.

[9] The MLX project is about 35 kilometres (km) north of Fort McMurray on oil sands leases 17 and 22 in Townships 93 and 94, Ranges 10 through 12, West of the 4th Meridian, in the Regional Municipality of Wood Buffalo (RMWB). The nearest urban centre is the hamlet of Fort McKay about 10 km north of the project area.

[10] In support of the MLX project, Syncrude applied to the Alberta Energy Regulator (AER) for approval of the following:

- Application 1820856 under section 13 of the *Oil Sands Conservation Act (OSCA)* for amendments to existing approval 8573

- Application 034-00000026 under sections 66 and 70 of the *Environmental Protection and Enhancement Act (EPEA)* to amend existing approval 26-02-00
- Application 001-00363203 under section 50 of the *Water Act* for a licence, and application 005-00263298 under section 42 of the *Water Act* to amend existing approval 00263298
- Applications MSL170423, MSL170430, and MSL352 under section 20 of the *Public Land Act (PLA)* for two new mineral surface leases and to amend an existing mineral surface lease
- A tailings management plan for the entire Mildred Lake site (existing Mildred Lake operations plus the MLX project) under the *Lower Athabasca Region Tailings Management Framework for the Mineable Athabasca Oil Sands* (Alberta Government, 2015) and *AER Directive 085: Fluid Tailings Management for Oil Sands Mining Projects* (AER, 2016)

Extension of Mildred Lake Mine

Oil Sands Conservation Act

[11] Syncrude applied under section 13 of the *OSCA* for amendments to existing approval 8573 to construct, operate, and reclaim the MLX project. The proposed project extension would recover bitumen resources from additional mineable oil sands deposits on Syncrude's leases 17 and 22. The current Mildred Lake operation would deplete bitumen resources in the North Mine by the mid-2020s. The proposed extension would allow Syncrude to extend the life of the Mildred Lake mine by 14 years. The MLX project includes bridge and access-road construction, oil sands mining, and site reclamation for closure.

Tailings Management Plan for the Entire Mildred Lake Site

[12] Tailings are a by-product of the process used to extract bitumen from mined oil sands and consist of water, silt, sand, clay, and residual bitumen. The *TMF* under the *Lower Athabasca Regional Plan (LARP)* provides direction to the AER and industry on the management of fluid tailings during and after mine operation. *AER Directive 085*, under the *OSCA*, sets out requirements for managing fluid tailings for oil sands mining projects.

[13] In December 2014, Syncrude submitted the MLX project application, including a tailings management plan as required by *AER Directive 074: Tailings Management for Minable Oil Sands* (2009). In March 2015, the Government of Alberta (Alberta) published the *TMF*, and the AER subsequently published *Directive 085* to replace *Directive 074*.

[14] To avoid adding a new external tailings area for the MLX project, Syncrude proposes integrating tailings management for existing Mildred Lake operations and the MLX project. In early 2016, to respond to the requirements of *Directive 085*, an integrated tailings management plan for the Mildred Lake mine and MLX project was included in the MLX project application.

Environmental Protection and Enhancement Act

[15] The MLX project application includes the following activities at MLX west and MLX east:

- Bridge and access-road construction
- Tree clearing
- Surface and basal aquifer dewatering (as required)
- Reclamation material salvage
- Mine development and oil sands mining
- In-pit placement of centrifuge cake, coke, and overburden material
- Site reclamation for closure

[16] The proposed activities are an extension of Syncrude's current oil sands mining operation and therefore require an amendment to Syncrude's *EPEA* approval for the existing Mildred Lake and Aurora North Mine sites under *EPEA's Activities Designation Regulation* (Alberta Regulation 276/2003).

Water Act

[17] Syncrude has applied under section 50 of the *Water Act* for a new licence to divert 6.49 million cubic metres per year of surface water runoff from the MacKay River watershed, including shallow groundwater seepage into the mine pit, for industrial use.

[18] Syncrude has also applied, under section 42 of the *Water Act*, for an amendment to its existing approval (No. 00263298). The application includes various water management activities and extending the existing Mildred Lake fenceline boundary to support the MLX project.

Public Lands Act

[19] Syncrude has applied under section 20 of the *Public Lands Act* for an amendment to an existing surface disposition, mineral surface lease (MSL) 352, to remove held lands from the MSL. Syncrude said that it identified 876 hectares (ha) of land in MSL 352 that it will give back to the Alberta Crown. The returned land is intended to create an approximate 10 km by 100 m buffer of natural vegetation between the MSL boundary and the Athabasca River top of valley escarpment to mitigate the effects of the MSL on the Athabasca River. The buffer would run from the north end of the MLX east mining area south along the Athabasca River.

[20] Syncrude has applied under section 20 of the *Public Lands Act* for two new MSLs, MSL 170423 and MSL 170430, for oil sands mining and an access corridor and for a permanent and temporary MacKay River crossing (bridges).

[21] Syncrude has obtained the required forestry consents and has committed to continuing to work with Alberta Pacific Forest Industries to mitigate commercial loss of timber and disruption of planned harvest activities and access to them.

[22] The project overlaps three registered traplines within the terrestrial local study area. Of the three traplines only trapline 587 will be directly affected, with 10 per cent of the lands occurring within the project's footprint area. Syncrude has committed to mitigate to prevent potential loss of revenue to the affected trapline holders. Syncrude has committed to ongoing communication with affected trappers as outlined in the Alberta Trappers Compensation Board guidelines.

[23] The *Municipal Government Act*, the *Historical Resources Act*, and the *Highway Development and Protection Act* require additional approvals. The *Fisheries Act* and the *Navigable Waters Protection Act* require federal approvals. To proceed with the project, Syncrude must obtain all required approvals under applicable federal and provincial legislation.

Procedural Background

[24] Syncrude submitted integrated applications to the AER in support of its MLX project on December 18, 2014.

[25] On September 14, 2017, the AER determined that the environmental impact assessment (EIA) for the project was complete.

[26] On May 25, 2018, the AER issued a notice of hearing for applications 1820856, 005-00263298, 001-00363203, 034-00000026, MSL170423, MSL170430, and MSL0352.

[27] In correspondence dated May 28, 2018, the hearing panel (the panel) told Fort McKay First Nation (Fort McKay FN) and Fort McMurray 468 First Nation (Fort McMurray 468) that it had determined both First Nations might be directly and adversely affected by the activities proposed in Syncrude's applications and therefore were entitled to participate in the hearing without submitting a request to participate.

[28] In a letter dated June 14, 2018, Fort McKay FN confirmed its intention to participate in the hearing (Proceeding ID 361, the proceeding). The panel was made aware that Fort McMurray 468 withdrew its statement of concern and would not be participating in the hearing.

[29] Requests to participate were received from Suncor Energy Inc. (Suncor), Mikisew Cree First Nation (Mikisew), Athabasca Chipewyan First Nation (Athabasca Chipewyan), and John Malcolm on behalf of the Clear Water River (Paul Cree) Band #175 and the Original Fort McMurray Band.

[30] The panel determined that Mikisew, Athabasca Chipewyan, and Suncor could take part in the hearing as full participants.

[31] After considering submissions from the parties, the panel set a schedule for submissions and confirmed that the hearing would start on January 22, 2019.

[32] A prehearing meeting was held in Govier Hall at the AER's Calgary Head Office on September 12, 2018. A prehearing decision providing the panel's direction on various procedural matters was issued on September 28, 2018.

[33] On January 21, 2019, Syncrude provided the AER with letters from Fort McKay FN and Mikisew that said that the two First Nations would be addressing project-specific concerns through an agreed-upon process. In these letters, the First Nations removed their objection to the approval of Syncrude's applications and said that they would no longer participate in the proceeding.

Athabasca Chipewyan Motion

[34] On January 14, 2019, Athabasca Chipewyan filed a motion relating to information on conservation offsets filed by Syncrude in the proceeding. On January 15, 2019, Syncrude filed a response to that motion opposing it. On January 16, 2019, Athabasca Chipewyan filed a response to Syncrude.

[35] On January 17, 2019, Alberta filed a submission also opposing the motion. On January 18, 2019, Athabasca Chipewyan filed a submission in reply to Alberta.

[36] On January 20, 2019, the panel issued a decision denying Athabasca Chipewyan's motion which is provided at appendix 3.

Notice of Question of Constitutional Law

[37] On January 14, 2019, Fort McKay FN filed a notice of question of constitutional law pursuant to the *Administrative Procedures and Jurisdiction Act*. The document was also provided to Syncrude, the minister of justice and solicitor general of Alberta, and the attorney general of Canada.

[38] On January 16, 2019, Syncrude and Alberta's minister of justice and solicitor general filed submissions in response to the notice of question of constitutional law. Also on January 16, 2019, Fort McKay FN filed a reply to the submissions from Syncrude and the minister of justice, and solicitor general of Alberta.

[39] In a letter dated January 17, 2019, the panel issued a decision on the notice of question of constitutional law. The panel indicated that it had considered the notice of question of constitutional law and all subsequent submissions and determined that the notice of question of constitutional law was not properly before the panel. Because of this conclusion, the panel could not consider the notice of question of constitutional law at the hearing of the proceeding. The panel indicated that detailed reasons for the decision would follow.

[40] On January 21, 2019, Fort McKay FN provided a letter indicating that its project concerns will be addressed by Sincruide and that, therefore, Fort McKay FN would not be participating in the hearing.

[41] With Fort McKay FN's withdrawal from the proceeding, the panel's decision on the notice of question of constitutional law became moot and the panel did not issue detailed reasons.

The Hearing

[42] The hearing, held before commissioners A. Bolton (presiding), C. Macken, and P. Meysami (the panel) in Fort McMurray, Alberta, began on Tuesday, January 22, 2019. It was adjourned on January 29, 2019.

[43] Athabasca Chipewyan participated in the hearing. The parties' representatives and witnesses are listed in appendix 2. Although Suncor was granted full participation in the hearing, it did not participate in the proceeding. Representatives of the Aboriginal Consultation Office (ACO) attended the hearing to observe the proceeding.

[44] The panel and participants in the proceeding received the ACO hearing report on February 28, 2019. Following receipt of the ACO report, the parties were asked to provide written submissions on topics raised in the ACO report.

[45] The hearing resumed for closing arguments on March 27, 2019, in Calgary. The hearing closed on this date.

[46] Fort McKay FN and Mikisew filed written submissions before withdrawing their objections to the applications. In light of their non-objections and the fact that their submissions were not supported by oral evidence and were not tested at the hearing, the panel did not consider this evidence in coming to its decisions in this matter. Furthermore, at the opening of the hearing Sincruide said that it was withdrawing any of its written submissions made in response to the written submissions of Fort McKay FN and Mikisew. Accordingly, the panel did not consider those submissions made by Sincruide unless they were specifically adopted by Sincruide.

MLX Project Application Timelines

Date	Activity
December 18, 2014	Integrated application submitted to AER
September 14, 2017	EIA completeness decision by the AER
May 25, 2018	Notice of hearing
August 24, 2018	Notice of pre-hearing meeting
September 12, 2018	Pre-hearing meeting
September 14, 2018	Site visit to project area and Fort McKay
October 3, 2018	Notice of scheduling of hearing

Date	Activity
October 21, 2019	Peace-Athabasca Delta site tour
January 9, 2019	Revised notice of scheduling of hearing
January 22, 2018, to January 29, 2019	Hearing
February 28, 2019	ACO final hearing report
March 27, 2019	Final arguments

Regulatory Framework

Responsible Energy Development Act and the Oil Sands Conservation Act

[47] Section 2(1) of the *Responsible Energy Development Act (REDA)* states that the mandate of the AER is to provide for the efficient, safe, orderly, and environmentally responsible development of energy resources in Alberta. The AER is also mandated to regulate, for energy resource activities, the disposition and management of public lands, the protection of the environment, and the conservation and management of water.

[48] For the applications made under the *OSCA*, section 3 provides the purposes of that Act, including the following:

- (a) to effect conservation and prevent waste of the oil sands resources of Alberta,
- (b) to ensure orderly, efficient and economical development in the public interest of the oil sands resources of Alberta,
- (e) to assist the Government in controlling pollution in the development and production of the oil sands resources of Alberta,
- (g) to ensure the observance, in the public interest, of safe and efficient practices in the exploration for and the recovery, storing, processing and transporting of oil sands, discard, crude bitumen, derivatives of crude bitumen and oil sands products.

[49] Section 15 of *REDA* and section 3 of the *Responsible Energy Development Act General Regulation* requires the panel, when considering the *OSCA* applications, to consider the social and economic effects of the project and the effects of the project on the environment and on landowners.

[50] The panel's decision was also informed by the purposes of the environmental enactments, the *Water Act* and *EPEA*, under which Sincruide applied. The panel considered the sections below of particular significance in its decision.

Water Act

The purpose of this Act is to support and promote the conservation and management of water, including the wise allocation and use of water, while recognizing

- (a) the need to manage and conserve water resources to sustain our environment and to ensure a healthy environment and high quality of life in the present and the future;

- (b) the need for Alberta's economic growth and prosperity;
- (c) the need for an integrated approach and comprehensive, flexible administration and management systems based on sound planning, regulatory actions and market forces;
- (d) the shared responsibility of all residents of Alberta for the conservation and wise use of water and their role in providing advice with respect to water management planning and decision making;

Environmental Protection and Enhancement Act

The purpose of this Act is to support and promote the protection, enhancement and wise use of the environment while recognizing the following:

- (a) the protection of the environment is essential to the integrity of ecosystems and human health and to the well being of society;
- (b) the need for Alberta's economic growth and prosperity in an environmentally responsible manner and the need to integrate environmental protection and economic decisions in the earliest stages of planning;
- (c) the principle of sustainable development, which ensures that the use of resources and the environment today does not impair prospects for their use by future generations;
- (d) the importance of preventing and mitigating the environmental impact of development and of government policies, programs and decisions;
- (f) the shared responsibility of all Alberta citizens for ensuring the protection, enhancement and wise use of the environment through individual actions;

Public Lands Act

[51] *REDA* provides the AER with the authority to administer parts of the *Public Lands Act*. The AER is responsible for administering the *Public Lands Act* in respect of energy resource activities. The *Public Lands Act* ensures that the disposition and management of public lands in Alberta is carried out in a responsible manner.

[52] Syncrude's Mildred Lake operations and the MLX project are located in the *LARP* area. Section 20 of *REDA* requires the AER to act in accordance with *LARP* and any subregional plans that are in force. The panel must ensure that approval of Syncrude's applications is consistent with the intended regional outcomes identified in *LARP* which include the optimization of the economic potential of the oil sands resource and a landscape that can maintain ecosystem function and biodiversity amid land disturbance and habitat impact.

Resource Conservation and Mine Plan

Evidence

[53] Syncrude said that the proposed MLX project (MLX west and MLX east areas) contains additional surface mineable oil sands deposits on Syncrude's leases 17 and 22.

[54] Syncrude said that the MLX project is designed to sustain bitumen production levels at the Mildred Lake leases for about 14 years. The development timeline for the MLX project anticipates production of bitumen immediately following depletion of the North Mine resources in the mid-2020s. Syncrude said that the MLX project would enable Syncrude to maintain the current level of jobs, economic activity, and community benefits beyond the mid-2020s.

[55] In describing the need for the MLX project, Syncrude identified the following objectives and benefits:

- Sustaining bitumen production (about 117 million cubic metres [Mm³] of recoverable bitumen) at Mildred Lake for about 14 years using the existing infrastructure, including tailing-storage facilities.
- Maximizing extraction of recoverable resource on the Mildred Lake leases (lease 17 and lease 22) before decommissioning the Mildred Lake ore processing and extraction facilities.
- Minimizing ore sterilization and the disturbance footprint.
- Creating value for joint venture participants and economic benefits for the local communities and suppliers, including First Nations and Métis companies, Alberta, and Canada.

[56] Syncrude said that failing to develop the MLX project now would result in a shortage of bitumen supply to Syncrude's upgrader. Aurora South is the alternate bitumen supply should the MLX project not be approved. However, as there is currently no infrastructure at Aurora South, production cannot commence there as soon as it can for MLX which creates a risk of a significant gap in bitumen supply and a corresponding risk to jobs.

[57] Syncrude showed that the average drill hole spacing in the MLX west and MLX east mine pit areas is 262.8 m and 350 m, respectively. The drill hole spacing in some areas is greater than 350 m. For all areas subject to development in the first ten years, *Directive 082* requires a maximum 350 m spacing between drill holes, determined by triangulation.

[58] Syncrude said that the quantity and quality of mineable resource was determined in a manner consistent with guidance in AER *Directive 082: Operating Criteria: Resource Recovery Requirements for Oil Sands Mine and Processing Plant Operations*.

[59] Criteria incorporated in the geological model include a 3 m minimum mining thickness for ore and waste separation; a 6 weight per cent bitumen cutoff grade; and a total volume-to-bitumen in-place (TV:BIP) cutoff of 12:1.

[60] Syncrude said that although the initial resource estimate was based on the minimum TV:BIP cutoff of 12:1 in *Directive 082*, the pit design for this application is based on TV:BIP 14 at base of feed. Syncrude said that the limited core hole information shows a potential pit expansion into the southern part of the proposed overburden disposal area (ODA-E) area. Syncrude said additional drilling will be done to assess the possibility of expanding the pit into this area.

Analysis and Findings

[61] We understand that Syncrude's proposed mine plan is based on current drilling and geological information and that the mine plan might be refined over time as more information is collected during the detailed design and operational phases of the project. We find that the level of resource delineation drilling completed to date is appropriate for mine planning purposes at the application stage, but that additional drilling is required in some areas prior to mining to satisfy the requirements in *Directive 082*. The panel understands that more drilling is required to delineate the final pit limit. Syncrude is required to provide its drilling plans to the AER as a part of its annual mine plan submissions.¹

[62] If future drilling indicates potential resource in ODA-E area and significant changes are required to the approved mine plan due to changes in the resource evaluation, Syncrude shall submit a mine-plan amendment application to the AER indicating any impacts on the approved mine plan and the MLX project.²

Geotechnical and Dam Safety

Evidence

[63] MLX west is bordered by the Dover River to the north, the Suncor MacKay steam-assisted gravity drainage (SAGD) facility to the west, Suncor leases to the south, and the MacKay River to the east. MLX west includes one mine pit, two overburden disposal areas, and two reclamation-material stockpiles.

[64] MLX east is beside the existing Syncrude Mildred Lake operation to the north and west, the Suncor Base Mine operation to the south, and the Athabasca River to the east. MLX east has one pit, one overburden disposal area, and one reclamation-material stockpile.

¹ OSCA Amendment Approval – Condition 2

² OSCA Amendment Approval – Condition 3

[65] Syncrude said that determining the geotechnical stability of pit walls and overburden disposal areas relies on understanding the key subsurface geological features. Generally, the stratigraphic units governing design for the project are the presence and thickness of the Clearwater Formation and Pleistocene deposits.

[66] Syncrude derived information for the geotechnical analyses and design from geological drill cores, auger and sonic drilling, geotechnical sampling and testing results, and geotechnical information from similar material found at the Mildred Lake site and used in geologic models.

[67] Syncrude said that the preliminary design-strength and pore-pressure parameters were taken from previous submissions to the AER due to the proximity and similar geology of the MLX project.

[68] Syncrude proposed a final pit-wall configuration with a minimum safety berm 10 m wide, an oil sands slope of 28 degrees, which is a slope of about two horizontal units to one vertical unit (2H:1V), and an overburden slope of 6H:1V for both MLX west and MLX east.

[69] Syncrude proposed that overburden disposal areas have an overall slope of 14H:1V and a maximum height of 40 m, whereas for reclamation material stockpiles, Syncrude proposed 15H:1V for cover-soil types, 16.25H:1V for subsoil types, and a maximum height of 40 m for all reclamation material stockpiles in the MLX west and MLX east.

[70] Syncrude proposed relocating Highway 63 as part of the MLX east development and proposed an in-pit highway berm slope of 6H:1V in MLX east to accommodate the relocation. Syncrude said that it anticipates working closely with Alberta Transportation to plan highway relocation alignment and timing that satisfies both Syncrude and Alberta Transportation.

[71] Syncrude said that the preliminary location of the highway and the offset from the highway to the pit limits were based on experience from similar projects. Syncrude said that it would provide final stability analysis results once the final location of the highway is determined.

[72] Syncrude provided a setback distance of 250 m from pit crest to the toes of the overburden disposal areas and reclamation material stockpiles. For MLX east, Syncrude provided a setback of 200 m from pit crest to the toe of the Mildred Lake Settling Basin and to the toe of Mildred Lake Reservoir.

[73] Syncrude said that final designs for overburden disposal areas, reclamation material stockpiles, and pit slopes, including monitoring plans, will be provided before construction, in accordance with the *Oil Sands Conservation Rules*.

[74] Syncrude has not proposed any new external tailings facilities as part of the MLX project. Syncrude proposes placing the produced tailings in currently approved facilities at the Mildred Lake site. Syncrude will use the existing external tailings pond at the Mildred Lake site and proposes placing centrifuge cake deposits and creating end-pit lakes in the in-pit areas of the MLX project area.

[75] Syncrude proposed constructing cake berms buttressed by an in-pit overburden disposal area on the downstream side of the cake berms to provide storage space for cake deposits within MLX west to create dedicated disposal area 1 and dedicated disposal area 2. Syncrude proposed in-pit cake berms of 8H:1V downstream, and 6H:1V upstream slopes for MLX west.

[76] Syncrude proposed building a bridge across the McKay River to access MLX west. There are cut slopes through natural ground for part of the road connecting the bridge and MLX west. Syncrude proposed to construct two sumps in the MacKay River valley, under the bridge crossing, to manage surface water runoff. Syncrude said that the berms for the sumps do not meet the definition of a dam structure under the *Water Act*.

[77] Syncrude said that its operating approach for the sumps would be to keep them dry. Syncrude does not intend to retain water in them for very long after a rain. Syncrude plans on pumping them out and keeping them that way, minimizing the amount of water that can attract birds to the area.

Analysis and Findings

[78] The panel understands that Syncrude has based its preliminary mine design on information obtained from limited field and laboratory investigation, experience from the existing mine operation, and available best practice. The panel finds that the level of information and the design approach is appropriate for the application stage. The preliminary mine design supports the mine plan by defining the limits of the mine pits, the locations of disposal areas, and the capacities of the disposal areas. The preliminary design also identifies interactions and provides setback assessments for mine pits, disposal areas, plant sites, other mine infrastructure, and the environment.

[79] Syncrude showed that it would build an in-pit overburden disposal area that would buttress the final pit wall. The in-pit overburden disposal area would function as an in-pit berm to provide a surface area for the future relocation of Highway 63. Although the relocation of Highway 63 is under the jurisdiction of Alberta Transportation, the in-pit berm that supports and provides the surface on which the highway would be constructed needs to be authorized by the AER as for any other overburden disposal structure. The panel expects this in-pit berm to be constructed so that it provides a stable surface to support the future highway load and the traffic on it.

[80] The panel understands that Syncrude's plan to use existing external tailings facilities for the MLX project does not include changing the facilities other than extending their time of active operation.

[81] The panel finds that Syncrude's plan to construct an in-pit berm to buttress the final pit wall is acceptable. The berm provides an in-pit storage space for overburden material with a short haul distance and provides a surface for the relocation of Highway 63.

[82] The panel finds Syncrude's proposed approach to the design and operation of the sumps associated with the McKay River bridge to be acceptable. Keeping the sumps dry will help ensure capacity exists to deal with precipitation and limit their attraction to birds or other wildlife. Although Syncrude does not currently anticipate that the sump berms will meet the definition of a dam and require licensing under the *Water Act*, should their design change to meet the definition of a dam, Syncrude will need to apply for the necessary licences and follow the *Alberta Dam and Canal Safety Directive* and other AER requirements. The panel notes that Alberta provincial regulations apply to oil sands mines, so any application for a new dam and operation of an authorized dam must follow provincial and other AER requirements.

[83] Syncrude shall submit detailed geotechnical designs of final pit walls, external and in-pit overburden disposal areas, and reclamation material stockpiles six months before construction.³

[84] Syncrude shall follow the *Water (Ministerial) Regulation*, Part 6 (Dam and Canal Safety), and associated *Alberta Dam and Canal Safety Directive* requirements for any authorization to construct, undertake a major repair, decommission, close, cease long-term operation, or operate in a limited way a dam or canal.⁴

[85] Syncrude shall not begin any activities associated with dam or canal construction, major repair, decommissioning, closure, long-term cessation, or limited operation unless written authorization or approval amendment to the plan is granted by the AER.⁵

[86] For new dam or canal design and construction, Syncrude shall submit to the director for written authorization or approval amendment at least 180 days before the beginning of construction, or by another deadline specified in writing by the director, all required plans and supporting information for the proposed dam or canal under the provisions of the *Water Act*.⁶

[87] For changes to previously authorized dam or canal designs or to consequence classification, Syncrude shall submit to the director for written authorization or approval amendment at least 90 days before the beginning of construction or before the proposed change to consequence classification, or by another deadline specified in writing by the director, all required plans and supporting information for the changes under the provisions of the *Water Act*.⁷

³ OSCA Amendment Approval – Condition 12

⁴ *Water Act* Approval Amendment – Condition 12.1

⁵ *Water Act* Approval Amendment – Condition 12.2

⁶ *Water Act* Approval Amendment – Condition 12.3

⁷ *Water Act* Approval Amendment – Condition 12.4

[88] Syncrude shall provide a dam decommissioning plan to the AER for written authorization or approval amendment

- at least 12 months before performing any decommissioning activity,
- at least 12 months before beginning capping activities at any tailings pond or deposit, or
- when required by the director.⁸

MLX West SAGD Setback Assessment

Evidence

[89] MLX west is bordered by the Suncor MacKay SAGD facility to the west and by Suncor leases to the south.

[90] Syncrude showed that the buried Birch Channel extends from the Suncor SAGD area towards MLX west. Additional investigation conducted by Syncrude, including an airborne electromagnetic survey and the drilling of two confirmatory wells, concluded that the Birch Channel does not intersect the planned location of the MLX west pit. Syncrude's position is that the Birch Channel is either eroded at the MLX west lease or runs farther to the south from it. Syncrude said that additional geological drilling done for the delineation of the oil sands will provide more information on the extent of the buried channels in the southern part of the MLX west project development area.

[91] Syncrude said that the nearest SAGD well toes under production are about 2 km west of the south overburden disposal area and about 4 km southwest of the MLX west pit crest. Syncrude said that an impact assessment would be conducted for any areas of concern, prior to the extraction of bitumen or oil sands.

[92] Syncrude confirmed that it has engaged in discussion with Suncor to assess the potential for ground stress and pore pressure interactions between the MLX west and MacKay River SAGD projects. Syncrude said that Suncor had confirmed that the area of influence for the SAGD wells is conservatively estimated to be 1000 m. The MLX west mine, dump, and stockpile structures proposed in the application would be about 2000 m from the closest proposed well that belongs to the MacKay River SAGD project and, therefore, is well beyond the area of influence. Syncrude concluded that, based on the large buffer between the two projects, there are no containment risks due to MLX west mining activities.

⁸ *Water Act* Approval Amendment – Condition 12.5

Analysis and Findings

[93] The panel understands that the MacKay River SAGD operation is currently active and is owned and operated by Suncor.

[94] The panel notes that Syncrude initially said that a SAGD-mining interaction assessment would be done before the extraction of bitumen or oil sands. After discussion with Suncor, Syncrude said a buffer between the two operations of about 2000 m would be adequate and no further assessment was required.

[95] The panel finds that there is some potential for the Birch Channel to connect the two operations. This buried channel could function as a pathway for pore pressure migration from Suncor's SAGD operation to the mine area. The extent of the Birch Channel was not fully delineated, as the focus of Syncrude's surveys was on its intersection with the pit area. Integrating the data of the geological drilling program with the existing dataset will provide a better understanding of the extent and connectivity of the Birch Channel and the other buried channels to the south of the MLX west.

[96] Syncrude did not provide any monitoring data for pore-pressure measurement or geomechanical modelling assessments to justify the adequacy of the buffer zone between Suncor's SAGD operation and Syncrude's MLX West Mine area. Syncrude did not provide an assessment of any impact of mine-pit opening and overburden construction on the SAGD operation. A SAGD-mining interaction assessment that supports the required buffer distance between the two operations was not filed as part of the hearing record.

[97] If an excess pore pressure is present as a result of SAGD operation in the buffer zone, the construction of the overburden disposal area and reclamation material stockpile at MLX west would add to the pore pressure in the buffer zone. For this reason, a geological-geomechanical characterization of the buffer zone supported by monitoring data and numerical modelling is necessary.

[98] Syncrude shall provide a SAGD-mining impact assessment for the MLX west pit. The assessment needs to be supported by actual performance or monitoring data from an existing SAGD operation and by an additional monitoring program in the buffer zone before mine operation start-up.⁹ Depending on the results of the assessments, more monitoring might be required during mine operation as the mine pit is developed and overburden storage areas are being built.

Air Quality

[99] As part of its EIA, Syncrude was required to assess the impact of air emissions, including the components of the project that would contribute emissions and potentially affect air quality.

⁹ OSCA Amendment Approval – Conditions 14

[100] The panel considered the potential impacts of Syncrude's predicted emission levels on environment and health, and whether the predicted levels will comply with applicable air quality standards.

[101] The following are air emissions associated with the MLX project:

- Nitrogen oxides (NO_x), sulphur dioxide (SO₂), volatile organic compounds (VOCs), atmospheric particulate matter that have a diameter of less than 2.5 micrometres (PM_{2.5}), and greenhouse gases from the mine fleet
- Dust from haul roads and material handling (loading and unloading)
- Fugitive emission of VOCs, and reduced sulphur compounds from the mine face and exposed bitumen areas.

[102] Emission sources from the rest of the Mildred Lake site, including the upgrader, the sulfur extraction plant, the North Mine pit, storage tanks, fluid tailings facilities, and associated processing facilities are managed under Syncrude's current *EPEA* approval for the Mildred Lake operations. Syncrude has included the existing Mildred Lake emissions as part of the baseline case in its assessment of the effects of the MLX project on local and regional air quality.

[103] Syncrude used a local study area of 40 km × 40 km and a regional study area of 315 km × 225 km for its air quality assessment. Three scenarios were assessed: the baseline case, which included emissions from existing and approved projects; the application case, which included baseline emissions and predicted changes in ambient air quality associated with the MLX project, and the planned development case, which assessed the cumulative effects of existing, approved, and planned emissions sources as of 2014.

[104] Syncrude also said that the project would not cause any additional air emissions as emissions associated with the MLX project would replace emissions currently attributed to the North Mine.

Mine Fleet Emissions

[105] The mine fleet is a major source of air emissions as a result of combustion of diesel fuel. As the North Mine pit is depleted, Syncrude will transition the mine fleet to the MLX west mine pit starting in 2023 and to MLX east in 2027.

[106] Syncrude said it used 2030-operating-year conditions for the air quality assessment because the vehicle count and other mine emission sources would be at their maximum at that time. An assumption in the emissions assessment was that all large mining equipment (e.g., haul trucks and hydraulic shovels) purchased after 2017 would comply with Tier 4 emission regulations (as specified in the Canadian *Off-Road Compression-Ignition Engine Emission Regulations*).

[107] In its initial application, Syncrude provided the following schedule for moving the mine fleet to Tier 4 technology:

- By 2020, 50 per cent of loading and 50 per cent of the haul fleet will be Tier 4
- By 2025, 100 per cent of loading, 57 per cent of hauling, and 47 per cent of the support fleet will be Tier 4
- By 2030, 100 per cent of loading, 71 per cent per cent of hauling, and 75 per cent of the support fleet will be Tier 4
- By 2035, 100 per cent of loading, 100 per cent of hauling, and 88 per cent of the support fleet will be Tier 4

[108] At the hearing, Syncrude revised its schedule for upgrading the mine fleet. It said that by 2023 the mine fleet would have 56 haul trucks, 31 of which would be unrated tier class. The remaining 25 would be contract trucks, 50 per cent of which would be Tier 4 and 50 per cent unrated. Syncrude did not provide a schedule for when it plans to upgrade the remainder of the fleet.

Nitrogen Oxide Emissions

[109] The mine fleet is the only NO_x emission source at MLX. For the baseline case, which includes the existing Mildred Lake operations, NO_x emissions are 19.2 tonnes per day (t/d). In the application case, predicted NO_x emissions for the mine fleet are 12.70 t/d, of which 9.24 t/d is from MLX west and 3.46 t/d is from MLX east. This is a 6 per cent increase in NO_x emissions over the baseline case in the local study area and a 2.1 per cent increase in the regional study area. In its reply submission, Syncrude confirmed that its assessment of mine-fleet emissions is based on the application of Tier 4 emission factors for equipment, and it assumed the fleet would be upgraded to Tier 4 technology under the above schedule.

[110] The Alberta Ambient Air Quality Objectives one-hour and annual maximum concentrations for nitrogen dioxide (NO₂) are 300 micrograms per cubic metre (ug/m³) and 45ug/m³, respectively. Syncrude's application case assessment showed the one-hour and annual maximums for NO₂ will be, respectively, 1236 ug/m³ and 760 ug/m³ for the local study area and 179 ug/m³ and 142 ug/m³ for the regional study area.

[111] Syncrude acknowledged that the Alberta Ambient Air Quality Objectives are exceeded in the application case but that this is already the case for emissions in the baseline case. Syncrude said its modelled NO_x emissions represent a less than 1 (<1) per cent increase from the baseline case in both the local and regional study areas.

[112] Syncrude said that NO_x emissions at MLX will be 12.7 tonnes per day (as opposed to the 19.2 tonnes per day at the existing north mine). During the hearing, Syncrude confirmed that it does not plan to

use higher-tiered engine technology at MLX, where the existing north mine fleet will be reallocated to MLX.

[113] When asked for input on a potential approval condition that would require the older mine fleet to be retired or retrofitted by a certain date, Syncrude said it was strongly opposed. Syncrude pointed out the limitations of an equipment retrofit and the substantial cost of replacing the entire mine fleet. Syncrude asserted that emissions can be reduced through much more than just engine replacement, such as through mine planning, operating and maintenance procedures, tire technology, payload management, and fleet-size efficiency. Syncrude said that it intends to pursue these reduction efforts, as well as movement to Tier 4 technology, and mining improvements.

Sulphur Dioxide Emissions

[114] The mine fleet is the only SO₂ source associated with the MLX project. Predicted mine-fleet SO₂ emissions are 0.01 t/d for MLX east and 0.02 t/d for MLX west, for a total of 0.03 t/d site-wide. Syncrude said that SO₂ emissions data for the existing mine fleet, included in the baseline case assessment, was from existing assessments and EIAs. This data predates the introduction of ultralow sulphur diesel and therefore does not reflect emission improvements. As a result, Syncrude said SO₂ emissions from the existing fleet are significantly overstated.

[115] The 1-hour, 24-hour, 30-day and annual Alberta Ambient Air Quality Objectives for sulphur dioxide are 450 ug/m³, 125 ug/m³, 30 ug/m³, and 20 ug/m³, respectively. Syncrude's assessment of the application case predicts the following SO₂ emission levels for the regional and local study area:

- 1-hour maximum for both the local and regional study area will be 634 ug/m³
- 24-hour maximum for both study areas is 155 ug/m³
- 30-day maximum for both areas is 58 ug/m³
- Annual maximum for both study areas is 36 ug/m³

[116] The Alberta Ambient Air Quality Objectives for SO₂ are exceeded in all cases, but this is also true in the baseline case. The MLX project contribution to changes in the baseline case is estimated to be less than 1 per cent for all averaging times.

Acid Deposition

[117] NO_x and SO₂ are precursors to the formation of acid deposition. Syncrude found that potential acid input to acid deposition loads would increase by 1 per cent and 1.1 per cent in the local and regional study areas respectively as a result of the MLX project. Similar results were found for nitrogen deposition.

[118] Other mine fleet emissions, such as greenhouse gases and odours, are addressed below.

Mitigations Proposed by Sincruide

[119] In submissions filed after its initial application, Sincruide said the most economical strategy to reduce fleet emissions would be to purchase equipment with the latest technology as the existing equipment reaches the end of its life. It also said that new mobile equipment would meet Tier 4 standards.

[120] At the hearing, Sincruide further revised its estimate for moving to Tier 4 technology, and it clarified that of 56 haul trucks, 12 or 13 would be upgraded to Tier 4 technology, subject to vendor availability, with the remaining 43 or 44 haulers remaining unrated. Ms. Flynn explained that Tier 4 equipment can cost from \$2 million for smaller support equipment, to \$8 million for a heavy hauler, and to \$20 million or more for a hydraulic shovel.

[121] Ms. Flynn said that mine planning, maintenance, and operating procedures such as tire and payload changes and research into material transport are all focused on reducing fleet emissions and would reduce emissions more effectively than would moving to higher-tier engines. She said Sincruide would pursue both approaches—a shift to Tier 4 equipment, and improvements to operation, maintenance, and mine planning.

[122] In response to a question from the AER, Sincruide said the factors it uses to determine end of life include cost of repair versus cost of replacement, cost of maintaining and operating the fleet, and reliability thresholds. Reliability statistics are used to determine how much money is required to bring a piece of equipment to its reliability threshold. If the maintenance cost exceeds the threshold, the decision would be to invest in new equipment.

[123] Sincruide is involved in regional initiatives to monitor SO₂ and NO₂ levels and related acid-deposition levels. Emissions triggers and thresholds for these constituents are established under the *LARP* Air Quality Management Framework. Sincruide said that if triggers are reached or exceeded, management actions by Alberta are expected to occur at the regional levels.

[124] Sincruide also said that to mitigate SO₂ emissions, it would use ultralow sulphur diesel for fleet equipment. To reduce acid and nitrogen input, it said it would reduce NO_x and SO₂ emissions “wherever possible.”

Analysis and Findings

[125] The panel heard from Sincruide that predicted mine fleet emissions are overestimated because of the built-in conservatism, in its air quality model, of assuming that the fleet would be operating at the North Mine pit and MLX simultaneously. However, the use of Tier 4 emissions factors to calculate the predicted emissions provides us with no confidence that NO_x emissions will be 12.7 t/d as Sincruide predicted. We have Sincruide’s evidence that fleet NO_x emissions at the North Mine pit are 19.2 t/d using the existing equipment. If the fleet is not upgraded, as Sincruide initially proposed, this amount of NO_x

will be shifted to MLX. And because of the extended haul route at MLX, we expect NO_x emissions to be higher there than at the North Mine.

[126] We heard that 12 or 13 haul trucks will be upgraded, and only at end of life of the equipment. Syncrude was not able to provide clarity on how long a hauler would be in use before reaching end of life. We understand that Syncrude could use unrated haulers for the life of MLX (potentially until 2037).

[127] In addition to haul trucks, other equipment listed in Syncrude's application—hydraulic shovels, loaders, support vehicles, and water trucks—all contribute to NO_x emissions, and we have no assurance that these will be upgraded to Tier 4 technology.

[128] Without upgrading the fleet to Tier 4 technology, we anticipate total NO_x emissions at MLX to be 19.2 t/d or more, which is roughly 50 per cent more than Syncrude's modelled prediction of 12.7 t/d.

[129] Syncrude predicted that in the application case, the Alberta Ambient Air Quality Objectives for NO₂ in the oil sands region will be exceeded by a magnitude of four. They did not compare this result with triggers and limits established under the *LARP* Air Quality Management Framework. The panel understands that predicted air quality based on modelled data is not the same as actual measured air quality. However, we have no evidence to show how the modelled predictions compare with actual air quality. The panel is aware that ongoing and potentially increasing NO₂ emissions put the region at risk of exceeding critical and target loads established under the regional acid deposition management framework.

[130] Syncrude did not evaluate its modelled predictions for NO₂ against the 24-hour and annual Canadian Ambient Air Quality Standards for NO₂. Again, because of the decision to not shift the fleet to Tier 4 technology, the use of dated mine-fleet equipment presents a risk that NO₂ emissions from the mineable oil sands area might not meet the improved Canadian air quality standards for NO₂ that are expected to be announced soon.

[131] It is the panel's opinion that the project will extend NO_x, SO₂, and PM_{2.5} emissions for an additional 14 years. These are emissions that would not exist in the absence of MLX. The effects of NO_x and SO₂, in particular, are cumulative and will contribute to 14 years of additional input to nitrogen and acid deposition in the local and regional ecosystem. It is the panel's opinion that NO_x emission levels in particular need to be managed to avoid not meeting the Canadian Ambient Air Quality Standards and to avoid ongoing contributions to exceedances of Alberta air quality objectives and critical and target loads.

[132] We note that NO_x and particulate matter emissions will be shifted closer to Fort McKay. We accept Syncrude's assertion that the impact of ambient air quality is predicted to be relatively small at Fort McKay, which is about 10 km from MLX. Since these emissions will persist for 14 more years, the panel's view is that management actions are required considering the uncertainty around Syncrude's transition to Tier 4 equipment.

[133] The panel considered the following in reaching its findings:

- The fact that 100 per cent of project SO₂ and NO_x emissions are due to the mine fleet
- That mine fleet emissions will be extended for an additional fourteen years
- Lack of assurance from Syncrude about when and whether it will upgrade its mine fleet to Tier 4 standards
- Lack of confidence in the results of the air quality model assessment given use of Tier 4 emission factors to calculate changes in air quality
- The modelled assessment that shows exceedance of Alberta Ambient Air Quality Objectives for NO₂ and SO₂ and predicts exceedance of acid deposition loads in the oil sands region

[134] Syncrude maintained that its air emissions assessment was conservative, and did not withdraw its assertion that the mine fleet NO_x emissions would be 12.7 tonnes per day at MLX; however, Syncrude did not demonstrate how the 12.7 tonnes per day will be achieved.

[135] The panel recognizes the financial cost of mine fleet replacement or retrofit and the possible reduction of NO_x through nonengine-technology-based efforts identified by Syncrude. The panel also notes that Syncrude has not provided evidence that nonengine-technology-based reduction efforts will achieve the applied-for 12.7 tonnes per day of mine-fleet NO_x emission.

[136] The panel therefore requires Syncrude to achieve the outcome of 12.7 tonnes per day mine fleet NO_x emissions, as applied for, and will include a NO_x emission limit as a condition of approval. The MLX mine mobile equipment NO_x emission limit must be met by 2030, the operating year on which Syncrude based its air assessment scenarios. The NO_x emission limit for MLX mine mobile equipment will provide the panel with assurance of NO_x emission mitigation and will give Syncrude flexibility to achieve the claimed 12.7 tonnes per day mine fleet emissions. The panel also requires Syncrude to develop a plan to minimize and monitor MLX mine fleet emissions, the plan being to ensure that Syncrude will make meaningful reductions and measure and report on the emissions.¹⁰

[137] Syncrude is required to participate in and implement any management actions required by Alberta with respect to triggers and thresholds for acid deposition established under the *LARP* Air Quality Management Framework. Syncrude may also be required to develop and implement actions to achieve forthcoming standards established under the Canadian Ambient Air Quality Standards.¹¹

¹⁰ *EPEA* Amendment Approval – Conditions 4.1.21.1, 4.1.25.1, 4.1.41.1

¹¹ *EPEA* Amendment Approval – Condition 4.1.64

Greenhouse Gas Emissions

[138] A greenhouse gas management plan is a requirement of Draft *Directive 023: Oil Sands Project Applications* and is part of Sincruide's *OSCA* application. Sincruide assessed greenhouse gas emissions as part of its EIA. Based on the project being at full operation, Sincruide estimated the total greenhouse gas emissions from MLX to be 3618 kilotonnes of carbon dioxide equivalent per year (kt CO₂E/y). Fugitive greenhouse gas emissions from the mining area would account for 2379 kt CO₂E/y and mine fleet diesel combustion for 1239 kt CO₂E/y. The project greenhouse gas intensity is estimated to be 0.030 tonnes of carbon dioxide equivalent per tonne of oil sands. MLX greenhouse gas emissions would account for 1.45 per cent of Alberta's greenhouse gas emissions and 0.52 per cent of Canada's greenhouse gas emissions.

[139] Sincruide submitted a plan to minimize greenhouse gas emissions from the mobile mine fleet to Alberta Environment on March 31, 2008. The plan included engine selection and operational strategies to increase the overall efficiency of mine mobile equipment and thereby decrease the diesel consumed per tonne of material moved per kilometre. Tactics for doing this included limiting the haul distance, reducing the rolling resistance by improving the road surface and tire performance, and limiting up-hill hauling and multi-bench mining.

[140] Sincruide predicted that current greenhouse gas emissions from the North Mine fleet are about 700 kt CO₂E/y. The projected greenhouse gas emissions for the mine fleet in the application case are 1239 kt CO₂E/y. In information requests from the AER to Sincruide, Sincruide was asked if it had calculated the net increase in greenhouse gas emissions attributable to MLX alone, to which it replied that it had not.

Analysis and Findings

[141] Sincruide predicts a 1.45 per cent increase in Alberta greenhouse gas emissions as a result of MLX. This is likely a conservative estimate because the number didn't account for greenhouse gas reductions when mining is discontinued at the North Mine pit.

[142] The panel notes that Sincruide included in evidence a 10-year-old greenhouse gas mitigation plan that was submitted to Alberta in 2008.

[143] Greenhouse gas emissions from the MLX mine fleet are predicted to increase by at least 56 per cent, but there is some uncertainty about the accuracy of this number; 700 kt equivalent/per year is currently attributable to the North Mine, and we don't know by how much this number will drop when the North Mine is discontinued. We anticipate that not all of the mine fleet will move to MLX, as certain heavy equipment will continue to be used at the North Mine for tailings and reclamation work.

[144] Despite some uncertainty, we find that the MLX project would result in a relatively small contribution to cumulative greenhouse gas emissions from the Alberta oil sands.

[145] The panel finds that, in consideration that Sincruide North Mine pit greenhouse gas emissions will be discontinued, the MLX greenhouse gas emissions will likely be a relatively small increase to Alberta greenhouse gas emissions. The panel is of the opinion that Alberta's *Carbon Competitiveness Incentive Regulation* (CCIR) and *Oil Sands Emissions Limit Act* are the appropriate tools to manage and mitigate the MLX greenhouse gas emissions.

Dust

[146] Sources of dust at MLX include construction of the east and west mine pits, heavy haulers traversing the site, as well as dust from overburden storage piles and centrifuge cake storage. Particulates from dust sources might be a health risk for people living in nearby communities.

[147] In its air quality assessment, Sincruide used $PM_{2.5}$ to evaluate dust emissions. It said that haul roads, material handling, and an exposed mine face and other exposed areas are the primary sources of $PM_{2.5}$ emissions. For the baseline case (i.e., without MLX emissions), $PM_{2.5}$ emissions were predicted to be 12.39 t/d in the local study area and 31.25 t/d in the regional study area. The project would add 1.36 t/d of $PM_{2.5}$ emissions, which represent 11.0 per cent and 4.4 per cent net increases in the local and regional study areas respectively.

[148] The Alberta Ambient Air Quality Guideline 1-hour maximum for $PM_{2.5}$ is $80 \mu\text{g}/\text{m}^3$, and the 24-hour Alberta Ambient Air Quality Objective is $29 \mu\text{g}/\text{m}^3$ (it was $30 \mu\text{g}/\text{m}^3$ at the time of the assessment).

[149] Sincruide's prediction of $PM_{2.5}$ emissions for the application showed the following:

- The 1-hour maximum for the regional study area is $442 \mu\text{g}/\text{m}^3$ and for the local study area is $312 \mu\text{g}/\text{m}^3$, of which $PM_{2.5}$ from MLX represents a <1 per cent increase for both study areas.
- The 24-hour maximum for the regional study area is $209 \mu\text{g}/\text{m}^3$ and for the local study area is $159 \mu\text{g}/\text{m}^3$, of which MLX contributes a <1 per cent increase in the regional study area and a 1.6 per cent increase in the local study area.

[150] Sincruide's modelling shows that the air quality objectives and guidelines for $PM_{2.5}$ are already exceeded in the baseline case. Ambient monitoring results indicate that the maximum 24-hour average values for $PM_{2.5}$ at each of nine monitoring stations exceeded the Alberta Ambient Air Quality Objective of $30 \mu\text{g}/\text{m}^3$. The maximum values ranged from $70 \mu\text{g}/\text{m}^3$ at the Anzac station to $389 \mu\text{g}/\text{m}^3$ at the Fort McKay station. Sincruide said that effects of the MLX $PM_{2.5}$ emissions on ambient concentrations in the regional and local study area would be low.

[151] Athabasca Chipewyan raised concerns that dust emissions can pose risk to ecosystems, such as surface water in rivers and lakes. It said dust can gather on vegetation and plants that are ingested by wildlife or harvested by community members for medicinal and traditional use. Dust can also have sensory impacts.

[152] Syncrude spoke to perceived air quality risk to communities north of the MLX project. Construction and operation of the MLX project would move emission sources from the North Mine closer to the Fort McKay FN reserve lands. The MLX east mine pit is about 11 km from Fort McKay, and the MLX west pit is about 8.5 km from Fort McKay. Syncrude said there would likely be a small effect on air quality in Fort McKay, but the effect is dwarfed by double counting emissions in its assessment.

[153] Syncrude said it would accept, as a condition of MLX project approval, a requirement for it to develop a dust management and mitigation plan similar to that required in a recent approval issued for CNRL's Horizon project.

[154] Syncrude proposed watering haul roads, reducing speed limits, and stabilizing/revegetating stockpiles as mitigations for $PM_{2.5}$ emissions. Syncrude said that some mitigation occurs naturally through precipitation and snow cover.

[155] Haul-road dust is constantly monitored, and water trucks apply water as mitigation whenever necessary. Syncrude said a key mining activity is ensuring that haul roads are adequately maintained. Because dust also affects visibility and safety, Syncrude said that in dry conditions, water trucks are used to maintain the haul roads all summer.

[156] Syncrude proposed placing two centrifuge-cake deposits in the mined-out pit at MLX west. Syncrude said that cake tailings are in a wetted state when transported and consequently are not a source of dust. Upon completion of the cake deposit, the surface begins to dry and develop a crust. Syncrude does not plan to disturb the crusted surface prior to reclamation activities, thus reducing the potential for material to become airborne. Longer-term dust generation is mitigated by reclamation of the deposit.

Analysis and Findings

[157] We acknowledge Athabasca Chipewyan's concerns that dust may negatively impact vegetation its members may be using for medicinal or traditional purposes.

[158] The panel accepts Syncrude's assertion that centrifuge cake deposits are a minimal source of windblown dust. The panel's analysis is that dust from haul roads, mine constructions, and overburden dumps are primary sources of $PM_{2.5}$ emissions at MLX. While these emissions are predicted to have a relatively small effect on regional air quality, Syncrude's modelling shows that in the baseline case air quality objectives for $PM_{2.5}$ are already exceeded by a factor of 5 and 7, respectively, at both the local study area and the regional study area. MLX emissions by themselves do not show a material effect on ambient air quality as a result of MLX.

[159] Syncrude did not evaluate the $PM_{2.5}$ emissions against the applicable Canadian Ambient Air Quality Standards for $PM_{2.5}$. The panel is aware that the Canadian standard for $PM_{2.5}$ is expected to

become more stringent and more difficult to achieve. Dust-related PM_{2.5} emissions need to be mitigated to avoid not meeting the Canadian Ambient Air Quality Standards.

[160] Total suspended particulates and coarse particulate matter (PM₁₀) associated with dust also have localized impacts, which were not explicitly assessed by Sincruide. As the project would extend mining activity in the area for 14 years, dust issues will persist during this time.

[161] The panel finds that proactive management of dust emissions at MLX is required to mitigate health and safety risks. The panel requires Sincruide to develop and implement, to the satisfaction of the AER, a dust management and mitigation plan.¹²

Area Fugitive Emissions

[162] Fugitive emissions are a source of odours that can be a concern to nearby communities and traditional land users. Athabasca Chipewyan members voiced concern about smells from oil sands operations. Odours from hydrocarbons in the form of VOC and reduced sulphur compound emissions are perceived to have health and other sensory impacts.

[163] Mine faces with exposed bitumen, and diesel exhaust from the mine fleet, are the primary sources of VOCs and reduced sulphur compounds at MLX. VOCs and reduced sulphur compounds in bitumen cause odours. The mine pit open area, dump areas, reclamation stockpiles, overburden disposal, and gravel pit can also be sources of fugitive odour-causing emissions.

[164] Athabasca Chipewyan said that the MLX project's effects, including airborne contaminants and smell, will further undermine its members' confidence in traditional resources, particularly medicinal plants and berries, and will diminish their sense of place and the experience of being on the land.

[165] Sincruide evaluated 14 VOCs and 3 reduced sulphur compounds against the applicable Alberta Ambient Air Quality Objectives and odour thresholds. The maximum predicted ground-level concentrations of all odourous compounds were found to be below Alberta Ambient Air Quality Objective and odour thresholds:

- Total predicted VOC emissions are 117.5 t/d.
- Total reduced sulphur compound emissions are 0.047 t/d.
- The project represents a 39.2 per cent and 20.3 per cent increase in VOC emissions in the in the local and regional study areas, respectively.

[166] Sincruide proposed to continue examining options for reducing fugitive emissions as a source of odourous emissions. Sincruide also proposed to continue sampling and monitoring fugitive emissions.

¹² EPEA Amendment Approval – 4.1.58

Analysis and Findings

[167] The MLX mine pits combined account for 99.3 per cent of overall VOC emissions. The panel recognizes that there may be logistical challenges in management and mitigation of mine face emissions. The panel requires Syncrude to submit a plan to minimize fugitive emissions from exposed bitumen mine face.¹³

[168] The panel recognizes that Athabasca Chipewyan has expressed concerns about odorous emissions impacting traditional resources, and it acknowledges that odours have the potential to impact Athabasca Chipewyan and surrounding communities. The panel requires Syncrude to participate in any regional odour and air quality management initiatives to the satisfaction of the AER.¹⁴

[169] The panel requires Syncrude to provide an updated monitoring plan to quantify and characterize fugitive VOC and reduced sulphur compound emissions associated with the MLX project.¹⁵ Specific requirements for the monitoring plan are contained in the *EPEA* approval attached to this Decision.

Surface Water Quantity

[170] The panel has to decide whether Syncrude's application is consistent with the objectives of the *Water Act*, in particular section 2(a): to support the conservation and management of water, including use of water, recognizing, among other things, the need for economic growth and prosperity.

[171] Syncrude is also required, under section 6 of *Directive 023*, to provide information on water sources and the estimated annual volume that the project will use, and to identify effects of the project on water quantity.

[172] If MLX is approved, Syncrude will be required to comply with *Water Act* codes of practice for watercourse crossings, pipelines crossing a water body, outfall structures, and hydrostatic testing of pipelines.

[173] Syncrude submitted two applications for water:

- An application under section 50 of the *Water Act* for a new licence to divert 6.49 million m³ of water per year from the MacKay River watershed by collecting precipitation and runoff within the project footprint for the purpose of industrial use.
- An application under section 42 of the *Water Act* to amend its existing *Water Act* approval 263298 to expand its existing fenceline and to undertake *Water Act* activities associated with the MLX project.

¹³ *EPEA* Amendment Approval – 4.1.37.7

¹⁴ *EPEA* Amendment Approval – 4.1.64

¹⁵ *EPEA* Amendment Approval – 4.1.37.1

Application to Divert Surface Water Runoff at MLX West

[174] Syncrude will require a surface-runoff licence to account for water that would have flowed downstream from the project but that cannot be released because of Alberta policies for water that might have come into contact with bitumen.

[175] Syncrude proposes to establish a closed-circuit area at MLX west to capture surface water runoff that might have come into contact with bitumen. The water is from precipitation and from unnamed tributaries of the MacKay River. Water collected in the closed-circuit area will be incorporated into Syncrude's water-use recycling system.

[176] The MLX east closed-circuit area is inside the fenceline for existing *Water Act* licence 263297, so no additional water was requested for this area. Licence 263297 allows Syncrude to divert up to 39.84 million m³ per year of surface runoff collected within the fenceline from tributaries of Poplar Creek and of the Athabasca, MacKay, and Beaver (also known as Dogrib Creek) Rivers.

Application for Amendment to *Water Act* Approval 263298

[177] Syncrude applied for an amendment to *Water Act* approval 263298. The amendment allows Syncrude to expand its existing fenceline to include the MLX west footprint. The amendment would also allow it to construct and operate water management infrastructure for the development of MLX west and MLX east. Because the MLX east footprint is completely inside the approval 263298 fenceline, no changes to the fenceline are required for MLX east.

[178] The water management infrastructure includes separation and management of clean water, industrial runoff, and industrial wastewater. Site drainage and industrial runoff will be returned to the environment, while industrial wastewater will be collected in a closed-circuit system and will be recycled for use in the bitumen-extraction process.

[179] Key water management infrastructure will include clean-water interception and ditch systems, sedimentation ponds, outfalls, closed-circuit ditches, sumps, and bridge sumps.

MLX Project Impacts on Water Bodies

Impacts on the MacKay River

[180] Syncrude's evidence is that impacts on the MacKay River will be low. This is because the MLX project footprint in the MacKay River watershed is small relative to the size of the watershed (52.2 square km [km²] versus 5500 km²). Most of the watershed is undeveloped, and existing disturbances are associated with in situ projects that are known to have minor impacts on surface-water hydrology.

[181] The MacKay River watershed drains 4380 km² as it passes the MLX west project and 5500 km² at its mouth at the Athabasca River. The MLX west closed-circuit area therefore represents 1.2 per cent

and 0.9 per cent of the MacKay River drainage area at MLX west and at the mouth of the Athabasca River, respectively.

[182] Syncrude EIA hydrologic modelling, predicts that the net effect of the MLX west mine is to change average open-water and winter flows at the mouth of the Athabasca River by less than 1 per cent and to reduce the winter's lowest seven-day average flow that occurs (on average) once every 10 years (7Q10) by 5.7 per cent in 2035 from 0.070 cubic metres per second (m^3/s) to 0.066 m^3/s . This net change is due to a combination of water lost to mine-pit seepage, and increases from muskeg and overburden dewatering. Average mine seepage losses are expect to peak at 0.011 m^3/s in 2035.

[183] The record low observed average monthly flow rate in the MacKay River was 0.016 m^3/s in March 2003. Syncrude used a groundwater model to assess the MLX west impact on MacKay River flows during an equivalent future low-flow event caused by mine-seepage losses based on an average mine-seepage rate of 0.011 m^3/s . The impact was assessed by subtracting the average mine-seepage loss from the observed low flow and would therefore reduce MacKay River flows by 0.011 m^3/s to 0.005 m^3/s .

[184] Athabasca Chipewyan's primary concern is that water diverted by Syncrude will contribute to lowering water levels in the MacKay River. Athabasca Chipewyan did not provide any modelling work or other metrics to show how water levels in the MacKay River would be affected by diversions from MLX west.

[185] Athabasca Chipewyan maintained that water diverted at MLX west will prevent water from flowing to the MacKay River that would otherwise flow to the Athabasca River and the Peace-Athabasca Delta and will therefore add to existing navigation difficulties in these systems. The panel's consideration of impacts on indigenous navigation from a traditional-use perspective is in the Treaty Rights and Traditional Land Uses section of this document.

[186] Syncrude addressed Athabasca Chipewyan's concerns about navigating the MacKay River in its response to Athabasca Chipewyan's information request. Syncrude compared the baseline (i.e., the current scenario) with the application case, which includes the cumulative impacts of MLX, for three time periods: 2022, 2035, and the far future. The result of the comparison was that for each case it was hard to distinguish any difference in flows between the baseline and application case. Syncrude concluded that the effects of MLX on navigability in the MacKay River will be low in magnitude.

Impacts on Dover River

[187] Syncrude's hydrologic modelling of Dover River flows predicts that project-induced changes in average open-water flows, average winter flows, and 7Q10 low flows will be less than 1 per cent.

Impacts on the Athabasca River and the Peace-Athabasca Delta

[188] The amount of water diverted ($6.4 \text{ Mm}^3/\text{y}$) represents the amount of runoff or precipitation that would otherwise flow eventually to the Athabasca River from the MLX west site during a 1:10 wet year. In a 1:10 wet year, flows in the Athabasca River are higher than average, which mitigates any effects that the diversion might have on reduced flows in the Athabasca River.

[189] Syncrude's EIA hydrologic modelling predicted project effects on flows in the Athabasca River downstream from the MacKay River to be less than 0.1 per cent for all statistical measures considered, including average winter flows, 7Q10 low flows, and annual mean and peak flows. Planned-development-case flows measured downstream at the Embarras node would change less than 1 per cent from baseline-case flows. Syncrude submits that the net effect of the MLX project on water levels in the Peace-Athabasca Delta would be less than 1 mm.

[190] Because Syncrude will be capturing runoff generated within the project footprint, the effect of this diversion on downstream water bodies is proportional to the size of the project footprint relative to the drainage areas downstream. Syncrude said the combined effect of surface-water diversion at the MLX east and MLX west sites is equivalent to only 0.05 per cent of the drainage-basin area for the Athabasca River at Embarras Airport (i.e., $155\,000 \text{ km}^2$). Even if there was no runoff from the entire MLX footprint, the reduction in flows to the Athabasca River would be so low that it would not be measurable.

[191] These estimates are based only on surface runoff changes caused by operations at MLX west and MLX east and do not include water withdrawals from the Athabasca River for the existing Mildred Lake operations.

[192] In terms of impacts on the Peace-Athabasca Delta, Syncrude referenced research in the academic literature that the primary effect of oil sands withdrawals is to reduce outflows from Lake Athabasca. A cumulative withdrawal rate of $20\text{--}30 \text{ m}^3/\text{s}$ for all oil sands operations would not have a significant effect on long-term lake levels, although there is a higher risk to water levels in the winter period. Syncrude also said that the *Surface Water Quantity Management Framework for the Lower Athabasca River* (the *SWQMF*) mitigates some of this by restricting cumulative withdrawals during low winter flows.

[193] Syncrude provided projected changes in Athabasca River flows based on 64 projected climate change scenarios using the WATFLOOD model. This modelling predicts increased winter flows, earlier onset of spring freshet, and decreased late-summer and fall flows by the mid-to-late 21st century. These simulations predict average late 21st century September–October flows to change by between +12 per cent and -24 per cent, depending on the scenario. Athabasca Chipewyan presented a summary of projected climate change simulations that predict Athabasca River flows to decrease by 20–40 per cent through the 21st century.

[194] In its reply submissions, Syncrude compared its assessment of the effects of climate change on Athabasca River flows against the assessment done by Aqua Environmental Associates for Athabasca Chipewyan and found differences in the absolute values of the hydrographs estimated under the two analyses. However, in general terms they both predict that flows in the late summer/fall periods will decrease in the future due to climate change. Syncrude said it is important to note that this decrease is expected even without the MLX project.

[195] Syncrude's conclusion is that water-level changes in the Athabasca River and downstream in the Peace-Athabasca Delta will not be measurable, and in the MacKay River will be very small.

Impacts on Horseshoe Lake

[196] Syncrude said that its capture of surface-water runoff at MLX east will have some impact on Horseshoe Lake, which is small and has a small volume of water. Water levels in the lake would only be of concern in years with very low flow and little or no precipitation, or if there were concurrent years with these conditions. The modelling shows that this has a low probability.

[197] In its EIA, Syncrude said that a lower water table due to dewatering at MLX east could reduce annual inflows to Horseshoe Lake by up to 95 000 m³. Syncrude said it they would monitor the lake and supplement the lake with clean water if necessary to maintain mean open-water and baseline conditions.

[198] Syncrude's surface-water modelling showed that the project is not expected to measurably change average lake outflows during the project's life.

[199] Syncrude committed to developing a water management plan to monitor water levels in the lake, and if levels fall below levels necessary to sustain the fish in the lake (which Syncrude said are of low value), Syncrude would commit to add water to the lake.

Analysis and Findings

[200] If the application to use surface-water runoff is approved, Syncrude will be required to monitor the volume it is using and to provide monthly reports to the AER.

[201] Because oil sands mine surface-runoff licences involve the capture of all of the natural surface flow in small tributaries, the volume of water prevented from reaching downstream water bodies automatically scales with regional flow conditions, unlike pumped water diversions that tend to be relatively constant. Because of this, the environmental impact of a surface-runoff licence is significantly less under low-flow conditions than is a direct-pumped withdrawal licence.

[202] The panel accepts Syncrude's findings that project impacts on MacKay River flows are small and generally below detection levels. The panel finds that changes to Dover River flows due to MLX are

negligible. The panel finds that project effects on the Athabasca River and the Peace-Athabasca Delta are negligible.

[203] With respect to Horseshoe Lake, the panel requires the following condition in the amendment to Syncrude's *Water Act* approval 263298:

The Approval Holder shall submit to the Director for authorization, a monitoring program which shall include: the measurement of Horseshoe Lake water levels for at least three years prior to constructing the MLX east site; and the identification of conditions under which Horseshoe Lake needs to be supplemented with additional clean water to maintain mean annual, open water, and winter baseline conditions.¹⁶

Mackay River Bridge Runoff-Collection Sumps

[204] To transport mined ore from MLX west to the Mildred Lake plant, Syncrude will build a haul-road bridge over the MacKay River. Because ore is likely to spill off trucks on the bridge and on the approach road, road runoff is likely to come into contact with bitumen. The haul road is therefore part of the closed-circuit area.

[205] Syncrude proposes to collect runoff from the bridge and haul road in two sumps, one on each side of the river. Water collected in these sumps will be pumped to tailings ponds and become part of the Mildred lake operation's recycled water system and used in bitumen ore processing. This water management system will be designed to handle a 1:100-year 24-hour storm.

Analysis and Findings

[206] The panel notes that the sump proposed for the north side of the MacKay River bridge is within the MLX west fenceline and that the sump proposed for the south side of the bridge is within the existing Mildred Lake fenceline. Water collected in the north sump is therefore associated with the MLX surface-runoff licence that is under consideration at this hearing, and water collected in the south sump is associated with Syncrude's existing Mildred Lake surface-runoff licence.

Syncrude's *Water Resources Act* Licence

[207] Syncrude has a licence (#35216) to withdraw water from the Athabasca River for industrial use for an oil sands mine. This licence was issued in 1973 under the *Water Resources Act* (replaced by the *Alberta Water Act* in 1999). Syncrude is not requesting any change to the peak withdrawal rate or volumes approved under this water licence. Whether or not MLX is approved, Syncrude will continue to withdraw water from the Athabasca River to process bitumen at Mildred Lake.

[208] Athabasca Chipewyan submits that withdrawals under licence 35216 contribute to low water levels in the Athabasca River that have an adverse impact on its navigability. To protect navigation,

¹⁶ *Water Act* Approval Amendment – Conditions 19 and 20

Athabasca Chipewyan asked that conditions be applied to Syncrude's *Water Resources Act* licence to require the company to reduce water withdrawals and to require cutoffs when water reaches certain levels.

[209] When Syncrude conducted its EIA, the relevant regulatory document was the 2007 Instream Flow Needs and Water Management System for the Lower Athabasca River. In 2015, Alberta introduced the *Surface Water Quantity Management Framework for the Lower Athabasca River (SWQMF)*. The *SWQMF* is a subregional management plan under *LARP*. Direct withdrawals from the Athabasca River, including Syncrude's withdrawals under licence 35216, are regulated by the *SWQMF*.

[210] The *SWQMF* contains thresholds for cumulative oil sands mine withdrawals from the Athabasca River. Under the framework, Syncrude can withdraw up to 2 m³/s under *Water Resources Act* licence 35216 for use at the Mildred lake operations when Athabasca River flow is below the lowest threshold, 87 m³/s.

[211] Athabasca Chipewyan criticized the *SWQMF* for not addressing navigation. Specifically, the *SWQMF* does not include weekly cumulative withdrawal limits for open-water flows relevant to indigenous navigation. It said the framework's aboriginal navigation index does not distinguish changes to navigability when Athabasca River flow is below 300 m³/s. Athabasca Chipewyan criticized the aboriginal navigation index for being based on the flow-depth relationship at a single location, while the adaptive management trigger for the aboriginal navigation index is based on average seasonal navigability and focusses on the incremental impact of oil sands withdrawals.

[212] For these reasons, Athabasca Chipewyan said that the *SWQMF* cannot be relied on to mitigate impacts of Athabasca River withdrawals on downstream indigenous navigation and on access to traditional lands.

[213] In its reply evidence, Syncrude described working with others in industry to develop a water management agreement to meet weekly flow triggers and cumulative withdrawal limits from the Athabasca River. Syncrude said that in periods of low flow, it limits its withdrawals to 1.96 m³/s rather than the 4.16 m³/s permitted in its licence.

[214] In closing argument, Athabasca Chipewyan recommended that the *SWQMF* be revised by 2020 to include a cumulative withdrawal limit of 20 m³/s when Athabasca River flows are below 700 m³/s, a cutoff for all operators when open-water flows are below 500 m³/s, a requirement to only fill water storage ponds when river flows are above 600 m³/s, a new navigation index that has a value of zero at 500 m³/s and negative values for flows less than 500 m³/s, clear management responses to support indigenous navigability, provide support to the community based monitoring program, incorporate downstream monitoring, independent verification of industry reporting, public reporting of industry withdrawals, and annual reporting on the state of indigenous navigability.

[215] Athabasca Chipewyan also recommended that before MLX activities begin, Syncrude should identify and implement all opportunities to achieve no-net impact on water levels on any part of the MacKay and Athabasca Rivers.

Analysis and Findings

[216] The panel notes Athabasca Chipewyan's concerns about low water levels in the Athabasca River and Peace-Athabasca Delta. We find no evidence that the applications before us will create any adverse impacts on water levels in the Athabasca River or Peace-Athabasca Delta. The evidence indicates that adverse impacts on the Peace-Athabasca Delta are the result of Peace River hydropower flow regulation in British Columbia, climate change, and industrial water withdrawals over time, with hydropower regulation and climate change having the most significant effects. For the Athabasca River, the evidence indicates that adverse impacts are the result of climate change and industrial water withdrawals over time with climate change having the more significant effect.

[217] There is no application before us for water withdrawals from the Athabasca River. Syncrude has a valid water withdrawal licence to withdraw water for use at Mildred Lake for bitumen processing.

[218] The *SWQMF* is an Alberta, cabinet approved, water management policy and is therefore outside the AER's mandate. Under *REDA*, we are required to implement Alberta policies.

[219] Additionally, the adequacy of *LARP* and its subregional *SWQMF* is not before the panel. The parties were informed that *LARP* and any of its sub-regional plans, including adequacy of any environmental thresholds, are out of scope for this hearing.

Impact on Navigation

[220] Athabasca Chipewyan identified late summer and fall as a key time for navigational use of the Athabasca River, the Athabasca Delta, the broader Peace-Athabasca Delta, and tributaries of the lower Athabasca River. Athabasca River fall season flows have decreased since late 1970s. Athabasca Chipewyan presented a summary of projected climate change simulations that predict river flows to continue to decrease by 20–40 per cent through the 21st century.

[221] Athabasca Chipewyan maintains that the thresholds in the *SWQMF* are inadequate to support navigation and access to traditional activities. Athabasca Chipewyan asked in its submission for Alberta to make significant changes to the *SWQMF*.

[222] Athabasca Chipewyan identified a safe navigation depth for a fully loaded, outboard motor boat, including start-up, as 1.2 m. This depth was initially associated in 2010 with an approximate flow rate in the Athabasca River of 400 m³/s, which was defined as the aboriginal extreme flow.

[223] Athabasca Chipewyan's community based monitoring program has been measuring water levels in the Peace-Athabasca delta and has identified relationships between river flow at Fort McMurray and water depth in the Peace-Athabasca Delta. The data shows that, although there is significant variation in water flow depth at given locations for the same river flow rates, depths at key tributary and distributary points in the Delta are often less than 120 centimetres (cm) when flow at Fort McMurray is less than 500 m³/s and is usually more than 120 cm when flow is above 700 m³/s. Based on this data, the aboriginal extreme flow was revised from 400 m³/s to 500 m³/s.

[224] In the Athabasca River mainstem between Fort McMurray and the Athabasca delta, Athabasca Chipewyan described the progressive loss of access to side and back channels as flows in the Athabasca River decline from 800 m³/s to 300 m³/s. At a river flow rate of 500 m³/s, loss of access was described as widespread.

[225] Athabasca Chipewyan did not assess the impact of the MLX project or the current rate of withdrawal by Sincruide on Athabasca River flows and navigation. Athabasca Chipewyan's evidence focused on identifying historical and potential future trends in river flows and in describing how navigability and traditional land success decreases with river flow.

Analysis and Findings

[226] The panel finds that Athabasca Chipewyan and Sincruide are largely in agreement in terms of the magnitude of the MLX project effects on water levels and river flows. The parties differ considerably in terms of how to interpret the significance of these changes to environmental risk and river navigability.

[227] We note that the *SWQMF* itself describes the approach to indigenous navigation as "preliminary" and makes several references to the potential impacts of water withdrawals on indigenous navigation as a "knowledge gap" that will be subject to future reviews and potential framework updates.

[228] Much of evidence presented by Athabasca Chipewyan on navigation was not available at the time the *SWQMF* was enacted. The panel encourages Athabasca Chipewyan to continue to bring this information forward to the appropriate bodies dealing with the *SWQMF*.

[229] The panel concludes from the presented evidence that the principal long term risk to indigenous navigation in the Athabasca River is the likelihood that late summer and fall water flows will continue to decline over the next 100 years. This decline will likely result in increasing navigation hardships for indigenous communities in the lower Athabasca River basin. The panel recognizes that oil sands withdrawals add to this pressure, and that the most significant risk from these withdrawals is the potential for large cumulative withdrawals during low flows in the late summer and fall seasons.

[230] The conditions requested by Athabasca Chipewyan relate to matters not before this panel. Sincruide's *Water Resources Act* licence is not part of this application. The application before the panel is for a licence to use surface-water runoff.

Surface Water Quality

Project-Specific Runoff

[231] Surface water quality will be affected as a result of the proposed MLX project. To mitigate potential effects, Sincruide proposes handling surface water for the MLX project in three ways as outlined in its water management plan.

- Industrial runoff—composed of surface runoff originating from muskeg and overburden dewatering and from reclamation material stockpiles. This would be directed along interception channels, treated through a sedimentation (polishing) pond, and released to the environment assuming regulatory limits are met. For MLX west, treated runoff water would be discharged to the MacKay River, for MLX east, treated runoff water would be discharged to Beaver River and Horseshoe Lake.
- Industrial wastewater—composed of runoff water originating from mine dewatering (pit, overburden dump areas, haul roads and maintenance areas), cake consolidation and runoff water, coke deposit water, and basal aquifer depressurization water. Industrial wastewater from MLX west and MLX east is proposed to be routed via sumps to the North Mine's centre pit and Mildred Lake Settling Basin tailings area, respectively.
- Natural (unimpacted) runoff—runoff originating from undeveloped areas and flowing on to the MLX west project area would be intercepted by a diversion channel (northwest diversion channel). Captured water would be returned to the MacKay River without flowing through a sedimentation pond.

[232] Athabasca Chipewyan expressed concerns with project activities resulting in elevated concentrations of polycyclic aromatic hydrocarbons and metals entering the aquatic environment. As sedimentation pond discharges typically do not have limits for polycyclic aromatic hydrocarbons or metals, there would be no regulatory limits preventing water with elevated levels of these parameters from being discharged to the receiving environment. Furthermore, sedimentation ponds are not designed to treat (settle) sediment particles less than 15µm in size (small silt and clay particles) which polycyclic aromatic hydrocarbons and metals may be associated with. Given the strong affinity of polycyclic aromatic hydrocarbons for sediments, the concentrations in sediments could be significantly higher than the overlying water column. Athabasca Chipewyan said that sediment bound polycyclic aromatic hydrocarbons and metals would have the potential for transport for large distances downstream.

[233] Athabasca Chipewyan recommended developing regulatory limits for metals and polycyclic aromatic hydrocarbons at discharge points from sedimentation ponds. Athabasca Chipewyan said acute

toxicity limits would not account for potential chronic toxicity effects of polycyclic aromatic hydrocarbons and metals on biota. When asked what metals and polycyclic aromatic hydrocarbons should be included, Athabasca Chipewyan suggested metals with guidelines but said further research was needed and that a number of unknowns exist around the toxicity of alkylated polycyclic aromatic hydrocarbons.

[234] While Syncrude agreed with Athabasca Chipewyan that polycyclic aromatic hydrocarbons and metals could be associated with sediments, Syncrude said that use of sedimentation ponds is an effective means to reduce sediment concentrations and any associated polycyclic aromatic hydrocarbons or metals. As a result, Syncrude did not evaluate sediment quality and did not consider contact to aquatic plants or risks to benthic invertebrates. The other mitigation measures planned (closed-circuiting and clean-water diversion ditch) would be effective in preventing significant polycyclic aromatic hydrocarbons from being released to the receiving environment or preventing clean water from being contaminated by project activities. Syncrude said that their model assumed no partitioning of polycyclic aromatic hydrocarbons or metals to sediments and was therefore conservative in its prediction of concentrations in the receiving environment. Syncrude said that there are both natural and anthropogenic sources of polycyclic aromatic hydrocarbons and metals. The model results showed long range downstream transport of substances of concerns was unlikely to occur as a result of the project. Syncrude did agree to monitoring and reporting on suspended sediment concentrations in the northwest diversion channel.

Analysis and Findings

[235] We are satisfied that Syncrude's proposed surface water management strategy will minimize risks to the aquatic environment via closed circuiting of higher risk mine wastewater (expected to have the highest levels of polycyclic aromatic hydrocarbons, metals, and other contaminants of concern) and releasing lower-risk runoff only after treatment and only when regulatory limits are met. Given the concerns raised by Athabasca Chipewyan about potential contaminants of concern associated with sediments, Syncrude is required to monitor and report on suspended-sediment concentrations in the northwest interception ditch.¹⁷ The northwest interception ditch is a source of runoff water for which sediments are not mitigated through sedimentation ponds. Monitoring will enhance understanding of the relative contribution of sediments from this clean-water diversion ditch.

[236] Syncrude will be required to monitor for metals and polycyclic aromatic hydrocarbons in sedimentation ponds as part of standard *EPEA* monitoring requirements.¹⁸ As the monitoring data forms part of monthly and annual reporting requirements, this may be used to assess potential loadings and long-term trends in water quality from sedimentation ponds. While there are currently no regulatory limits for most metals and polycyclic aromatic hydrocarbons in sedimentation ponds, it is expected that monitoring data can be used in future development of regulatory release limits if needed.

¹⁷ *EPEA* Amendment Approval Conditions – 4.2.1.10.2(g), 4.2.3.7(i)

¹⁸ *EPEA* Amendment Approval Condition – Table 4.2-D

[237] If the assessments of monitored parameters (including polycyclic aromatic hydrocarbons and metals) indicate potential adverse effects to the receiving environment, Syncrude will be required to develop appropriate plans to mitigate these effects to the satisfaction of the AER.¹⁹ This may include, but is not limited to, the enhanced removal of particulates in sedimentation ponds below the 15µm design threshold as suggested by Athabasca Chipewyan.

[238] Syncrude shall design and construct the industrial runoff control system so that at a minimum, it achieves adequate pond retention time to remove 15 micron and greater sized particles for all precipitation events up to and including a 1 in 10 years event occurring over 24 hours) and meets *EPEA* release limits.²⁰

MLX West End-Pit Lake

[239] At the end of mining life, an end-pit lake would be formed within MLX west (MLX west end-pit lake). Tailings would not be placed into the MLX west end-pit lake, but seepage from centrifuge cake placement would no longer be diverted to the closed-circuit recycle water system at closure and would instead be expected to seep into MLX west end-pit lake. Syncrude suggested that the filling of the MLX west end-pit lake would occur between 2037 and 2057 using natural land runoff. Industry best practice indicates that 20 years is at the high end of filling times. In its application, Syncrude evaluated alternative scenarios to supplement natural filling, but did not suggest pursuing augmentation. Seepage from the cake deposited, will no longer be mitigated at closure and is expected to reach the MLX west end pit lake by 2064. Syncrude indicated that seepage water contributions would not meaningfully contribute to MLX west end-pit lake volumes.

[240] Initial estimates of MLX west end-pit lake water quality at closure were approximated to be similar to MacKay River water quality and reclaimed saline-sodic overburden run-off which would represent overburden dump area runoff. PAH data for overburden dump area runoff was based on the MacKay River since there was no previous PAH data for overburden available. Future water quality trends for the MLX west end-pit lake were based on results from Base Mine Lake. Syncrude said that the model used to predict future surface water quality was a simple mass loading approach. Syncrude said that they do not believe modelled predictions represented a worse-case scenario, but rather a conservative estimate of water quality at closure. Currently the model does not account for more complex processes which may reduce the concentration of chemical components over time.

Analysis and Findings

[241] Runoff from the closure landscape and seepage from centrifuge cake placement will influence the water quality of the pit lake. Regardless of whether tailings are placed in MLX west end-pit lake or not,

¹⁹ *EPEA* Amendment Approval Condition – 3.3.39(c)

²⁰ *EPEA* Amendment Approval Condition – 3.3.36

release criteria are subject to provincial policy. As government policy and criteria for release of water from end-pit lakes in mineable oil sands does not currently exist, Sincruide cannot release water from the MLX west end-pit lake until policy is in place and Sincruide can demonstrate compliance with regulatory limits for end-pit lake releases.

[242] Sincruide's water quality model developed for the MLX west end-pit lake is simplistic and relies on a number of unconfirmed assumptions given the lack of site-specific data. The panel therefore requires Sincruide to regularly update its water quality models for MLX, including for MLX west end-pit lake water quality as site specific data becomes available and as more complex processes are better understood and accounted for in the models.²¹ Updated models are required to be submitted as part of updated closure plans, and must incorporate more recent and direct water quality monitoring data from natural land runoff and overburden dump area runoff as this becomes available. The updated models must account for physical, chemical and biological processes such as aerobic degradation, sorption/desorption, oxidation/reduction, dissolution/precipitation or flushing of deposits. If this work finds that under some scenarios the lake will not achieve the desired outcome of water quality typical for locally common boreal lakes, Sincruide will identify how the closure plan can be adjusted to ensure the water quality trajectory of the lake will be ensured, provide modelling results supporting these changes, and evaluate potential impacts on other end-pit lakes affected by these changes.

[243] The panel notes that the *EPEA* approval for Mildred Lake contains a condition related to end-pit lake research. The panel recommends that the existing requirements for end-pit lake research for the Mildred Lake site be expanded to include MLX west end-pit lake.

MacKay River Bridge

[244] Development of MLX west would include construction of a bridge across the MacKay River. The construction of the MacKay River bridge may result in erosion effects resulting in elevated levels of sediments in the MacKay River.

[245] Clean water (non-project impacted water) would be diverted away from the bridge and haul road and discharged to the MacKay River via water dissipation structures. Once operational, any runoff water from the haul road and bridge would be captured and pumped to the Mildred Lake facility.

[246] In their application, Sincruide committed to an upstream/downstream surface water quality monitoring program within the MacKay River to evaluate potential construction and clean water diversion related effects and mitigation effectiveness. Sincruide indicated this would focus primarily on total suspended sediments and turbidity monitoring. If water diversions around the bridge were creating sediment impacts, Sincruide committed to diverting this water to sumps and directing the water to the Mildred Lake facility.

²¹ *EPEA* Amendment Approval Condition – 6.1.16(b)

Analysis and Findings

[247] Mitigation measures proposed for preventing erosion and sedimentation effects to the MacKay River during the construction of the proposed MacKay River bridge and diversion of non-project impacted runoff water are appropriate. The proposed measures follow industry standards that have been shown to be effective when properly implemented and maintained at similar sites. The panel supports Syncrude's proposal to develop a monitoring program for sediment related effects in the MacKay River to confirm the effectiveness of proposed mitigation measures. Therefore, as part of the MLX water management plan, Syncrude is required to submit a specific monitoring proposal for clean water releases from the areas surrounding the MacKay River bridge, with triggers for implementation of mitigation measures for adverse effects on water quality.²²

Horseshoe Lake

[248] Syncrude proposes to construct a channel to reroute runoff from the southwest portion of the MLX east project area to a polishing pond which would then be pumped into Horseshoe Lake. Athabasca Chipewyan said that Syncrude's water quality assessment for the Horseshoe Lake area was insufficient as it was based on a single sample collected from the lake. Syncrude said that the single sample was considered sufficient as Horseshoe Lake is well mixed and they would not expect seasonal variation to significantly alter the model output. Syncrude did commit to conducting additional water quality monitoring in Horseshoe Lake starting three years prior to the start of mining at MLX east.

Analysis and Findings

[249] We find that the single sample collected from Horseshoe Lake is not sufficient to characterize potential seasonal variation in water quality. Syncrude is required to submit a proposal to collect more water-quality data from Horseshoe Lake and indicate how project-related effects will be assessed using this data. This condition is aligned with Syncrude's commitment to collect more water-quality data from Horseshoe Lake starting three years before the start of mining at MLX east. This data would form the basis for future comparisons of project-related impacts on Horseshoe Lake, including direct discharge of treated industrial runoff to the lake.²³

Mercury

[250] Athabasca Chipewyan raised concerns about Syncrude's modelling of instream mercury concentrations. According to Athabasca Chipewyan's assessment, Syncrude's baseline-case-modelled mercury concentration of about 50 nanograms per litre (ng/L) was twice the highest total mercury concentration measure observed in the Athabasca River (24.9 ng/L). Athabasca Chipewyan said this assessment would either underestimate project-related increases in mercury, or if the concentrations are

²² EPEA Amendment Approval Condition – 3.3.39(e)

²³ EPEA Amendment Approval Condition – 3.3.39(f)

valid, there would be a significant unexplained increase in mercury concentrations in the lower Athabasca River.

[251] Sincruide said that the baseline case scenario is a hypothetically modelled case and was not intended to reflect observed conditions. The predicted baseline case includes all inputs to modelled nodes and would include inputs from approved projects not yet built, which is why modelled concentrations are higher than measured concentrations. Datasets used for modelling water quality excluded outliers from the model to avoid biasing the model towards extreme values.

Analysis and Findings

[252] We find that Sincruide demonstrated appropriate modelling of mercury data with justification for exclusion of outliers. Standard *EPEA* monitoring requirements for sedimentation ponds include total mercury and methyl-mercury concentrations and will be required for this project.²⁴ This data is required to be reported monthly and annually along with an assessment of the data. If assessment shows trends in mercury data which indicate a potential risk to the receiving environment, Sincruide will be required to develop and implement appropriate mitigation measures to the satisfaction of the regulator.

Regional Effects

[253] The application did not assess potential impacts on water quality in the Peace-Athabasca Delta. The rationale provided by Sincruide was that concentrations of parameters of concern for water quality at Embarras on the Athabasca River were predicted to remain the same or decrease relative to the upstream Firebag River location. As a result, Sincruide said that no effects on the downstream delta were expected. Sincruide indicated that the MLX project is not anticipated to affect sediment quality as a result of project specific mitigation measures including closed-circuit water management, and treatment of runoff water through polishing or sedimentation ponds.

[254] Sincruide said that their model assumed no partitioning of polycyclic aromatic hydrocarbons or metals to sediments and was therefore conservative in its prediction of concentrations in the receiving environment. The model results showed long range downstream transport of substances of concerns was unlikely to occur as a result of the project.

[255] Sincruide confirmed that while they have completed snow-pack monitoring in the region for polycyclic aromatic hydrocarbons and metals, the application did not include an assessment of regional effects of aerial deposition of these parameters. While Sincruide has participated in site specific snowpack and snowmelt monitoring, they indicated this is an area with a high degree of uncertainty and a focus of active research. Sincruide said that transport of alkylated polycyclic aromatic hydrocarbons through aerial

²⁴ *EPEA* Amendment Approval Condition – Table 4.2-D

transmission is not expected to occur, but parent polycyclic aromatic hydrocarbons and metals could be transported by atmospheric methods.

[256] Athabasca Chipewyan provided evidence from research that shows a possible increase in polycyclic aromatic compounds (which include polycyclic aromatic hydrocarbons) in the Peace-Athabasca Delta and increases in polycyclic aromatic hydrocarbon concentrations in the Athabasca River. As a result of the MLX project, further increases in polycyclic aromatic hydrocarbons and metals would be expected from discharges of water and sediment not removed by the sedimentation ponds. Athabasca Chipewyan said that long-range transport of small clay particles with bound polycyclic aromatic hydrocarbons is possible because of the hydrophobic and buoyant nature of the combination. Athabasca Chipewyan also said that these substances can move from dissolved to particulate phases in water which is an important consideration as regulatory limits and Sincruide models focus primarily on water quality which is not a reliable predictor of sediment quality.

[257] Athabasca Chipewyan calculations of loadings for polycyclic aromatic hydrocarbons showed that the project would contribute increased loadings to the Athabasca River. Sediments would be expected to accumulate in the Peace-Athabasca Delta as this is a depositional area for sediments. Increases in polycyclic aromatic hydrocarbons in the sediments in the Peace-Athabasca Delta would pose a potential risk to invertebrates that live on and consume sediments.

[258] Athabasca Chipewyan recommended enhanced sediment and water quality monitoring and biomonitoring within the Athabasca River and the Peace-Athabasca Delta. Athabasca Chipewyan clarified that regional monitoring would likely be conducted by regional monitoring programs, such as the oil sands monitoring program. However, monitoring would also be needed for project-specific releases.

Analysis and Findings

[259] We find that Sincruide did not fully consider potential impacts from the MLX project to the Peace-Athabasca Delta. While Sincruide asserts that modelled water quality data at Embarras relative to the Firebag River location is sufficient to conclude no project effects, the panel did not find evidence that transport of parameters of concern, specifically polycyclic aromatic hydrocarbons and metals, was considered for other pathways, specifically aerial deposition and sediment bound transport. However, we agree that the contribution of aerial deposition effects and sediment bound transport from the project would not likely be detectable at the Peace-Athabasca Delta given the size of the delta, relatively low volume contribution of discharged water from the MLX project area, and proposed mitigation measures to be implemented.

[260] Athabasca Chipewyan demonstrated that polycyclic aromatic hydrocarbons and metals may be associated with clays which would not be expected to be removed in sedimentation ponds and have the potential for long-range transport downstream. Recent findings of potential increases in polycyclic aromatic hydrocarbon concentrations in the Athabasca River and Peace-Athabasca Delta highlighted by

Athabasca Chipewyan provided support to these claims. Syncrude did demonstrate that there are both natural and anthropogenic sources of metals and polycyclic aromatic hydrocarbons in the mineable oil sands region, and that determining the source is extremely difficult.

[261] As the MLX project represents one of many sources of influence from the mineable oil sands region, we find that enhancements to monitoring should be done through regional integrated monitoring programs, such as the oil sands monitoring program. Syncrude is required to participate in regional oil sands monitoring initiatives. As one of the oil sands producers, Syncrude is required to provide financial support, but would not have oversight to the program design.²⁵

[262] Given the uncertainties highlighted by Athabasca Chipewyan and Syncrude's own admission that areas of aerial deposition and snowmelt contribution of contaminants of concern is an emerging area of research, the panel supports the recommendation to enhance sediment and water quality monitoring and biomonitoring within the Athabasca River and the Peace-Athabasca Delta with the goal of better understanding potential impacts the oil sands industry may be having on these areas.

[263] Athabasca Chipewyan raised concerns about the potential for long-range transport of contaminants and the impact of contaminants on the environmental receptors and the resulting implications on human health. These concerns are best addressed at a regional level. The incorporation of community based monitoring programs within regional monitoring would help to address community concerns and may improve community confidence in regional monitoring results. We support seeking opportunities for meaningful engagement and input between Athabasca Chipewyan and Alberta in the development of enhanced regional monitoring programs.

[264] Should any regional initiatives for the research and monitoring of the MacKay River be implemented, the panel recommends Syncrude participate in the initiative.

Recommendations to Alberta

[265] The panel recommends that Alberta consider the need to enhance sediment and water quality monitoring and biomonitoring within the Athabasca River and the Peace-Athabasca Delta with the goal of better understanding potential impacts the oil sands industry may be having on these areas.

[266] The panel recommends that Alberta consider opportunities for meaningful engagement and input between Athabasca Chipewyan and Alberta in the development of enhanced regional monitoring programs.

²⁵ EPEA Amendment Approval Condition – 4.2.4.3

Aquatic Effects

[267] Syncrude assessed potential aquatic effects from the proposed MLX project using three snapshots. During the preproduction phase (2022), clearing in MLX west would result in small, short-term and localized sedimentation effects which are not expected to affect fish or fish habitat (including invertebrates). During the operations phase snapshot (2035), small changes were predicted for sediment loading and water quality, neither of which was expected to affect fish or fish habitat. Finally, for the far future snapshot, defined as when the MLX project is fully reclaimed and steady-state, the overall impact is expected to be positive due to the addition of the MLX west end-pit lake.

[268] Overall, the only potential aquatic effect predicted by Syncrude was under the planned development case due to potential lake acidification which may affect an additional 11 per cent of lakes in the region.

Analysis and Findings

[269] The panel finds that although the project will result in changes to water quality at the local scale (project area), project effects are unlikely to be detected at the Peace-Athabasca Delta. The mitigation measures proposed by Syncrude and regulatory limits for discharges minimize the potential for the project to have water quality related effects. The panel recognizes however that there are uncertainties associated with the models and interactions between water quality parameters are difficult to predict or may not have been accounted for in the models. The panel finds that there is insufficient data to understand the risks to aquatic life associated with accumulation of certain parameters within the sediments.

[270] To ensure project effects on water quality and aquatic ecology are consistent with Syncrude's predictions of a low to moderate effect within the local study area, a project-specific aquatic environmental effects monitoring program for the McKay River is required. An effective monitoring program will ensure project effects are either confirmed as per the application, or potential adverse effects are detected in a timely manner which allows implementation of mitigation measures.²⁶

Groundwater

[271] Development of the MLX project has the potential to impact groundwater flow regime and quality. The changes to groundwater levels, flow patterns, and chemistry might contribute to effects on the other environmental indicators, such as surface water quantity and quality, or vegetation.

[272] During the preproduction and operations phases of the MLX west and MLX east pits, the open-pit mine excavations will result in the influx of groundwater towards the pits, subsequent lowering of the groundwater table around the pits and reduction of the groundwater input to surface water bodies (rivers,

²⁶ EPEA Amendment Approval Condition – 4.2.3.30

creeks, and wetlands). Depressurization of the Basal McMurray aquifer will lower groundwater pressures in this deeper aquifer and produce quantities of groundwater of variable quality.

[273] At closure, the groundwater flow regime will be altered from preproduction conditions. Process-affected groundwater, due to contact with tailings in the backfilled mine pits can migrate to the shallow nonsaline aquifers or discharge into the surface water bodies.

Primary Aquifers Impacted by the Mining Activities

[274] Current groundwater use in the MLX project area comes from collecting shallow groundwater seepage and surface water runoff associated with mining activities and diversions from the Empress Formation.

[275] Sincruide said that aquifers within the Grand Rapids Formation and the aquifers of the Empress Formation in the buried channels can be considered domestic-use aquifers. Sincruide submitted that the saturated shallow Quaternary sediments in the MLX west area consisting of the lower permeability till are unlikely to comprise a domestic-use aquifer, while the saturated shallow Quaternary sediments in MLX east have higher hydraulic conductivity and will constitute a domestic-use aquifer.

[276] Sincruide considers Quaternary sediments, the Empress aquifer associated with the Birch Channel, and the basal aquifer in the Basal McMurray Formation (Basal McMurray aquifer) to be the primary aquifers in the project development areas likely to be impacted by the mining activities.

[277] Wastewater disposal into deep aquifers is not associated with the MLX project.

[278] Sincruide's position is as follows:

- The Quaternary aquifer is bounded by the Athabasca River, MacKay River, and Dover River as well as by the creeks in the area.
- The Birch Channel is eroded in its western extent, ending to the south of the MLX west pit's extent.
- The Empress aquifer is not hydraulically connected to the Basal McMurray aquifer.
- The Basal McMurray aquifer occurs as sand pods of limited thickness (up to 2 m) and connectivity in most of the MLX east and MLX west with the exception of the thicker Basal McMurray aquifer at the northernmost extent of the MLX east pit, where the thickness of the Basal McMurray aquifer is up to 10 m.

[279] Sincruide's position is that the MLX east and MLX west mining areas are not connected by any of the primary aquifers, so the groundwater-related effects of each pit will not overlap. Even if groundwater has the potential to flow below the Dover and MacKay Rivers, Sincruide expects the flow volumes to be negligible due to the lack of connectivity, or the low hydraulic conductivity, of the units extending under the rivers.

[280] For MLX west, Sincruide did not consider nearby operations' effects (including Sincruide's existing Mildred Lake operations) because the stress imposed on the Quaternary aquifer cannot extend past the MacKay River, which cuts into the McMurray Formation, and the Basal McMurray aquifer and the Empress aquifer are not continuous between MLX west and MLX east.

[281] For MLX east, parts of Sincruide's existing Mildred Lake operations (e.g., the Mildred Lake Settling Basin, Base Mine Lake, southwest in-pit, east in-pit north, east in-pit south, and the Mildred Lake reservoir), and Suncor's lease 86/17 (Suncor ponds 5 and 6) were incorporated into the model as constant head boundaries, which were adjusted to reflect conditions during operations and post-closure.

[282] Additional geological drilling done for delineation of the oil sands will provide more information, including the delineation of the North Spruce buried channel.

Analysis and Findings

[283] Understanding of the extent of the buried channels to the south of MLX west and to the east of the Birch Channel is important in conceptualizing the MLX west and MLX east as hydraulically separate areas and may impact the estimation of the quantity of groundwater intercepted as seepage into the MLX west pit. While the electro-magnetic survey did not show any of the buried channels to the south of the MLX west project development area intersecting the MLX west pit, the absence of the Birch Channel sediments was only confirmed by the drilling of two exploration wells on the project footprint directly to the south of the proposed pit under the proposed location of the overburden dump. The panel understands that Sincruide will improve the delineation of these features during the course of geological drilling in the MLX west area and will require Sincruide to provide updates on its investigations.²⁷

[284] The panel notes the scarcity of data in the MLX west area related to Basal McMurray aquifer distribution and groundwater information and will also require Sincruide to report on its investigations related to Basal McMurray aquifer distribution.²⁸

Reduction in Groundwater Base Flow

[285] Sincruide said that groundwater-flow modelling quantified potential impacts of the proposed mine on groundwater, including

- the extent of groundwater drawdown within Quaternary sediments;
- the rate of groundwater inflow into the mine pit;
- the reduction of groundwater flow to the MacKay, Dover, and Athabasca Rivers;
- the pumping parameters for the depressurization of the Basal McMurray aquifer; and

²⁷ EPEA Amendment Approval Condition – 4.6.1.1(a)

²⁸ EPEA Amendment Approval Conditions – 4.6.1.1(p), 4.6.7(x)

- the flow rate of process-affected groundwater towards the MacKay, Dover, and Athabasca Rivers.

[286] Syncrude said that groundwater flows from upland areas towards and discharges into the major rivers in the project area, including the Dover, MacKay, Ells, and Athabasca. The recharge is low, less than 3 per cent of the precipitation. In MLX east, recharge also occurs from the natural and man-made lakes and ponds.

[287] Groundwater springs have been identified near the river banks in the area, including saline springs located to the east of the study area that were interpreted as points of discharge for deep saline Devonian groundwater.

[288] A sample collected from an oxbow lake on the western shore of the Athabasca River and within the study area had a total dissolved solids concentration of 1800 milligrams per litre (mg/L). Syncrude compared the routine chemistry parameters with Quaternary, Basal McMurray aquifer, and Devonian water, as well as with the water samples collected from the Mildred Lake Settling Basin and the overburden disposal area in MLX east. The sample composition correlates more closely with Quaternary groundwater with lower chloride concentrations, and high in calcium and bicarbonate ions than with deeper groundwater coming from the Devonian or McMurray aquifers. The concentration of naphthenic acids was much lower than results from the contact with the bitumen-bearing McMurray Formation, suggesting minimal influence from the process-impacted groundwater on the oxbow lake surface-water sample.

[289] Syncrude's position is that the sample collected from the oxbow lake demonstrates connection between the shallow Quaternary groundwater that has total dissolved solids between 230 and 3000 mg/L and surface water, rather than the discharge of the deeper saline groundwater within the project area or contact with process impacted water.

Basal McMurray Aquifer

[290] Syncrude said that depressurization of the Basal McMurray aquifer will take place before mining, during the preproduction phase. Syncrude's position is that the Basal McMurray aquifer occurs in both MLX west and MLX east in a pod-like structure, with limited thickness and connectivity. The Basal McMurray aquifer is 80 m below the surface and is a confined aquifer isolated by the overlying oil sands from the shallow Quaternary aquifers. Based on the sampling program, the Basal McMurray aquifer is expected to be saline with total dissolved solids content up to 35 000 mg/L. In the event that Syncrude encounters depressurization water with a total dissolved solids concentration of less than 4000 mg/L, for MLX west the nonsaline Basal McMurray aquifer groundwater will be pumped to the North Mine centre pond tailing facility through the mine dewatering system; the nonsaline Basal McMurray aquifer groundwater from the MLX east will be pumped into the Mildred Lake Settling Basin tailings facility.

[291] Syncrude said that it will apply for separate *Water Act* licences if the following occurs:

- MLX east: Basal McMurray aquifer is found to be nonsaline (i.e. with total dissolved solids <4000 mg/L) and therefore requires a licence under the *Water Act* to depressurize Basal McMurray aquifer
- MLX west: If a high yield of nonsaline aquifer is encountered, Syncrude will apply for a temporary diversion licence under the *Water Act* for additional volume of water before carrying out the dewatering activity

[292] Syncrude said that due to the limited lateral extent of the Basal McMurray aquifer and its being confined, the depressurization will result in significant lowering the groundwater level within the Basal McMurray aquifer unit only, without impacting the adjacent hydrostratigraphic units, including the Quaternary sediments. In the MLX west area, the drawdown extends up to 2 km from a pumping point, and is confined within the contour of the mine pit.

[293] Syncrude expects connection between the Basal McMurray aquifer unit and the Athabasca River in the MLX east area. A pumping rate of 500 m³/day starting one year prior to mining was estimated as necessary for the depressurization of the MLX east pit in preproduction phase. The cone of depression is contained primarily to the Basal McMurray aquifer, with an estimated 1.75 km radius.

[294] During production (2027–2035), an estimated 347 m³/d of groundwater recharge to the Athabasca River would be lost from the Basal McMurray aquifer, and, in addition, 470 m³/day of the river water will be drawn towards the pumping wells during the Basal McMurray aquifer depressurization.

[295] Syncrude expects that there will be no residual impacts on the Basal McMurray aquifer after the cessation of depressurization operations, and groundwater levels will recover to close to the preproduction levels.

Empress

[296] Syncrude's position is that the Empress aquifer is not present under the MLX west and MLX east pit footprints and therefore will not be impacted by either depressurization or dewatering.

Quaternary

[297] Syncrude concluded that shallow Quaternary sediments differ between the MLX east and MLX west parts of the project based on the data collected from 12 groundwater monitoring wells between 3.7 and 16.8 m deep. MLX west Quaternary sediments are fine-grained tills, while at most locations in MLX east, the investigation found sand layers 1–12 m thick. The surficial Quaternary sediments in the MLX east area are subsequently modelled as coarse-grained.

[298] For MLX west, the maximum extent of the cone of depression in the Quaternary sediments (1 m of drawdown contour) extends to about 6 km from the edge of the pit towards the north, west, and south,

but only 1 km towards the east, to the escarpment of the MacKay River (confined by the MacKay River). The development of the cone of depression over the years is impacted by the progressive backfilling of the mine with the backfill material consisting of overburden mixed with other materials that will have a low hydraulic conductivity (modelled as 1×10^{-7} m/sec).

[299] Syncrude modelled the groundwater flow rate into the mine pit and the groundwater flow into or out of the MacKay and Dover Rivers for MLX west. The length of river reach considered for the MacKay and Dover Rivers extended from the confluence of the rivers to an upstream location where there was less than 0.5 m simulated drawdown due to the mining activity.

Table 1. Groundwater contribution for project phases at MLX west

MLX west (m ³ /day)	Pre-mining	End of 2026	End of 2036	Closure
Total flow rate into the mine	-	10400	10800	
Flow rate into the MacKay River	730	238	-57	583
Flow rate into the Dover River	344	296	185	140

[300] The groundwater inflow to the mining pit is at a maximum at the beginning of each excavation stage, then the inflow gradually tapers off over a few years.

[301] The groundwater contributions to the MacKay and Dover Rivers (in the selected reaches) prior to excavation are at 730 and 344 m³/day, respectively.

[302] At the maximum extent of excavation at the end of 2036, the MacKay River will not receive 730 m³/day of the groundwater discharge and, in addition, would lose 57 m³/day of surface water to the pit, until mining stops (787 m³/day estimated loss of water to the mine capture and flow reversal).

[303] At the maximum extent of excavation, the Dover River will receive 159 m³/day of groundwater discharge less in the selected reach than prior to mining.

[304] After MLX west closure, the end-pit lake serves as a point for groundwater discharge because its water level is lower than the pre-mining water table elevation in the Quaternary, as well as the elevation of the nearby reaches of the MacKay and Dover Rivers. The groundwater flow direction towards the end-pit lake in the vicinity of the mine pit eliminates direct flow from the mining backfill and the end-pit lake towards the MacKay River. Groundwater interception by the end-pit lake leads to 20 per cent and 60 per cent reduction of the groundwater contribution to the MacKay and Dover Rivers, respectively (in the selected reaches), after closure.

[305] For MLX east, the proposed mine will operate for 13 years. At the end of mining, the simulated 1 m of drawdown contour extends to about 3 km from the MLX east pit, bound on other sides by the existing structures (Mildred Lake Settling Basin dyke, Mildred Lake reservoir) and the Athabasca River.

[306] During production (in 2027–2035), an estimated 133 m³/d of groundwater recharge to the Athabasca River would be lost from the Quaternary sediments, and 757 m³/day of the river water will be drawn towards the pumping wells during mining. The quaternary recharge from the mine pit area will be reduced post-closure, while it will increase from the Mildred Lake Settling Basin area.

Table 2. Groundwater contribution for project phases at MLX east

MLX east flow rate (in m ³ /day)	Pre-production	End of 2035	Closure (2235)
To the Athabasca River (Quaternary) from the mine pit	130	-757	50
To the Athabasca River (Quaternary, McMurray, and BMA combined) from the mine pit	149	-948	177
To the Athabasca River from the MLSB area (Quaternary, McMurray, and BMA combined)	1636	1959	1776
To the Horseshoe Lake basin from the mine pit	71	NA	21

[307] Syncrude said that the closure simulation at a far future date (2235) will see the groundwater elevations return to close to the pre-mining conditions. Syncrude said that while the closure at MLX east is a complex process involving the backfill of the pre-existing structures (Mildred Lake Settling Basin, Mildred Lake north pit), surface contouring, and drainage network re-arrangement, the partial groundwater-level recovery will occur before 2235, within a few decades after closure.

[308] Syncrude assessed the effect of the net reduction in groundwater discharge in case of an extremely low flow event to the MacKay River. The monthly average flow of 0.016 cubic metres per second (m³/sec) is the extremely low flow, the lowest in the 45 years on record. It is comparatively close to the groundwater flow reduction at the maximum buildup of the project, at 0.011 m³/sec. Syncrude said that the flow of 0.016 m³/sec is close to no-flow in the river and practically indistinguishable from 0.005 m³/sec, the difference between the extreme low flow and the loss of groundwater contribution. The second lowest flow on record in the MacKay River is 0.069 m³/sec.

[309] Syncrude said that there is little the project could do to mitigate the extremely low flows in the MacKay River. Syncrude said that decreased groundwater flows due to the impact of the project on the typical flows observed in the river are small, quoting an estimated reduction of 0.0109 m³/sec at the mouth of the river as an example, which represents an approximately 0.1 per cent reduction. Syncrude said the project impact with respect to groundwater discharge interception does not translate into a significant reduction of the surface water level in the MacKay River when the flows are typical. Syncrude also said (basing it off the same analysis) that groundwater flow to the Dover River will not change.

[310] After closure of MLX west, the permanent reduction to the groundwater flow due to the capture by the end-pit lake will only impact the local reaches of the rivers near the pit, and the groundwater drawn to the end-pit lake will return to the MacKay River via the end-pit lake main outlet.

[311] To estimate the impacts on the loss of groundwater input to the Athabasca River, Syncrude assessed the river flow changes at the location downstream of the project, below the MacKay River. Syncrude said that the impact of the loss of groundwater input is not measurable for the Athabasca River. Syncrude said that this is due to the relatively small scale of the MLX project disturbances to the groundwater flow relative to the size of the Athabasca River's watershed.

[312] The impacts of the project on the surface water level and navigability are discussed in the Surface Water section.

Analysis and Findings

[313] The panel accepts that groundwater interception by the mine pit and depressurization of the Basal McMurray aquifer are necessary parts of the mining process, and the associated lowering of the groundwater table cannot be avoided. The groundwater monitoring program already in place for the Mildred Lake operations with amendments to accommodate the MLX east addition under the *EPEA* approval is sufficient to provide information on the changes to groundwater levels and assess the accuracy of the modelled predictions in respect to the groundwater capture and its subsequent impact on the river levels during operations.

[314] The panel notes that under *EPEA* the groundwater monitoring plan for MLX west has to be developed and submitted to the AER before the beginning of the mining and will include as standard conditions monitoring of the groundwater levels.

[315] The groundwater inputs to the Dover, MacKay, and Athabasca Rivers will be impacted by mining in the reaches close to the pit. The panel notes that when the average groundwater contribution is compared with the extreme low flows in the MacKay River measured in 2003, it is proportionally significant. However, it is expected that the groundwater flow does not remain at its average value during the years of the extremely low flow, and is also reduced. The panel also understands that the groundwater flow reduction occurs in the reaches of the rivers near the pit, and does not apply to the entire watershed. When the loss of groundwater contribution is compared to typical flow values in the MacKay River, it is not significant. The panel therefore finds that while some loss of groundwater inflow will occur during operations, it does not translate into measurable changes to the surface water levels in the rivers, but has the potential to impact the smaller surface water bodies like the fens, streams, and creeks.

Seepage Control from the In-pit and External Tailings Areas

[316] Syncrude said that the natural groundwater chemistry varies across the project areas in the shallow Quaternary sediments, with the total dissolved solids ranging from 230 to 3000 mg/L in the twelve sampled groundwater wells. The elevated concentrations in these background samples were observed for the following chemical constituents: total dissolved solids, sodium, chloride, sulphate, nitrite-N, aluminium, boron, cadmium, manganese, molybdenum, uranium, zinc, petroleum hydrocarbon

fraction F2, and phenols. Syncrude collected the samples in the areas with a minimal anthropogenic disturbance, and considers these concentrations representative of the natural heterogeneity of groundwater compositions in the shallow groundwater in the area.

[317] The groundwater in the aquifer units deeper than the Quaternary are expected to be saline in the project area and are below the base of groundwater protection.

[318] Syncrude does not anticipate changes to groundwater quality post-closure in the MLX west because the backfill material consisting of overburden and centrifuge cake will be placed in direct contact with low permeability Quaternary sediments and the unmined McMurray formation oil sands. The backfill material itself is expected to have a lower hydraulic conductivity than the Quaternary sediments it is replacing, reducing the discharge rate of groundwater. The groundwater flow in the vicinity of the end-pit lake after closure will be towards the end-pit lake, so the end-pit lake is expected to be the only surface water receptor for the groundwater that comes into contact with the backfill material. Due to the groundwater flow direction towards the end-pit lake, Syncrude believes that migration of process-impacted water to the MacKay River is unlikely. Due to the nature of the backfill, it is expected to have a neutral effect on the groundwater quality.

[319] Syncrude plans to backfill the MLX east pit and not create an end-pit lake. The backfill material consisting of coke and overburden will be placed directly on top of the conductive Quaternary sediments in the overburden disposal area and reclamation material stockpile areas. When the pit is backfilled, the backfill will come into contact with Quaternary sediments and unmined oil sands. Syncrude predicts seepage from the mine pit area to be 50 and 127 m³/day through the Quaternary and Basal Water Sands, respectively. The seepage will eventually reach the Athabasca River and Horseshoe Lake via groundwater. The rate of seepage reaching Horseshoe Lake was modelled to be 0.0002 m³/sec.

[320] The quality of groundwater that comes into contact with the backfill is expected to approximate the pre-mining groundwater quality due to the nature of the backfill.

[321] In relation to the impact on surface water quality, Syncrude said that the groundwater flow towards the Horseshoe Lake basin from the MLX east mine pit decreased from all aquifers and particularly from the Quaternary aquifer. The reduction of the groundwater flow volume results in a reduction of potential effects on surface water quality in the basin. This reduction was considered significant enough by Syncrude to not warrant additional analysis of the groundwater impact on the surface water quality in the modelling.

[322] Syncrude anticipates that as a result of MLX west and MLX east, the total volume of tailings in the Mildred Lake Settling Basin will increase from 88 to 164 Mm³ due to the proposed extended use of this facility. The Mildred Lake Settling Basin dyke is built primarily with hydraulically placed tailings, with the hydraulic conductivity value on the order of 10⁻³ to 10⁻⁴ m/s. The modelled value of seepage from

the Mildred Lake Settling Basin that enters the Beaver River channel is estimated to be 0.0012 m³/sec post closure. Suncrude said that the Mildred Lake Settling Basin is an approved tailings facility and the extended use of this facility does not require changes to the approved design and operation. Suncrude said that the current groundwater network configuration will remain in place, and will change only if there is an indication of changes to the groundwater conditions.

[323] For MLX west, Suncrude said that cake placement construction details in the mine pit could assist in determining seepage mitigation measures at closure to prevent potential seepage of the process affected groundwater to the MacKay River. The groundwater monitoring program will continue to monitor groundwater chemistry for the indications of the tailings seepage.

[324] For MLX east, Suncrude submitted that the tailings placement plan will ensure that process-affected water flows through the McMurray oil sands formation and therefore has no impact on groundwater quality. In addition, more groundwater monitoring wells will be installed between the Athabasca River and the MLX east mine and incorporated into the current Suncrude groundwater monitoring program. The mitigation of the impacts on the Athabasca River will be specific to the nature of the impact.

[325] Suncrude relies on the approved mitigation and monitoring measures currently in place for the Mildred Lake Settling Basin for the placement of tailings for the MLX expansion.

Analysis

[326] *EPEA* prohibits contaminant release in excess of what is expressly prescribed by an approval (section 108) and sets out requirements for contaminant release management (section 112). *EPEA* approvals do not have limits for releases to groundwater. Releases that result in exceedance of *Alberta Tier 1/ Tier 2 Soil and Groundwater Remediation Guidelines* (2014) must be remediated or managed according with the guidelines and *EPEA*. Alberta's policy on contaminated sites management allows a management option of exposure control, which may be accomplished through administrative restrictions (e.g., municipal bylaws or land title restrictions prohibiting groundwater use). However, regulatory closure (e.g., reclamation certificate) is not currently available for sites where contamination is managed through exposure control.

[327] *Alberta Tier 1/ Tier 2 Soil and Groundwater Remediation Guidelines* (2014), section 2.5, articulates the policy for protection of the quality of domestic use aquifers (DUA; defined in terms of hydraulic conductivity and yield): "a DUA is an important current and future groundwater resource and must be protected to the maximum extent possible." The human health groundwater ingestion pathway criteria must be met everywhere within a DUA. The groundwater ingestion guidelines cannot be modified based on site-specific conditions. Where natural concentrations of substances in groundwater exceed applicable remediation guidelines, remediation to below the background levels is not required.

[328] *LARP* includes the *Lower Athabasca Region Groundwater Management Framework* (2012). The supporting document for the North Athabasca Oil Sands area (2013) provides further direction for protection of groundwater quality in the North Athabasca Oil Sands area by defining priority aquifer management units that require protection and defining regional groundwater quality management triggers and targets.

[329] The framework is applicable in general to nonsaline groundwater in near surface sand and gravel deposits as well as to nonsaline intervals of the Basal McMurray aquifer. The framework has identified that in the Mildred Lake area the Quaternary sediments and the Birch Channel Empress aquifer have higher priority. Currently, only interim groundwater quality triggers have been identified and there are no targets; the implementation of interim triggers is not mandatory. In its current form, the framework does not provide any further restrictions or guidance for groundwater protection in the project area.

[330] The panel considers the seepage of process-affected water from external tailings areas to be the primary risk to groundwater quality during operations and post-closure. The panel recognizes that Syncrude proposes to use the existing approved external tailings area (Mildred Lake Settling Basin) for the MLX project, and that the Mildred Lake Settling Basin has monitoring and mitigation measures in place approved under *EPEA*.

[331] Seepage of process affected water from the in-pit tailings disposal areas also has the potential to adversely affect groundwater quality post-closure.

[332] The panel understands that there are uncertainties associated with the modelling and the spatial coverage of the hydrogeological dataset that was used to predict the groundwater flowrates and direction of groundwater flow, particularly in the MLX west area of the project. The panel accepts Syncrude's proposed approach to develop a site-specific groundwater monitoring program for the operations and post closure phases of the project and requires this as a condition of approval.²⁹ The panel requires the refinement of the existing groundwater models as pertinent data becomes available.³⁰

Devonian Geohazard

Evidence

[333] Syncrude said that, for the stratigraphy of the MLX west project area, the Devonian unconformity has a shallow downward slope to the north. Lower McMurray fluvial sediments infill local lows along the paleotopographic surface. Basal McMurray aquifer is thin and discontinuous. Erosion of the Devonian surface before McMurray deposition is inferred from increased thickness of the Upper McMurray members and Clearwater Formation to the north.

²⁹ *EPEA* Amendment Approval Condition – 4.6.1.1

³⁰ *EPEA* Amendment Approval Condition – 4.6.7(aa)

[334] Evidence from exploration and analysis suggest that localized areas have undergone deformation during or after McMurray deposition, due to differential dissolution of the underlying Devonian salt formation.

[335] Core drilling conducted by Syncrude commonly terminates 3 to 10 m into the Devonian formation. Devonian facies in this upper depth interval commonly consist of calcareous shale, argillaceous limestone and thin biomicrite.

[336] Drilling at the MLX west has identified no structural anomalies on the Devonian surface beyond some shallow fractures or fissures in the top of the Waterways Formation. These fractures or fissures are typically sealed by a lime-clay paleosol and are not expected to adversely affect mining operations.

[337] The paleotopographic surface underlying MLX east is relatively flat across most of the proposed pit area, but overlies a structural low at the north end. This area is expected to contain some basal water sands as part of the infilling sediments from the Lower McMurray member.

[338] Syncrude is aware of saline water upwelling through the Devonian at the Shell/Albian lease. Syncrude said that the MLX project area differs from the Albian lease as it is not situated in the fault and salt dissolution zone controlled Bitumount Basin.

[339] Syncrude further said that drilling at both the MLX west and MLX east project areas has not encountered any evidence of major faulting.

[340] Syncrude said that Devonian cap rock geology information is based on drillhole data. This information indicates consistent Devonian geology across the MLX project area, with a minimum of 137 m of cap rock (calcareous shale and argillaceous limestone) below the McMurray Formation. There is no indication of cap rock faulting that would raise concerns about cap rock integrity. Cap rock in the proposed development area is expected to prevent upward movement of water from potential water-bearing units below the pit.

[341] Devonian bedrock units underlay the MLX east and MLX west areas and include deeper saline aquifer units.

[342] Fracture permeability produced by the dissolution of the Prairie Evaporate Formation and collapse-deformation of the Devonian-age carbonate rocks beneath the northern parts of the MLX east and MLX west project development area, may result in the hydraulic connection between the deep Devonian aquifers (such as the Middle-Lower Devonian Elk Point Group) and overlaying units.

[343] In both MLX east and MLX west, if the pathway is created between the deep Devonian aquifers and the surface due to the above mechanism, the upwelling of the saline groundwater would present a potential geohazard.

[344] For the MLX east project development area, if the Upper Devonian Formation is fractured, there is a potential for seepage from the pit backfill to preferentially migrate to eventually discharge into the Athabasca River.

[345] Syncrude maintains that the major Devonian structure trending NW-SE is a broad low, resulting from a gradual dissolution of the Prairie Evaporates and continuous subsidence of the overlaying deposits, not associated with major faulting.

[346] Syncrude's position is that while the Middle-Lower Devonian Elk Point Group can be a potential source of upwelling saline water, the basal water sands are effectively isolated within the project development area.

[347] Syncrude's position is that the Upper Devonian units constitute a low-permeability aquitard based on the following lines of evidence:

- 2014 pumping test conducted in the basal water sands
- Used available sample chemistry of two Elk Point Group wells (at Aurora North Mine) to conduct major-ion/isotopic mixing analysis with basal water sands. The samples from the two wells completed in the upper Devonian units were not included in this analysis because they may not represent groundwater from the deeper Devonian units.
- Syncrude concluded from a mixing analysis using these data that Devonian water upwelling was not induced during the basal water sands pumping test
- Syncrude did not monitor water levels or sampled a well completed in the Beaver Hill Lake Group of the Upper Devonian Formation to evaluate potential for communication between the Upper Devonian and BWS, due to it being completed in the uppermost unit of the Waterways Formation which is considered an aquitard in the Karst Geohazard Protocol developed for Aurora North Mine
- Devonian groundwater was characterized by seven Upper Devonian monitoring wells within the two project development areas where the water levels were collected and four hydraulic conductivity tests. Drilling did not encounter evidence of major faulting.
- There are no monitoring wells within the proposed extent of the MLX west pit and along the major Devonian structure trending NW-SE.
- Geophysical surveys conducted by Syncrude did not target the Devonian formation and the survey methods had not enough resolution to pick out faulting in the Devonian units.

[348] Syncrude said that geological areas of interest within Devonian bedrock will be investigated as deemed necessary, integrating the learnings obtained from the current and future mining operations at Syncrude's Aurora North site.

[349] Syncrude said that any monitoring of the basal water sands undertaken during the depressurization will be for operational purposes rather than to monitor for the evidence of the hydraulic communication between various hydrostaigraphic units (such as Devonian).

[350] Syncrude said that should a release of Devonian water occur, it would be contained within the Mildred Lake wastewater management system. The emergency response plan is in place for this eventuality at the existing Mildred Lake operation and is applicable to the MLX.

Analysis and Findings

[351] The panel is aware that Shell experienced significant ingress of deep saline aquifer water into cell 2A of its Muskeg River Mine while it was conducting ore clean-up operations. The incident resulted in some ore sterilization and a loss of storage space for tailings. Consequently, Shell had to revise its mining and tailings plans to accommodate the cell 2A incident.

[352] The panel understands that Syncrude carried out some deep drilling into the Devonian units. However, the drilling information requires further validation through additional investigation using appropriate techniques such as geophysical assessment, additional targeted drilling, installation of monitoring wells, hydraulic testing, and evaluation of groundwater chemistry if permeable Devonian strata are encountered.

[353] The panel believes that mapping of the Devonian geohazard and the Devonian risk management plan should be based on a sound geological model.

[354] The panel also understands that characterization activity, when done in conjunction with resource drilling for the mine plan, would benefit both the mine plan and management of the Devonian geohazard.

[355] The panel requires that Syncrude provide a Devonian geohazard management plan, including a program to evaluate the potential for Devonian karst features and contingency measures that would be implemented in the event karst features or inflow of Devonian water is encountered.³¹

[356] The panel also requires that Syncrude develop

- a set of performance criteria for monitoring during depressurization of the basal water sands (such as pressure and salinity changes) to indicate hydraulic connection to the deep Devonian aquifers;³² and
- a set of performance criteria for the pit floor that could include indicators of stress and pore pressure, seepage quantity and seepage quality.³³

³¹ OSCA Amendment Approval Condition – 13

³² EPEA Amendment Approval Condition – 4.6.1.1(p)(iv)

³³ OSCA Amendment Approval Condition – 13

[357] Syncrude shall provide updates on the further investigation of the Devonian in the annual groundwater monitoring reports submitted under *EPEA* approval.³⁴

Effects on Fisheries and Fish Habitat

[358] The primary drivers for impacts on fish and fish habitat are the physical footprint of the project, and groundwater drawdown at MLX west which would reduce flow to watercourses downstream of the project. The main mitigation measure to address impacts on fish and fish habitat is achieved via offsetting measures in association with federal requirements under the *Fisheries Act*.

[359] Syncrude acknowledged that construction of the project will cause harm to fish, including permanent alteration and destruction of fish habitat at MLX west. These disturbances include unavoidable losses of fish habitat in the MacKay River tributaries on and adjacent to the mine site footprint. Syncrude also identified potential impacts on fish habitat at Horseshoe Lake. Syncrude concludes that, the project does not result in any alteration or destruction of fish or fish habitat at MLX east in proximity to the Athabasca River.

[360] As a result of predicted impacts on fish and fish habitat at MLX west, Syncrude applied for an authorization under section 35(2)(b) of the federal *Fisheries Act*. Syncrude made an application to Fisheries and Oceans Canada (DFO) in May 2017 that included an offsetting plan as compensation for fish habitat that will be lost as a result of the project.

MacKay River

[361] In its EIA, Syncrude distinguished fish and habitat impacts into those occurring above the MacKay River escarpment and those below the escarpment. Above the escarpment, it found that fish habitat suitability is limited by impoundments such as beaver dams and low winter dissolved oxygen concentrations. Syncrude rated the habitat as moderate-to-good for small-bodied forage fish that are tolerant of poor water quality conditions. Species found above the escarpment include brook stickleback, fathead minnow, finescale dace, lake chub, and pearl dace. Syncrude said there is no suitable habitat or, at best, poor-quality habitat for large-bodied forage fish and sport fish. It estimated the loss of fish habitat above the escarpment to be 2 286 462 m².

[362] Below the escarpment, Syncrude found fish habitat is available in four small shallow streams that flow into the MacKay and Dover Rivers. The nature of the streams limits their use by large-bodied forage and sport fish. Fish species documented using the four streams include brook stickleback, finescale dace, lake chub, and slimy sculpin. Syncrude indicated that the nature of the streams limits their use by large-bodied forage and sport fish; however, based on connectivity, fish in the MacKay and Dover Rivers are

³⁴ *EPEA* Amendment Approval Condition – 4.6.7(x)

able to access and potentially use the habitat below the escarpment. Syncrude calculated the loss of fish habitat below the escarpment to be 13 433 m².

[363] The MLX project will impact a total of 2 299 895 m² of fish habitat.

[364] Syncrude documented 24 fish species in the MacKay River watershed. These species are potentially impacted by loss of habitat in the small streams that flow to the MacKay and Dover Rivers. Syncrude says that, federally, none of the 24 species are classified as “at risk.” Provincially, two species (Arctic grayling and northern redbelly dace) are classified as “sensitive,” and one species (spoonhead sculpin) is classified as “may be at risk.”

Horseshoe Lake

[365] Fish habitat in Horseshoe Lake was found to be moderate for small-bodied forage fish and poor for large-bodied forage fish.

[366] Syncrude said there is potential for groundwater drawdown at MLX east to impact water levels in Horseshoe Lake. They committed to monitoring water levels in the lake, and if levels were to fall below levels necessary to sustain fish they would augment water in the lake. Syncrude’s final assessment of Horseshoe Lake is that with the proposed monitoring plan there will be no residential impact on fish or fish habit.

[367] Syncrude’s final closure plan for the MLX project includes an end-pit lake that would be connected to the MacKay River. Syncrude anticipated this lake would provide opportunity for sport fish species within the MacKay River after the MLX site is reclaimed sometime around 2097. The lake would increase the availability of lake habitat in the watershed by 20–25 per cent. Syncrude expects that its end-of-life closure plan will support a range of traditional land use, including fishing.

[368] Athabasca Chipewyan community traditional land use studies found that in the 1960s fishing was a widespread activity along the Athabasca and MacKay Rivers. They said that the level of fishing has declined due to fishing regulations, and a health advisory. Fishing has also declined near MLX east because of perception that oil sands development is contaminating the local waters.

[369] In its regional study area, Athabasca Chipewyan reported 14 fishing locations, although they were not identified as being current or historical. In the local study area Athabasca Chipewyan members reported fishing values for species that include pickerel and jackfish and said that these are often harvested at the confluence of the MacKay and Athabasca Rivers. Athabasca Chipewyan did not present any specific evidence of fishing, such as precise locations, within the MLX west footprint.

[370] At the commencement of the hearing, Athabasca Chipewyan Chief Allan Adam told the panel that Syncrude “won’t work with us” on fisheries or conservation offsets. Athabasca Chipewyan is a

signatory to a letter from indigenous communities to the federal Department of Fisheries and Oceans opposing the use of Owl River as a fisheries offset.

[371] Athabasca Chipewyan traditional land user James Ladouceur told the panel that Athabasca Chipewyan is not in agreement with the Owl River offset because it is a long way away from its traditional fishing areas. He said that when he goes fishing, he uses catch and release because of his reluctance to eat the fish. He also said he would not go fishing in the interceptor ditch that is proposed as an offset for loss of fish habitat because, “that’s asking me to go jump in a garbage can.”

[372] Elder Tripp de Roche explained that he used to be a commercial fisherman on Lake Athabasca. He said today he doesn’t eat fish from the Athabasca River because of his perception that oil sands companies are polluting the water and the air.

[373] Mr. C. Candler, Athabasca Chipewyan expert witness, mentioned serious interactions caused by the existing oil sands mine footprint with fishing at the mouth of the MacKay River where it joins the Athabasca River.

[374] As part of its EIA for this project, Syncrude was required to “identify plans proposed to offset any losses in the productivity of fish habitat. Indicate how environmental protection plans address applicable provincial and federal policies on fish habitat including the development of a “No Net Loss” fish habitat objective.”

[375] Syncrude’s primary mitigation for fish impacts is the proposed fish offset project at the Owl River. Secondary mitigations include the use of best management practices such as isolating in-water work areas during MLX activities, diverting and containing water that comes in contact with the mine, measures to minimize erosion and sedimentation where they could pose risk to fish habitat, and timing of works to avoid sensitive windows for fish. Other measures include design and implementation of fish rescue and relocation plans, and monitoring to ensure mitigation is effective.

Owl River Project Offsetting Plan

[376] Because the MLX project will result in the loss of fish habitat, Syncrude was required to apply to DFO under section 35(2) of the *Fisheries Act* for approval of a fish offset initiative. Syncrude has made application for approval of an initiative at the Owl River. As of the date of the hearing, Syncrude was working with DFO to finalize the initiative.

[377] The Owl River offset, if approved, would be a continuation of an existing offset initiative at Owl River. The existing initiative was previously approved by DFO for disturbance of fish habitat south of the Mildred Lake site in close proximity to the MLX project.

[378] In response to an information request from AER, Syncrude provided detailed information on its engagement efforts for the fisheries offset. Between August 2017 and January 2018 Syncrude consulted

seven First Nations and Metis communities, including Athabasca Chipewyan, for input on offsetting options.

[379] Using input received from the communities, Syncrude evaluated a range of possible locations for the program. Locations identified by the communities were Coffey Creek, Grayling Creek, the Ells River, Moose Lake, the Athabasca River at Lobstick point, the east side of Duncan Island, and Shaw Island at the mouth of the Firebag River. Syncrude concluded that none of the options suggested had the capacity to offset all MLX habitat losses. It selected Owl River as their preferred location for the offset.

[380] Suggestions from indigenous communities to locate offsets in the Athabasca River or at confluences of the river were not pursued by Syncrude as the dynamic and shifting nature of the river precludes it as an option for long-term meaningful fish habitat enhancement. DFO also raised concerns about working in rivers because they are dynamic systems.

[381] Although located 350 km from MLX, Syncrude maintained that the Owl River project has the greatest probability of success. While the project is outside of Athabasca Chipewyan's traditional territory, it is within the traditional territory of Treaty 8 and will benefit a number of sport- and forage-fish species important to indigenous communities.

[382] The Owl River is an Alberta class A watercourse and the primary spawning river for Lac La Biche walleye. Class A watercourses are designated by Alberta as critical fish habitat protection areas. Components of the Owl River initiative include land acquisition, restoration and enhancement of riparian areas along a 21 km stretch of the river, and use of riparian fencing to exclude livestock.

[383] At the hearing, Syncrude acknowledged that some indigenous communities were opposed to the offset at Owl River because of the distance from the MLX project.

[384] Syncrude said the Owl River project would be implemented before most MLX development to minimize any temporal aspects of loss and restoration of fish habitat.

Offsetting Initiative at the MLX Diversion Channel

[385] Syncrude applied to DFO on January 21, 2019, to use a water diversion channel at the MLX site for an enhanced offset. At the hearing, Ms. Shelvey confirmed that DFO had asked Syncrude for a more local offset.

[386] Syncrude recognized that indigenous communities prefer offsets to occur in closer proximity to MLX and preferably at an area used by their members. The new initiative proposed by Syncrude would use an interceptor ditch at MLX to provide additional fish habitat to compensate for loss of habitat in the local area.

[387] The diversion channel would intercept all clean water in the MLX west footprint and divert the water to the MacKay River and surrounding watershed. Syncrude will construct the channel and said it would add 63 000 equivalent fish habitat units at MLX west. The Owl River project would continue to provide the primary offset, with the diversion channel providing a supplemental offset. The diversion channel would also become part of the closure landscape and presumably be available to local and indigenous fishers at closure.

Calculating Offsets

[388] To satisfy the DFO requirement for calculating offsets the impact in square metres is converted to habitat units (HU). The habitat units are reflective of the quality of the habitat impacted for the species present. The determination of habitat quality was based on the watercourse and waterbody characteristics, and the data collected during the MLX field programs. The table below shows the estimated offset requirement and the breakdown on how it was derived.

Estimated MLX Offset Requirements

MLX impact type	Area (m ²)	Habitat quality (HU/m ²)	Habitat units affected	Proposed offset ratio	Estimated offset requirement (HU)
Direct above escarpment	1 427 885	2.75	3 926 683	1:1	3 926 683
Direct below escarpment	1 500	15.7	23 550	2:1	47 100
Drawdown above escarpment	858 577	2.75	2 361 087	1:1	2 361 087
Drawdown below escarpment	10 649	15.7	167 191	2:1	334 382
Flow reduction	1 284	15.7	20 154	2:1	40 308
Total	2 299 895		6 498 665		6 709 560

[389] The largest habitat loss occurs above the MacKay River escarpment. Syncrude estimated a total of 6 287 700 habitat units would be required to offset all fish-related impacts at MLX, above the escarpment. The Owl River offset when fully implemented is expected to accommodate the entire offset.

[390] Below the escarpment, the habitat is of higher value and using an offset ratio of 2:1, Syncrude calculated that 421 790 habitat offsetting units would be required. The proposed diversion channel offset will provide 63 000 habitat units.

Analysis and Findings

[391] The MLX project does not result in any impact on fish habitat at MLX east. As a result, there will be little to no change on fish or fish habitat in the Athabasca River.

[392] The main impact on fish and fish habitat will occur above the MacKay River escarpment where Syncrude has indicated that there is no suitable habitat or, at the very best, poor quality habitat for large-bodied forage fish and sport fish. As said by Syncrude, the habitat below the escarpment may be used by

fish species in the MacKay River and possibly Dover River. This has the potential to provide direct value to traditional communities from a fishing perspective.

[393] The Owl River project has been identified as being able to offset for impacts on fish and fish habitat associated with MLX. Based on input from local indigenous communities, Syncrude is seeking additional approval from DFO for a complementary local offsetting measure. Syncrude has proposed designing a diversion channel with curves and vegetation that will support 63 000 fish habitat units in the local area.

[394] Separately, Alberta has established management objectives for fisheries. One such objective is the development of a strong and prosperous fishery for all Albertans. Provincial management objectives focus on improving fish stocks and habitat to increase production of sport fish species which results in increased/enhanced fisheries for resource users. Syncrude indicated that the key fisheries management objective, used to assess potential offsetting measures was to rehabilitate habitat used by freshwater fish to enhance recreational or Indigenous fisheries and this is consistent with Provincial management objectives.

[395] The panel accepts Syncrude's evidence that there is no offsetting option in closer proximity to MLX that would satisfy the magnitude of the offset required. Potential locations suggested by indigenous communities did not have capacity to support the 6 709 560 units needed to offset all losses at MLX. When considering Syncrude's proposal to develop the diversion channel, the panel finds this does not fully offset the impacts below the escarpment. The diversion channel at MLX will provide 63 000 local offsetting units, creating a shortfall in the local area of roughly 350 000 units.

[396] The panel is aware that the DFO requirement for the development of a fisheries offset plan is accepted by Alberta as the primary mitigation for large-scale impacts on fish and fish habitat in the oil sands region. Although the panel has no authority to approve the offsetting plan, the plan provides most of the mitigation for MLX impacts on fish and fish habitat.

[397] Alberta's acknowledgement of and reliance on the federal process for mitigating impacts on fish habitat for projects of this scale supports the need for Syncrude to provide to the AER all monitoring reports associated with the offsetting plan. Therefore, Syncrude is required to provide to the AER all monitoring reports and results of the Owl River offset project and of any other offset projects established to mitigate impacts of MLX on fish and fish habitat.³⁵

[398] The Owl River offset will benefit provincial fisheries by restoring habitat in a Class A watercourse, thus helping to meet DFO and Alberta fisheries objectives. The proposed diversion channel (interceptor ditch), when modified, will not fully compensate for loss of fish habitat below the escarpment in the MacKay River watershed.

³⁵ EPEA Amendment Approval Condition – 6.1.87.18

[399] The panel believes it is possible for Syncrude to find an offsetting location somewhere in the MacKay River watershed with the capacity to support the 350 000 units needed to offset loss of fish habitat below the MacKay River escarpment. We note that at the hearing, Ms. Shelvey said Syncrude is “open to continuing engagement and consultation with local First Nations and Metis, and information that Athabasca Chipewyan could provide in that regard would definitely be considered for future applications of fisheries offsets as required.”

[400] The panel recommends that Syncrude provide an additional local offset to satisfy the offsetting requirements for all of the impacts below the escarpment. This offset would mitigate impacts on fish habitat that might be used by species in the MacKay and Dover Rivers, including those that are traditionally fished.

[401] The panel recommends that Syncrude work with DFO to investigate options for the additional local offset enhancement either at (1) the proposed diversion channel (interceptor ditch) or (2) at an area in the MacKay River watershed, to be selected based on input received from Athabasca Chipewyan.

[402] The panel considers the Owl River offset, the MLX diversion-channel offset, and the additional local offset recommended above to be appropriate mitigations for fish and fish habitat loss resulting from MLX. The panel recognizes that offsetting plans are subject to DFO approval.

[403] As for impacts on Athabasca Chipewyan’s traditional right to fish, very little evidence was provided to demonstrate that the waterways near MLX east were used specifically for fishing. The panel accepts that since this area is already disturbed by Syncrude operations, indigenous fishers are inclined to avoid the area for fishing.

[404] The area that will be disturbed at MLX west is currently intact. The panel finds there is historical use of the area by indigenous communities for fishing. However, no evidence was presented that Athabasca Chipewyan currently use the MacKay River or its tributaries in proximity to MLX west to fish. The panel finds that impacts on fish and fish habitat associated with the MacKay River watershed can be appropriately mitigated by the Owl River offset, by the proposal to use the drainage channel, and by the panel’s recommendation that Syncrude work with DFO and Athabasca Chipewyan to create an additional offset enhancement in the MacKay River watershed.

Wildlife

[405] Syncrude assessed the impacts of the MLX project on wildlife and concluded that activities associated with construction, operation, and reclamation of the project will affect wildlife and wildlife habitat. It said any impacts on wildlife would be adequately mitigated through land reclamation and conservation offsets. Athabasca Chipewyan disagreed with the results of the assessment, primarily with

- the significance of land disturbance,

- impacts on caribou and caribou habitat,
- impacts on moose and moose habitat, and
- impacts on wildlife as a result of the MacKay River bridge crossing.

[406] Athabasca Chipewyan also said that impacts on wildlife will affect their traditional use activities. We have considered impacts on Athabasca Chipewyan's traditional use activities, such as hunting and harvesting, in the Treaty Rights, Traditional Land Use Activities, and Culture section of the decision.

Land Disturbance

[407] Syncrude calculated the amount of land disturbed in the baseline, application, and planned development cases. In the baseline case, the land base within the MLX west area is relatively intact while a large portion at MLX east is disturbed. The project will directly disturb a total of 6732 ha of land. Of this amount 1049 ha (i.e., 15 per cent) is already disturbed—165 ha in MLX west and 748 ha in MLX east.

[408] Syncrude used ecological and hydrological boundaries to define an area of 11,443 km² around the MLX location as its regional assessment area, and the project footprint plus a 1 km buffer as its local assessment area. Syncrude said that in the baseline case, it found 82 per cent of the land in the regional study area is undisturbed. Comparing the amount of land disturbance to the amount of land in Athabasca Chipewyan's traditional territory, Syncrude's analysis is that 2.2 per cent of the traditional land base is already disturbed. In the planned development scenario, land disturbance in Athabasca Chipewyan's traditional territory would increase by 0.7 per cent, to 2.9 per cent. The contribution of the MLX project to this 2.9 per cent total regional disturbance is 3.5 per cent.

[409] In its closing argument, Syncrude emphasized that the land disturbed at MLX is in an area designated under *LARP* as an intensive zone for oil sands development. Oil and gas is identified as a primary use in the area.

[410] Athabasca Chipewyan disagreed with Syncrude's assessment of the significance of land disturbance. It said that the regional study area as defined in Syncrude's assessment is already heavily disturbed and at risk of ecosystem shift as a result of ongoing habitat loss and fragmentation. To calculate land disturbance in the regional study area, Athabasca Chipewyan used a "zone of influence"—the footprint of a disturbance plus a 250 m buffer around the disturbance—that reflects their understanding that wildlife will avoid a 250 m area around industrial facilities, in effect reducing the amount of productive habitat.

[411] Using the zone-of-influence approach, Athabasca Chipewyan found that land disturbance in the regional study area changed from 53 per cent in 2007 to 65 per cent in 2016. Its expert, Ms. Stewart,

forecast that at this rate of development there would be no land farther than 250 m from an industrial feature in the Syncrude regional study area by 2039.

[412] Athabasca Chipewyan also said that in 2014 the “mean patch size” of a piece of undisturbed land in the region was 0.14 km² but two years later had dropped to 0.11 km². Athabasca Chipewyan said the number of patches and their reduced size is evidence that the landscape in the regional study area is highly fragmented and tied to ecosystem shift.

[413] Syncrude and Athabasca Chipewyan agreed that buffer zones (i.e., areas of undisturbed land) around facilities are a potential mitigation to avoid impacts on wildlife, especially moose. They disagreed with each other on the appropriate size of a buffer zone. Mr. Hartman, Syncrude’s expert, confirmed that zones of influence were considered in Syncrude’s habitat assessment for various wildlife species. Athabasca Chipewyan said zones of influence can range from 100 m to 500 m and beyond depending on the species.

Analysis and Findings

[414] The parties looked at land disturbance through different lenses. Syncrude compared the amount of land disturbed by the project (6732 ha) with the total land available to Athabasca Chipewyan for traditional use (more than 6 million ha) and concluded that a further 0.1 per cent of land would be disturbed within Athabasca Chipewyan traditional territory.

[415] Athabasca Chipewyan used a 250 m zone of influence around all disturbances to assess potential impacts to wildlife habitat as a result of the MLX project. They concluded that by 2039 all of the land in the Syncrude regional study area will be disturbed, thus eliminating wildlife habitat and negatively impacting their practice of traditional resource use in the regional study area.

[416] The panel finds both assessments have strengths and weaknesses, and that the true impact is likely somewhere between the two. Syncrude’s assessment does not fully account for zones of influence or for higher priority habitat areas as viewed by Athabasca Chipewyan, and assumes all areas of Athabasca Chipewyan’s traditional territory are of equal importance. Syncrude focused on the small incremental increase in land disturbance at the regional scale to conclude that land disturbance would be low.

[417] Athabasca Chipewyan’s assessment focussed on land disturbance within a smaller radius closer to MLX and as a result found the amount of disturbance to be high. Athabasca Chipewyan’s land disturbance assessment accounts for zones of influence, but takes an overly conservative approach, assuming that all disturbance types have an equal impact. Its assessment did not account for the eventual removal of disturbances on the landscape through reclamation.

[418] Depending on the measurement used, land disturbance as a result of MLX is either minimal or significant. The question the panel must answer is whether the disturbance, on its own or in combination with existing, approved, and planned activities, has the potential to adversely impact wildlife and wildlife habitat availability.

Wildlife Assessment

[419] As part of its EIA, Syncrude carried out a comprehensive terrestrial resources assessment of two geographic areas: the terrestrial local study area and the terrestrial regional study area. Impact on wildlife was one element of the assessment.

[420] Syncrude identified 10 individual species and two species communities as valued ecosystem components for detailed effects assessments. The valued ecosystem components were selected based on Syncrude's knowledge of species of concern, on assessments done for other oil sands applications, and on traditional use species identified through consultations with indigenous communities. Syncrude did less detailed assessments of other species that might be in the terrestrial local study area.

[421] Athabasca Chipewyan questioned the adequacy of Syncrude's terrestrial regional study area, saying it included too large an area and thus underrepresented the magnitude of impacts on wildlife. They said that in addition to habitat disturbance, sensory disturbances such as noise, light, air emissions, and linear features such as roads, utility corridors and seismic lines, all impact wildlife at the local level. Athabasca Chipewyan's primary focus was on impacts on caribou and moose habitat. They also raised concerns about impacts on wildlife movement through river corridors near the MLX project. The panel has addressed adequacy of river corridors in its discussion of potential impacts of the project on Athabasca Chipewyan's treaty rights.

[422] With the exception of caribou and moose, the panel did not have concerns about Syncrude's assessment of wildlife. We found the results of those assessments to be acceptable. Because Athabasca Chipewyan raised numerous concerns about moose and caribou, we turned our attention to those.

Caribou

[423] The Syncrude terrestrial local study area does not overlap with any designated caribou ranges, but the regional study area overlaps with a part of both the West Side Athabasca River and the Red Earth caribou ranges. The caribou herd closest to the MLX project is the West Side Athabasca River herd. The range for this herd is about 15 km west of the MLX project.

[424] Syncrude did not assess caribou as a valued ecosystem component because of the location of the ranges in relation to the MLX project. As a result, Syncrude's assessment of impacts on caribou is less detailed than that required for a valued ecosystem component.

[425] Syncrude acknowledged that caribou make exploratory movements outside of range boundaries. However, they found no evidence of caribou activity within the project boundary, and caribou were not detected by any of the field surveys conducted for the project. Over three years, Syncrude conducted various field surveys and found no caribou tracks or pellets and no incidental observations. It found no large contiguous tracks of lichen-rich mature and old-growth coniferous forest in the terrestrial local study area in proportions needed to be considered suitable habitat for caribou. Syncrude also searched records on AEP's Fisheries and Wildlife Management Information System and found no records of caribou in the terrestrial local study area.

[426] Syncrude included caribou telemetry data collected by Alberta in its assessment. It also used data from reports prepared by the Alberta Biodiversity Monitoring Institute on movement of caribou in various caribou ranges. None of this data showed caribou within or near the MLX project area. In its reply submissions, Syncrude said the only historical record of a caribou occurrence within the terrestrial regional study area is a single detection of a caribou track at an Alberta Biodiversity Monitoring Institute station in 2012 at an unspecified location southwest of MLX west.

[427] Syncrude's assessment is that overall impact on caribou is low because the MLX project is not within a caribou range. They concluded that impacts on caribou habitat would be low in magnitude and long-term in duration because of the long time frame for reclamation of the project area.

[428] Athabasca Chipewyan are traditionally known as Etthen Eldeli Dene, meaning "caribou eaters because the livelihood and culture of their ancestors revolved around hunting caribou."

[429] Athabasca Chipewyan maintained that their traditional knowledge of caribou is some of the "best existing data." They said Syncrude did not consult them or consider their data in preparing the wildlife impact assessment. They claimed that failure to use their traditional knowledge renders the EIA deficient, and does not adequately inform the panel of the impacts and benefits of the project.

[430] Athabasca Chipewyan's assessment, found in its traditional knowledge and use study, is that the entire project area, and especially the area that will be mined for MLX west, is exceptional woodland caribou habitat.

[431] Athabasca Chipewyan's wildlife expert, Ms. Stewart, said that provincial caribou ranges are not reflective of the actual habitat needs of caribou. She pointed to provincial telemetry data to show that individual caribou move outside of designated herd boundaries.

[432] Dr. Candler, Athabasca Chipewyan's expert on impacts on Athabasca Chipewyan land use and cultural practices, said the following studies are relevant and were available to Syncrude:

- *As Long as the Rivers Flow* (Candler et al. 2010)

- Nih boghodi: We are the steward of our land (Athabasca Chipewyan caribou stewardship strategy) (Marcel et al 2012)
- Athabasca Chipewyan Knowledge and Use study for Syncrude Canada Ltd.'s Proposed MLX Project (Candler et al, 2016)
- Athabasca Chipewyan Knowledge and Use Study prepared for AER MLX Hearing, report submitted January 2017 (Candler et al)

[433] Dr. Candler said that caribou values in the local study area are current and that critical caribou movement corridors are west of the MLX project. He also said that because caribou, and Athabasca Chipewyan practices related to caribou, were not properly considered in Syncrude's EIA, one has to make assumptions about what the impacts will be.

[434] The *Effects on Traditional Resources of the Athabasca Chipewyan First Nation* study (Management and Solutions in Environmental Science [MSES] December 2018) says that "ACFN knowledge holders have noted that the historic range of the West Side Athabasca River herd extended to the MacKay River. With respect to current movements of caribou ACFN knowledge holders have tracked caribou outside of their designated range - in the MacKay River valley within the last 10 years, within the proposed TLSA (Syncrude 2018), and provincial telemetry data shows individual movements occurring both inside and out of designated herd boundaries."

[435] Dr. Candler said adverse impacts on caribou as a result of the MLX project include habitat destruction, reduced range, noise and sensory disturbance, contaminants in water, soil and air, increase in the number of roads, non-indigenous access to sensitive habitat areas, and cumulative effects, all of which affect the likelihood of caribou returning.

[436] Elder L. Laviolette said Athabasca Chipewyan land users know that caribou use the MLX project area and are certain the project will negatively affect this endangered population.

[437] Mr. J. Ladouceur told the panel he sees caribou tracks at MLX east but does not hunt them because they're woodland caribou. Elder Trippe de Roche said he has seen caribou tracks in the MLX west area but hasn't seen the actual animals there.

[438] Athabasca Chipewyan asked Syncrude to undertake several mitigations in collaboration with Athabasca Chipewyan to address impacts on caribou. These are summarized as follows:

- Syncrude should complete additional targeted baseline ecological and indigenous knowledge work on historical and current caribou range in the area of the project.
- Syncrude should develop caribou mitigation and conservation offsetting strategies to result in a no-net-loss impact on caribou habitat and on Athabasca Chipewyan members' ability to carry on cultural practices and land uses related to caribou in the area.

[439] Athabasca Chipewyan also recommended that Syncrude work with them and other indigenous communities to develop caribou range plans. Ms. Flynn, chair of Syncrude's witness panel, said that establishment of caribou ranges is the responsibility of Alberta, and Syncrude would look to government to consult indigenous groups for their perspectives and input on caribou range plans.

Analysis and Findings

[440] The parties agree that at one time the MLX project area provided caribou habitat and that caribou were harvested in the area. The matter in dispute between them is whether caribou currently use the area, and if so, whether the project affects caribou.

[441] Syncrude's conclusion that impacts on caribou and caribou habitat would be low and confined locally is somewhat incomplete because of the lack of consideration in its assessment of information from Athabasca Chipewyan knowledge holders. Given the cultural and ecological significance of caribou to Athabasca Chipewyan, it would have been helpful if caribou had been selected as a valued ecosystem component for a detailed assessment. Inclusion of traditional knowledge and a valued ecosystem component assessment might have provided a more complete assessment, which in turn might have helped inform potential mitigations or monitoring.

[442] The panel has regard for Athabasca Chipewyan's evidence that not all caribou are collared which means some caribou are not accounted for in provincial studies. We also note that Athabasca Chipewyan does not agree with the provincially designated caribou ranges. The designation of caribou ranges is outside of the panel's jurisdiction and must be addressed with Alberta Environment and Parks (AEP) and Environment and Climate Change Canada.

[443] We find there is some incidental use of the project area by caribou as indicated by Athabasca Chipewyan elders. We find the evidence presented by Syncrude, including its field investigations and search of provincial databases, to be comprehensive. We accept that Syncrude was unable to detect any signs of caribou in the terrestrial local study area and agree with their assessment that MLX project effects on caribou would be low because the number of observations is low.

Moose

[444] Syncrude identified moose as a valued ecological component and thus conducted a detailed assessment to identify potential impacts on moose and moose habitat. In the baseline case, it found presence of moose in both MLX east and MLX west. It said the corridor adjacent to MLX west is important movement corridors for moose, and also noted higher use and movement through the riparian area. It also said, "the data suggests the MacKay River valley functions as a moose winter movement corridor and as important local winter habitat, with moose accessing preferred habitat on the upland portion (above the escarpment) of the MLX west Terrestrial Local Study Area from the adjacent riparian corridor."

[445] Syncrude's evidence is that 2,559.2 ha consisting of a mix of good and high-quality moose habitat will be disturbed within the project footprint. This amount represents 18.6% per cent of available moose habitat within MLX west terrestrial local study area, 0.7 per cent of available moose habitat within MLX east terrestrial local study area, and 0.5 per cent of available moose habitat in the terrestrial regional study area.

[446] In its initial application, Syncrude said moose populations in the area are declining. In subsequent submissions, they provided data for 2016 and 2017 that show increases in moose populations for wildlife management units 530 and 531, which overlap the project area. They said this information did not change the results of its assessment.

[447] Syncrude said that MLX will impact habitat within the project footprint but is not expected to result in moose mortality. They said that moose are expected to use habitat adjacent to the project, and would continue to be available regionally, including in Athabasca Chipewyan's traditional territory.

[448] Syncrude submitted that its reclamation plan and conservation offsets provide sufficient mitigation for the loss of moose habitat. It stated that reclamation activities will result in "high and good quality moose habitat" and "with mitigation and reclamation the final effect is high positive."

[449] Syncrude acknowledged that the time frame for closure and reclamation of the site is long. They are carrying out research on reclamation activities and said they are confident it will lead to restoration of habitat that will be a net positive in the final closure scenario. It is their opinion that the reclaimed landscape will include more moose habitat than currently exists in the MLX project area. At the same time, Syncrude said that "the lack of knowledge and research on the effectiveness of reclamation for wildlife habitat" results in poor confidence in the results of its impact assessment.

[450] In closing argument, Syncrude said, "there is no information before you to suggest the moose population will be adversely impacted." They said the only evidence presented by Athabasca Chipewyan is in regard to moose populations in the region and is not specific to the MLX project. Syncrude also claimed that regional trends in moose populations are not relevant to the panel's consideration of the MLX project.

[451] Athabasca Chipewyan's evidence is that moose populations have been declining since 1970 and the project will further exacerbate impacts on moose. They claimed that habitat loss, linear disturbances and fragmentation of land in the oil sands region have negatively impacted moose populations, and that more moose are killed closer to mines. Ms. Stewart, Athabasca Chipewyan's wildlife expert, said her research shows that moose populations in Wildlife Management Unit 532, which overlaps the MLX project footprint, are declining.

[452] Athabasca Chipewyan's community witnesses said that their land users "live off moose meat." They told the panel that they hunt moose in the MLX west area and along the MacKay River, and said the

MacKay River area in particular is good quality habitat for moose. They've also seen and tracked moose at MLX east. Traditional land user, Mr. Ladouceur told the panel that linear features and disturbed areas associated with oil sands development have allowed wolves to become very efficient at killing moose.

[453] Athabasca Chipewyan asked that Syncrude be required to do rigorous monitoring of moose in order to assess abundance and mortality, and that this monitoring should occur outside of the project fenceline. They also said that Syncrude should restore linear features within the terrestrial local and regional study areas in order to reduce wolf predation, and should complement linear restoration with actions to improve or reverse habitat degradation.

[454] Ms. Tssessaze, Athabasca Chipewyan community member, said despite Syncrude's acknowledgement that moose will be highly impacted they refused to work with Athabasca Chipewyan to develop mitigation or conservation offsetting strategies. She found this to be disappointing and disrespectful, and not acceptable to the community. She said her community is aware that Syncrude is conducting research on the effectiveness of various reclamation activities for wildlife habitat however their confidence in this assessment is poor.

Analysis

[455] Syncrude maintained there is no evidence before us that the moose population will be impacted as a result of the MLX project. We agree with Syncrude that when assessing impacts at a population scale, there is unlikely to be a significant impact on moose populations within Athabasca Chipewyan's traditional territory. That does not mean there will be no impacts on good quality moose habitat in an area that is shown to have ecological and traditional use value for Athabasca Chipewyan members.

[456] Moose are an important species for Athabasca Chipewyan. Syncrude's evidence supports Athabasca Chipewyan's assertion that the area at MLX west is good to high quality habitat and also an important corridor for moose movement. During construction and operation of the MLX project, there will be an impact on moose, in the area of MLX west above the escarpment and along the river corridor. These impacts will be continuous over the life of the project. We accept that the moose population at MLX west will be displaced, although moose may continue to use the MacKay River valley below the escarpment as a movement corridor.

[457] There is also potential for increased moose mortality as a result of increased vehicles and increased exposure to hunting and poaching as a result of roads and other linear disturbances at MLX west.

[458] The question the panel must answer is whether the mitigations proposed by Syncrude are sufficient to mitigate loss of habitat and impact on moose. Syncrude offered two types of mitigations to address impacts on moose: conservation offsets and reclamation of the MLX project area.

Conservation Offsets

[459] Syncrude provided evidence of its role in creating the Birch River Wildland Provincial Park (Birch River Park), a conservation area of 3300 km² in northeast Alberta. The park provides habitat for 68 species of conservation concern and three species at risk—the wood bison, woodland caribou, and the peregrine falcon. The park connects with five other provincial parks that either connect with or buffer Wood Buffalo National Park. Combined, the parks will form the largest protected area of boreal forest in the world, an area of 67 000 km². The park is about 80 km northwest of the MLX project and is partially within the traditional territories of Athabasca Chipewyan, the Fort McKay FN, and the Mikisew.

[460] Syncrude contributed \$2.3 million to the Nature Conservancy of Canada to purchase a timber quota from the Tallcree First Nation, in effect cancelling the timber licence and freeing up 217 ha of land that would otherwise be harvested annually.

[461] In recognition of Syncrude's contribution, Alberta granted Syncrude a quantity of conservation offset credits. Syncrude provided a letter from the minister of Alberta Environment and Parks, dated March 28, 2018, describing the use of the credits:

Syncrude is anticipated to undertake activities that would impact biodiversity and habitat. Syncrude is expected to fulfill its reclamation obligations associated with those impacts. Syncrude also wishes to address the impacts caused by activities - loss of biodiversity and habitat - by undertaking conservation action until such time as reclamation occurs.

[462] In the letter, it is explained that the credits can be used in a regulatory process to offset habitat impacts of industrial activities planned by Syncrude and are applicable for use in the Boreal Forest Natural Region. The offsetting activities must provide net positive improvement, that is, the ecological value of offsetting activities must be greater than ecological loss due to impact.

[463] The credits were calculated by multiplying the 217 ha of timber not harvested annually by 20 years to come up with a total of 4340 credits. The credits available for offsetting activities are as follows:

- 2018 to 2037: 4340 ha
- 2038 to 2057: 8680 ha
- 2058 to 2077: 8680 ha
- 2078 to 2090: 7168 ha

[464] Syncrude proposed the offset credits as a voluntary initiative on its part as mitigation for land disturbance associated with the MLX project. In response to an information request from the AER about what component of the MLX project or amount of impact would be offset, Syncrude said the offset is “a voluntary offset to MLX project effects related to land disturbance, including wildlife, vegetation, soils, land use, and traditional land use.” It did not provide a number for the amount of land or habitat disturbance that might be offset.

[465] Syncrude also acknowledged that the offsetting initiative does not relieve it of its “responsibilities regarding reclamation of disturbed land...[and] is in addition to all other legislated reclamation accountabilities, and as a result, will have a net positive land impact in Alberta.”

[466] In its reply evidence, Syncrude responded to proposals from Athabasca Chipewyan that Syncrude should be required to establish conservation offsetting strategies specific to impacts on moose and caribou. Athabasca Chipewyan said the strategies should result in no-net-loss impact on caribou and moose and on the ability of Athabasca Chipewyan members to carry on cultural practices and land uses in the area.

[467] Syncrude rejected Athabasca Chipewyan’s proposals. It said the Birch River conservation project contributed 333 000 ha of caribou and moose habitat and was adequate to offset impacts of the MLX project. It also pointed out that Birch River Park is within Athabasca Chipewyan’s traditional territory and is available to its members for hunting and related activities.

[468] In the hearing, Syncrude suggested that the credits could mitigate for some effects that would be “in the negative direction” at closure of the MLX project. Ms. Flynn also suggested to the panel that the credits be applied to new MLX project disturbance, which she estimated to be around 5700 ha.

[469] In response to a question from Athabasca Chipewyan counsel about use of the offsets, Ms. Flynn explained that Syncrude used the calculation methodology in the letter from Alberta to apply the offset. Applied to the MLX project, the credits would result in a surplus of offset hectares because the number of offsetting activities (8680 ha) is greater than the MLX project footprint of 6900 ha.

[470] Athabasca Chipewyan had several concerns about the use of the Birch River credits as compensation for impacts associated with the MLX project. One concern is that Syncrude did not consult them about its intent to use the offset for the MLX project. Another concern had to do with how Syncrude compared conservation of the land at Birch River Park with land disturbed for the MLX project. Syncrude said it did not do a study to compare the two, but noted that “both are within the boreal forest of northern Alberta and are very close to one another.”

[471] In response to a question from the panel about appropriate use of offsets, Dr. Candler answered that offsets should occur within a culturally and ecologically similar habitat. He said, “there are many, many places within 2 km of the Athabasca River that are currently disturbed... and not culturally functional.” He said, “the first place that you look for offsets is making sure those places that are disturbed are culturally and ecologically restored. As that restoration happens, you can basically offset new disturbances.”

Analysis and Findings

[472] There is some agreement between Athabasca Chipewyan and Sincruide that conservation offsets can compensate for habitat loss, although they have very different views on appropriate locations for offsetting activities.

[473] The use of conservation offsets to compensate for temporal and residual effects (i.e., effects that cannot be mitigated and are inevitable) is growing in Alberta. The panel is aware that *LARP* references conservation offsets as an instrument for achieving desirable landscapes and biodiversity targets. The panel was told of a draft Conservation Offset Policy Framework developed by Alberta, although that document is not in evidence before us. As of the date of the hearing, there is no published policy or regulations to guide us in our use of offsets. What we do have is the letter from AEP providing direction to Sincruide on how the conservation offset credits can be used.

[474] The MLX project will disturb 5700 ha of wildlife habitat and vegetation communities that won't be replaced for 100 or more years. AEP calculated the amount of offset credits available to Sincruide as 4340 for an initial 20 years, 8680 for the next 40 years, and 7161 for the period 2078 to 2090. The credits, or offsetting activities, retire in 2128. Sincruide estimated that all Mildred Lake sites, including MLX east and MLX west, will be reclamation certified by 2130.

[475] We recognize Sincruide's leadership in the use of conservation offsets and agree with them that offsets can add great value to the oil sands region as conservation initiatives. The use of the credits is voluntary, and we applaud Sincruide for its contribution because it sets a precedent for broader use of this type of initiative. We also expect this initiative will result in valuable knowledge that we encourage Sincruide to share with its industry colleagues, *LARP* stakeholders, and government.

[476] Given that the draft policy framework is not available to this panel, we have taken our direction from the guidance provided in the letter from Alberta to Sincruide. To ensure that the Birch River offset credits meet the Alberta requirement of net-positive improvement, we applied the 8680 offset credits as mitigation for temporal loss of biodiversity and habitat resulting from the MLX project. Because the offset credits expire before the MLX project will be fully reclaimed, the credits cannot be applied to offset residual impacts. The panel accepts that the 8680 offset credits are now allocated to offset habitat and ecosystem impacts associated with the MLX project, and directs Sincruide to notify Alberta Environment and Parks that the 8680 offset credits have been used in this regulatory process.

[477] The panel's consideration of offsets to mitigate impacts on traditional land use, and of their cultural appropriateness, is addressed in the Treaty Rights and Traditional Land Use section of this document.

Reclamation

[478] The panel considered whether Syncrude's proposed reclamation activities would effectively restore habitat use for the MLX project area in the final landscape.

[479] Reclamation for the MLX project will start when the mine pits stop producing ore and will continue through to the complete closure of the site, which is scheduled to happen in 2130. Ms. Flynn said that Syncrude's reclamation and closure strategy, combined with mitigations outlined in its application, are sufficient to address the impacts of the mine.

[480] Ms. Stewart, Athabasca Chipewyan's wildlife specialist, testified that there is little scientifically rigorous assessment of whether reclamation re-establishes wildlife populations. Syncrude acknowledged that "due to the reclamation time frame...and the lack of knowledge and research on the effectiveness of reclamation for wildlife habitat," their confidence in the assessment is low.

[481] In response to information requests from the AER, Syncrude said more than 2000 ha of good- and high-quality moose habitat are anticipated to be gained through reclamation. This would constitute a nearly 50 per cent increase in habitat compared to baseline conditions and "includes a no-net loss scenario for moose."

[482] Syncrude provided evidence about the reclamation engagement focus group, which was formed in 2017. The group is composed of individuals from indigenous communities, and its role is to enhance Syncrude's consideration and inclusion of traditional knowledge in the reclamation and closure design for the MLX project. Syncrude said the terms of reference for the reclamation engagement focus group contains a requirement for Syncrude to report back annually to the participating communities. Syncrude said Athabasca Chipewyan had been invited to participate in the reclamation engagement focus group but did not become a member.

[483] Syncrude offered to provide information on its use of traditional ecological knowledge in its reclamation plans to Athabasca Chipewyan. When questioned at the hearing, Syncrude did not support an approval condition that would require involving Athabasca Chipewyan in the reclamation engagement focus group. It also did not support a condition that would require it to report to the AER on its reclamation engagement focus group efforts.

[484] The panel asked Athabasca Chipewyan to comment on an approval condition that would require Syncrude to report back to the AER on its consultation with Athabasca Chipewyan and on how Syncrude used Athabasca Chipewyan's input to inform its reclamation plans. Ms. Tsessaze responded that Athabasca Chipewyan would encourage that type of condition for all of their concerns, and that it is important for Athabasca Chipewyan to know how its input is being used in reclamation planning.

Analysis and Findings

[485] There is uncertainty about whether Syncrude's reclamation and closure activities will create a viable ecosystem capable of sustaining wildlife. There is a high degree of uncertainty about the potential for the closure landscape to support caribou, given the nature of the habitat they require. There is potential for the closure landscape to support moose habitat, but we do not know to what extent. Syncrude itself pointed to a lack of confidence in whether its reclamation activities will support wildlife habitat. Many details of the final reclamation plan are unknown, other than the broad requirement to return the land to a terrestrial ecosystem.

[486] The biggest and most significant impact on wildlife and wildlife habitat is the temporal nature of the project; the MLX site will not be certified as reclaimed until 2130. This is a 100-year period where the land is not available for wildlife use or wildlife habitat. Based on the evidence presented, it is clear that impacts happen quickly whereas reclamation occurs very slowly.

[487] On the issue of reclamation as mitigation for impacts of the MLX project, there are uncertainties about whether the reclaimed landscape can achieve an equivalent level of biodiversity, what species it will support after reclamation, and the time frame over which this could be accomplished. We find that the timeline for reclamation, knowledge gaps around the effectiveness of reclamation to support diverse wildlife habitat, and lack of information about the final reclamation and closure plan, combine to present serious challenges to Syncrude's goal of using reclamation as mitigation for land and wildlife disturbance.

MacKay River Bridge – Impacts on Wildlife

[488] Syncrude plans to construct a road and a bridge across the MacKay River to provide access to the area to be mined for MLX west. The road and bridge would be used by heavy haulers and other equipment needed to excavate the west mine pit and to haul ore back to Mildred Lake for processing. Associated with the crossing will be water management infrastructure including drainage and ponds.

[489] Syncrude said the MacKay River Bridge is designed to not have any piers going into the river channel, to minimize impacts on fish and wildlife habitat. In response to questioning from the AER, Syncrude referred to bridge openness ratio calculations they completed showing the openness ratios range from 6.2 to 11.5, which are greater than recommended openness ratios of 2.0 that they referenced for ungulates. The bridge will be 4 m, or 28 per cent, higher from the MacKay River than is required under Transport Canada guidelines.

[490] In its application, Syncrude said that "works in the river valley will be staged to accommodate wildlife movement wherever possible; planting vegetation beside the bridge to link the passageways to nearby riparian forests as much as possible to maximize habitat connectivity."

[491] In response to questioning, Syncrude said that wildlife monitoring, including remote cameras, track plates, and winter track count surveys, will be in place to monitor wildlife use and movement along

the MacKay River valley near the bridge-crossing location. If deflections are identified, Syncrude will employ an adaptive management approach and could consider planting shrubs or other vegetation along the corridor to improve cover, or look at opportunities to allow wildlife passage above the bridge.

Analysis and Findings

[492] The panel finds the design of the bridge and underpass at the MacKay River to include reasonable mitigations to address potential impact on wildlife. We also find Syncrude’s commitments to expand wildlife monitoring and to assess wildlife use and movement along the MacKay River valley to be acceptable. Based on the presented evidence, the bridge, underpass, and monitoring programs should mitigate the potential risk of impacts on wildlife movement from the bridge and associated infrastructure.

[493] In its submissions, Syncrude committed to developing wildlife monitoring plans for the MLX project, including the MacKay River bridge area, and said that these would be “in accordance with approval conditions.” The panel expects that wildlife monitoring plans specific to the MLX project will be combined with *EPEA* wildlife monitoring requirements for the entire Mildred Lake site.

[494] We have considered the written and oral evidence and conclude that the MLX project results in impacts on wildlife habitat, in particular in the MLX west area. We find the following:

- The MLX project will result in land disturbance and loss of wildlife habitat; this disturbance will impact moose habitat in particular and will interfere with moose movement above the escarpment.
- These impacts, from a regional perspective, are likely to be very low.
- The comparison of impacts on habitat and moose available in the entirety of Athabasca Chipewyan’s traditional territory causes an underestimation of impacts in the local area, especially at MLX west.
- Reclamation does not compensate for temporal impacts that will occur for more than 100 years.
- Syncrude’s ability to provide effective and diverse ecosystem capable of supporting wildlife habitat at final closure is uncertain and is a matter of concern for the panel.
- Syncrude is required to reclaim the Mildred Lake site to a terrestrial ecosystem at closure. Reclamation requirements are designed to result in no net loss of habitat in the final landscape.
- The Birch River offset credits are accepted as a “net positive improvement” where the final ecological value will be greater than the ecological loss. The panel notes that the credits do not cover the full temporal aspect of disturbance for the MLX project, nor are they culturally appropriate.

[495] To address the impacts on wildlife habitat and the uncertainties about success of reclamation activities, the panel requires Syncrude to do the following:

- Submit a wildlife mitigation and monitoring program to the AER for approval.³⁶ In addition to addressing standard *EPEA* requirements for wildlife monitoring, Syncrude must include in the program a component to assess the effectiveness of wildlife use of and passage along the MacKay River corridor, including the MacKay River bridge crossing.³⁷ Should this monitoring program identify impacts on wildlife passage, adaptive management mechanisms to improve wildlife use and passage must be proposed to the AER and implemented if authorized.³⁸
- Include in its *EPEA* comprehensive wildlife report a summary of discussions with Athabasca Chipewyan traditional land users on the implementation, monitoring, and adaptive management measures, including any concerns raised and how or if these concerns were addressed.³⁹ This report shall provide details on how Syncrude has considered and used information from Athabasca Chipewyan's traditional-land users in its reclamation activities and final closure design for MLX.
- Contribute the offset credits from the Birch River offset initiative to compensate for the loss of biodiversity and habitat resulting from the MLX project.
- Report to the AER every five years on its Reclamation Engagement Focus Group activities, including the results of its research into reclamation activities, in order to increase knowledge, improve understanding, and instill confidence in Syncrude's ability to create a final landscape capable of supporting wildlife and wildlife habitat.⁴⁰

Noise

[496] Syncrude conducted a noise impact assessment as part of its EIA following criteria set out in *AER Directive 038: Noise Control*, 2007. The assessment included cumulative changes to noise due to MLX in conjunction with existing, approved, and planned activities in the area. The conclusion of the noise impact assessment is that most of the noise effects of MLX project construction, operation, and closure activities on the surrounding area will be low.

[497] Syncrude included mining equipment, ore preparation facilities, processing plant operations, tailings management, and bird deterrent systems as primary noise sources in the noise impact assessment. For the application case assessment, the MLX project was assumed to be operating continuously (24 hours/day, 365 days/year). For sound emissions from existing Mildred Lake operations, the facilities

³⁶ *EPEA* Amendment Approval Condition – 6.1.87.3

³⁷ *EPEA* Amendment Approval Condition – 6.1.87.4(q)

³⁸ *EPEA* Amendment Approval Conditions – 6.1.87.8, 6.1.87.9

³⁹ *EPEA* Amendment Approval Condition – 6.1.87.8(j)

⁴⁰ *EPEA* Amendment Approval Condition – 6.1.90

were assumed to be operating at full capacity, with all processes and mine fleets active. Sincruide said that this wouldn't actually be the case because the MLX project is designed to replace bitumen supply when the existing North Mine pit is depleted. For environmental noise from nearby existing and approved facilities, the facilities were also assumed to be simultaneously operating at full production.

[498] Sincruide established a noise local study area boundary using the MLX west and MLX east mine boundaries, the existing Mildred Lake facilities, and the boundaries of adjacent existing and approved regulated facilities. The community of Fort MacKay (R1) and four hypothetical receptors (R2–R5) along the north noise local study area boundary were selected as receptor locations.

[499] Sincruide's noise impact assessment considered three scenarios, the baseline case (which included existing and approved adjacent facilities), application case (the baseline plus MLX project noise using two peak-noise-emission years, 2023 and 2029), and the planned development case (maximum allowable sound at known future facilities).

[500] The results from the baseline case indicate that current conditions comply with AER-prescribed permissible levels, except for one receptor (R5). The exceedance of predicted sound level at this location is due to noncompliance levels reported for the Suncor Base Mine operations.

[501] The calculated cumulative noise impact indicates compliance at all receptors, except R4 at year 2029 and R5 at years 2023 and 2029. The predicted noise exceedance at R4 at year 2029 is less than 1 dB above the limit and is likely due to conservatism built into the model that all facilities would be operating continuously at maximum noise levels. The potential noncompliance at R5 is due to the noise exceedance attributed to the Suncor Base Mine operations and is not related to activities at MLX.

[502] Sincruide said that the MLX project would alter the existing sound levels in the region due to the change in mining location; however, people are not expected to be affected by noise because there is no permanent residence near the project. The magnitude of noise effect for the region is considered to be moderate to low.

[503] Sincruide will monitor noise as the MLX project mine pits are developed. The monitoring is expected to verify the assumption of exceedances at R4. If noise levels are exceeded, Sincruide must develop a mitigation plan to bring them into compliance. The conclusion of Sincruide's noise impact assessment is that noise emissions will be minor and acceptable and will comply with *Directive 038*.

[504] Athabasca Chipewyan expressed concern that noise from MLX creates a sensory impact on wildlife and on its members' sense of enjoyment of the land as they exercise their traditional activities. Athabasca Chipewyan did not raise any issues or concerns about Sincruide's noise impact assessment. They said that MLX's local and regional effects, including air contaminants, noise, smell, and traffic will undermine Athabasca Chipewyan's confidence in traditional resources, particularly medicinal plants and berries, and will diminish their sense of place and their experience of being on the land.

Analysis and Findings

[505] The panel finds that the noise impact assessment provided by Syncrude is acceptable and that the MLX project is expected to meet the requirement of *Directive 038*. The modelling results indicated that the cumulative sound levels would be higher than the permissible sound levels at R4 at year 2029 and R5 at years 2023 and 2029. Potential exceedances at R5 are due to the noise exceedances attributed to the Suncor Base Mine operations, which is not related to activities at the MLX project.

[506] Fort MacKay, the indigenous community closest to the MLX project, was included in the noise impact assessment as receptor R1. The noise impact at Fort MacKay was predicted to be minor. The panel accepts that MLX project noise is not expected to be a health and safety concern in the community.

[507] The panel acknowledges that increased noise levels might result in some impacts on wildlife use of habitat in the project area. The panel recognizes that the MLX project's noise can be perceivable at some locations near the noise local study area; however, the noise effect will not be significant outside of the noise local study area. The panel accepts that the noise effects of the MLX project in the region are expected to be moderate to low.

[508] The panel requires Syncrude to conduct an acoustical survey for the MLX east mine operations. The survey shall be conducted during conditions representative of noise emissions in the modelled peak year (2029) to confirm compliance at the receptor location R4. Syncrude shall provide an acoustical study report within six months after the survey. If the acoustical study report shows noise levels that do not meet *Directive 038* criteria, Syncrude will implement a noise mitigation plan and conduct a follow-up acoustical survey within six months.⁴¹

Human Health Risk Assessment

[509] Syncrude completed a human health risk assessment to determine potential adverse effects within the air quality regional study area of the MLX project. A baseline case, an application case, and a planned development case were considered for non-carcinogenic risk, and a project-alone case was considered for carcinogenic risk.

[510] Syncrude identified an indigenous individual as the most conservative human receptor and considered a toddler for non-carcinogenic risk and an adult for carcinogenic risk. Receptor characteristics were identified and included body weight, age, inhalation rate, surface water ingestion rate, and skin surface area. Soil ingestion rates were obtained from a consultant publication Richardson (2013). Aboriginal adult and toddler food-ingestion rates were obtained from a study completed by Alberta Health and Wellness examining First Nations of the Wood Buffalo Region, as well as a study that considered Canadian aboriginal populations.

⁴¹ OSCA Amendment Approval – Condition 11

[511] Human health risk was considered for residential land use assuming year-long exposure. Ingestion of local surface water was considered for six months of the year. Risk was calculated at 42 receptor locations in the air quality regional study area, including residences, trapper cabins, provincial parks, campgrounds, and the communities of Fort MacKay and Fort McMurray. Risk was also assessed at a maximum point of impingement, which was the location of the highest ground-level air concentration, and which varied for each chemical.

[512] Chemicals predicted to be emitted by the MLX project were identified as chemicals of potential concern. A toxic-potency screening method was used to select chemicals of potential concern to consider in the risk assessment using predicted emission rates and toxicity reference values. Certain air contaminants, such as NO₂, SO₂, CO, PM_{2.5}, lead, and arsenic were included regardless of the toxic potency screening results because Sincruide indicated that they are a concern to regulatory authorities.

[513] Sincruide identified a hazard quotient of 0.2 as the non-carcinogenic risk threshold for multimedia exposures. Sincruide calculated hazard quotients greater than 0.2 for multimedia exposure to antimony and arsenic at all receptor locations. Hazard quotients greater than 0.2 were calculated for multimedia exposure to formaldehyde and toluene at some receptor locations, and cadmium exceeded the hazard quotient of 0.2 at the maximum point of impingement only. Where the hazard quotient exceeded the risk threshold of 0.2, the hazard quotient was similar in the baseline case, application case, and planned development case. For remaining chemicals, the hazard quotient was less than 0.2 in all cases at all receptor locations.

[514] MLX project emission and fugitive-dust sources included haul roads, the mine fleet, material handling, and the mine face and dump areas. Emissions from the MLX project were considered to have the potential to migrate off-site and increase human health risk. A hazard quotient of 1.0 was defined as the non-carcinogenic risk threshold for inhalation exposures.

[515] Sincruide calculated a hazard quotient greater than 1.0 at multiple receptor locations for inhalation exposure to NO₂, PM_{2.5}, SO₂, acrolein, benzene, and hydrogen sulphide. For remaining parameters, the calculated hazard quotient was greater than 1.0 at the maximum point of impingement only, or was below 1.0 at all receptor locations. For instances where the hazard quotient exceeded the risk threshold of 1.0, the hazard quotient was similar in the baseline case, application case, and planned development case.

[516] A hazard quotient greater than 1.0 was calculated for lower respiratory system irritation from acute inhalation exposure to chemical mixtures and was largely attributed to NO₂ and SO₂. A hazard quotient greater than 1.0 was calculated for upper respiratory system irritation from chronic inhalation exposure to chemical mixtures and was largely attributed to acrolein.

[517] For soil lead, a non-carcinogenic risk threshold was defined as a modelled blood lead level of 1.0 microgram per decilitre (ug/dL). Suncrude used the Integrated Exposure and Uptake Bio-Kinetic Model to determine child blood lead levels. Blood lead levels in the baseline case, application case, and planned development case were at or below the risk threshold.

[518] A carcinogenic risk threshold of an incremental lifetime cancer risk of 1 in 100 000 (i.e., 1×10^{-5}) was identified by Suncrude. The incremental lifetime cancer risk of 1.7×10^{-5} for inhalation exposure to 1,3-butadiene in project emissions exceeded the risk threshold at the maximum point of impingement. The incremental lifetime cancer risk for remaining chemicals was below the risk threshold.

[519] Suncrude concluded the MLX project will not contribute appreciably to health risks above current levels. The risk estimates for the baseline case and application case did not differ measurably and, in most instances, there was no change in the risk estimates between the two cases.

[520] Mitigation measures were identified in other sections of the EIA and referenced in the human health risk assessment. Suncrude proposed dust suppression of haul roads, stabilization and revegetation of stockpiles, and soil management practice to reduce human exposure to chemicals of potential concern.

[521] At the hearing, Suncrude said that it would be amenable to a condition related to dust control and mitigation. Suncrude was of the view that the clauses as written in the CNRL approval for the Horizon Mine would be appropriate and sufficient, with the addition of petroleum coke as a material in clauses 2(b) and (c). Suncrude said that it was not amenable to accepting an approval condition related to off-site monitoring. Suncrude indicated it supports the oil sands monitoring program, including the Wood Buffalo Environmental Association, and considered that off-site monitoring could be managed through this program. Suncrude also noted that continuous improvement in dust management is better attained through an outcomes-based approach rather than through prescriptive approval conditions that would limit the ability of an operator to adaptively respond to changing conditions.

[522] Suncrude characterized the saturated surficial Quaternary sediments in MLX east as a domestic use aquifer. This pathway was not assessed in the human-health risk assessment. Suncrude said a groundwater monitoring program will be designed to monitor effects of the MLX project on groundwater, including the Quaternary sediments between the MLX east mine and the Athabasca River in accordance with approval conditions, and will be incorporated into the current groundwater monitoring program.

[523] Surface water ingestion, fish ingestion, and dermal exposure to surface water were identified as human exposure pathways in the EIA. A hazard quotient greater than 0.2 was calculated for surface water and fish ingestion for arsenic, and surface water ingestion for toluene. Monitoring at polishing pond release points, as well as surface water monitoring as part of the oil sands monitoring program were proposed by Suncrude to monitor surface-water quality.

[524] Athabasca Chipewyan expressed general concerns regarding contamination of water, air, and wild foods. Specific comment on the human health risk assessment was not provided by Athabasca Chipewyan.

Analysis and Findings

[525] We agree with the overall findings of Syncrude's assessment that human health risk is generally similar in the baseline case, application case, and planned development case. Alberta Health and Wellness guidance says, "though a proposed project alone may not increase risks appreciably beyond the existing levels, unless the project contribution is demonstrated to be zero, these elevated risk levels and their implications to human health should be discussed." Given risk to human health was not demonstrated to be zero, we must consider project-related risk to human health, including the potential for increased risk and severity of effects.

[526] Alberta Health and Wellness recommends assessment of risk using a project alone scenario when hazard quotients exceed 1.0 to provide context into project-related health risk. Syncrude presented a project-alone case for carcinogenic risk that was examined by the panel. The incremental lifetime cancer risk for 1,3-butadiene exceeded the risk threshold of 1×10^{-5} at the maximum point of impingement only. The maximum point of impingement represents the location with the highest ground level air concentration, although we did not consider this to represent off-site air concentrations relevant to human exposure. Given the incremental lifetime cancer risk was below the risk threshold at all off-site locations, the panel finds the MLX project does not considerably increase carcinogenic risk to human health.

[527] The EIA did not present a project-alone case for assessment of non-carcinogenic risk. We must therefore consider risk in the baseline case, application case, and planned development case as presented in the EIA and examine other available information. Project-only emissions were reported for numerous ambient air parameters. Although Syncrude did not provide an assessment of these values in comparison to the reported toxicity reference values the panel considers them relevant to understanding project related risk in the absence of a project alone case.

[528] The panel considers risk associated with inhalation exposure as the main human exposure pathway associated with the MLX project. Dust control from MLX project operations and emission reductions are considered appropriate mitigation strategies to reduce human exposure.

[529] Soil ingestion rates used in risk calculations were lower than Alberta Tier 2 values and were sourced from a consultant publication by Richardson (2013). In the hearing Syncrude said that Richardson (2013) identified soil consumption rates for an indigenous toddler. The panel notes that the study conducted by Richardson (2013) is a general Canadian population study and did not consider an indigenous receptor. Syncrude indicates that the most conservative receptor selected was the indigenous receptor. The panel has some concerns that the soil ingestion rates used may not be sufficiently protective of an indigenous receptor given reliance on general population values sourced from Richardson (2013).

However, no further evidence was provided in relation to this matter. Notwithstanding concern regarding parameters used in risk calculations, we determined that increasing exposure via soil ingestion will not increase human health risk above defined risk thresholds for most parameters given the contribution of risk via soil ingestion. The exception to this is lead where child blood lead levels were calculated to be at the risk threshold of 1.0 ug/dL. Input parameters for the Integrated Uptake and Bio-kinetic Model were not provided and we could not confirm the contribution of risk via soil ingestion based on provided information, although we noted increased risk would be similar in the baseline, application, and planned development cases.

[530] Human consumption of groundwater via a domestic use aquifer is a relevant exposure pathway to all land uses regardless of current water use based on Alberta Tier 1 guidelines but was not assessed. A groundwater monitoring program was proposed by Sincruide, but did not identify monitoring or mitigation strategies to ensure protection of human health. The groundwater monitoring program in MLX east should include monitoring of Quaternary sediments that are considered representative of a domestic use aquifer with comparison of measured values to relevant water quality guidelines. Mitigation strategies should be identified if monitoring identifies exceedances of relevant water quality guidelines related to the MLX project in the Quaternary sediments.

[531] Overall, the panel finds there is the potential for the MLX project to increase risk to human health largely via inhalation exposures to fugitive dust and emissions. Although risk was identified in the baseline case, application case, and planned development case, project alone emissions for some parameters, in particular NO₂, PM_{2.5}, and acrolein, represent potential risk to human health.

[532] The panel requires that Sincruide include monitoring of groundwater within the Quaternary sediments of the MLX east area and between MLX east and the Athabasca River as part of its groundwater monitoring program. The monitoring should include the following:

- Comparison of project-related parameters within the Quaternary sediments considered to be a domestic use aquifer to relevant water quality guidelines⁴²
- Identification of mitigation strategies if exceedances of relevant water quality guidelines are identified in the Quaternary sediments that are considered related to the MLX project⁴³

[533] The above condition, in combination with the conditions imposed on Sincruide relating to dust control from MLX project operations and emission reductions in the Air Quality section are considered sufficient for mitigation of risk to human health.

⁴² EPEA Amendment Approval Condition – 4.6.7.o

⁴³ EPEA Amendment Approval Condition – 4.6.7.s

Wetland Policy

[534] The terrestrial local study area in Sincruide's 2014 application included the west pit mine, overburden dump areas, a west side access corridor and the MacKay River bridge for MLX west. For MLX east, the east pit mine, overburden dump areas, associated infrastructure and a road connecting to the existing Mildred Lake operations were included in the terrestrial local study area. The local study area included a buffer of approximately 1 km to account for indirect effects. Detailed vegetation surveys at 190 plots were completed in 2012 and 2013, and wetland surveys at 26 sites were completed in 2013 which was comprised of 53 separate wetland ecosystems. Sincruide's 2014 application included disturbance of 2157 hectares of wetlands within the planned project areas of MLX west and MLX east.

[535] Sincruide submitted a *Water Act* addendum in late 2016 which included an expansion to the applied for *Water Act* fenceline boundary to accommodate the construction of an armoured channel to convey water from the MLX west sedimentation pond and the northwest interception ditch to the MacKay River. This armoured channel may, in part, be constructed through a portion of the 16.64 hectares of wetlands identified within the applied for expansion area. The addendum was received after the Alberta Wetland Policy came into effect for the Green Zone of Alberta on July 4, 2016.

Analysis and Findings

[536] Sincruide's original application, including wetland assessments for the terrestrial local study area, was received approximately two years prior to implementation of the Alberta Wetland Policy. The panel is satisfied that the 2014 application adhered to requirements of the day related to wetland disturbance and the applied for 2014 terrestrial local study area would therefore not be subject to Alberta Wetland Policy requirements implemented in 2016. This applies only to project components included within the 2014 application. New project components or significant changes to the applied for components within the terrestrial local study area may be subject to new Alberta Wetland Policy requirements pending future decisions by regulators.

[537] While the original applied for fenceline boundary is not subject to Alberta Wetland Policy requirements, adherence to principles of the policy for the area would apply. This includes avoiding wetland disturbance to the extent possible, minimizing impacts on wetlands, and preferentially replacing disturbed wetlands with wetlands on the reclaimed landscape.

[538] The *Water Act* fenceline boundary expansion addendum was received subsequent to implementation of the Alberta Wetland Policy. The Alberta Wetland Policy requirements apply to this expansion and therefore Sincruide is required to submit a wetland assessment and impact report as an amendment to the *Water Act* approval for any planned wetland disturbance within the expanded fenceline

boundary associated with the construction, operation, and reclamation of the proposed armoured channel.⁴⁴

MLX Reclamation and Closure Plan

[539] Syncrude's 2014 MLX application includes a reclamation and closure plan required under *EPEA's Guide to Content for Industrial Approval Applications* (Alberta 2014). The objective of the reclamation and closure plan is to mitigate the environmental impacts of the project and provide a closure landscape with a land capability equivalent to that which existed before disturbance.

[540] Syncrude's 2016 updated life of mine closure plan for the entire Mildred Lake site includes an updated reclamation and closure plan for the proposed MLX project. Syncrude said the updated life of mine closure plan has fully integrated the reclamation and closure planning for the MLX project with the main Mildred Lake site closure plan. Syncrude's proposed closure plan assumes an extended use of MLX east to 2090 for petroleum coke placement from production of other bitumen sources beyond the life of the MLX project, including future Aurora South bitumen resources. Syncrude indicates that, if the MLX project is approved, it does not object (with one exception) to the imposition on the MLX project of the terms and conditions of *EPEA* approval 26-02, as amended, that directly relate to the MLX project. The exception noted is to two of tailings-specific clauses (clauses 3.3.22 and 3.3.23) that Syncrude believes should be removed to as part of the tailings management plan decision under *OSCA*.

[541] In addition to the standard *EPEA* approval conditions, Syncrude has committed to undertake ongoing collaboration with First Nations to enhance its reclamation and closure outcomes. Syncrude said that it expects to enhance reclamation outcomes by including traditional knowledge, as appropriate, in reclamation plans, practices, and monitoring through its work with the reclamation engagement focus group.

[542] Athabasca Chipewyan submitted that Syncrude's proposed reclamation and closure plan is inadequate since the plan largely relies on *LARP*, which in its opinion is an ill-conceived and deficient regional plan.

[543] Athabasca Chipewyan also said Syncrude's proposed reclamation methods will not restore Athabasca Chipewyan's ability to practise its rights in the project area. Athabasca Chipewyan said that the post-closure landscape of the regional study area will be less diverse, with significantly fewer plant species and a significantly greater percentage of non-native plant species.

[544] Athabasca Chipewyan submitted that Syncrude's proposed reclamation and closure plan is deficient given that Syncrude's current reclamation methods are inadequate. This is primarily because of the poor quality of reclamation soils and an inadequate understanding of how to reclaim the vast majority

⁴⁴ *Water Act* Approval Amendment – Conditions 21, 22, and 23

of native plant species. Attempted reclamation of previously disturbed areas at Syncrude's existing Mildred Lake operations is not returning the land to pre-disturbance levels of plant and wildlife species diversity that will support traditional land use and treaty rights.

[545] In the event the MLX project is approved, Athabasca Chipewyan asked that the panel impose 16 approval conditions specific to reclamation and closure. The requested approval conditions can be broadly summarized in two main categories:

- Approval conditions that will require Syncrude to enhance its proposed reclamation plan and methodology and improve its current reclamation research, monitoring, and adaptive management approach
- Approval conditions that will require Syncrude to meaningfully engage with Athabasca Chipewyan in all aspects of reclamation planning, research, monitoring, and adaptive management

[546] With respect to ongoing engagement through the reclamation engagement focus group, the panel asked both Syncrude and Athabasca Chipewyan about the merits of an approval condition requiring reporting to the AER on how the results of the reclamation engagement focus group or collaboration on reclamation have informed or been used in Syncrude's reclamation planning. Syncrude said such a condition would hinder participation of many communities due to concerns over how the reclamation engagement focus group dialogue would be used. Syncrude also said it has already committed in the reclamation engagement focus group terms of reference to reporting back to the communities that will be engaged through the reclamation engagement focus group. Athabasca Chipewyan said it would encourage such a condition but would want to work with Syncrude on the nature and scope of the report back to AER.

Analysis and Findings

[547] We acknowledge the objective of land reclamation is to return disturbed land to equivalent land capability. Equivalent land capability, as defined in the *Conservation and Reclamation Regulation*, means that the ability of the land to support various land uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical.

[548] We find Syncrude's proposed reclamation and closure plan meets the requirements and reclamation outcomes outlined in Alberta's approved *LARP* (Alberta 2012), which was developed under Alberta's *Land-use Framework* (Alberta 2008).

[549] We note that there will always be some level of uncertainty with a long term reclamation planning that spans over multiple decades. These uncertainties may include the type of habitat that will form at closure. Despite these uncertainties, Syncrude's proposed reclamation methods are consistent with existing policy direction and meet currently accepted reclamation standards and guidelines. .

[550] We find Athabasca Chipewyan's argument that current regulatory requirements and reclamation methods and standards are deficient is outside the scope of this decision and the AER's mandate. We acknowledge that reclamation and closure planning is a long-term dynamic planning process that will continue to evolve throughout the life of any project. On-site conditions, new technology, new policy directions and standards, ongoing research, and innovation will dictate adjustments to the proposed reclamation and closure plan.

[551] In December 2018, the AER published *Specified Enactment Direction 003: Direction for Conservation and Reclamation Submissions Under an Environmental Protection and Enhancement Act Approval for Mineable Oil Sands Sites (SED 003)*, which outlines submissions and reporting requirements for life of mine closure plans, mine reclamation plans, and annual reclamation-progress tracking reports under an *EPEA* approval for mineable oil sands. Under *SED 003*, oil sands mine operators are required to provide an updated, detailed life of mine closure plan, along with their *EPEA* renewal application, every 10 years, or at any time when an application for major amendment is submitted. A life of mine closure plan submission must satisfy the regulatory requirements of the day and the submissions requirements of *SED 003*.

[552] With respect to Athabasca Chipewyan's proposed conditions of approval for Syncrude's proposed reclamation plan, methodology, research, monitoring, and adaptive management, we find that standard reclamation planning, research, monitoring, and adaptive management conditions in *EPEA* approval 26-02, as amended, are satisfactory. These approval conditions will be imposed on Syncrude.

[553] With respect to Athabasca Chipewyan's proposed conditions of approval specific to the need for meaningful engagement and participation with Syncrude in reclamation planning, research, monitoring, and adaptive management, we acknowledge that First Nations involvement at all stages of reclamation is essential to ensuring that the targeted reclamation outcomes will support the use of the land by all indigenous communities, including Athabasca Chipewyan.

[554] We find Syncrude's commitment to the reclamation engagement focus group and ongoing collaboration with indigenous groups related to reclamation and closure planning to be an acceptable approach. This topic is discussed further in the Treaty Rights, Traditional Land Use Activities, and Culture sections.

[555] We recognize that *LARP* encourages timely and progressive reclamation. Petroleum coke storage in the MLX east pit is proposed to begin in 2037. The proposed use of the MLX east mine pit for petroleum coke deposition starts after MLX east is done mining. We don't have sufficient information to justify and authorize the use of the MLX east facilities beyond the end of mining year 2035.

[556] Should Sincruide require the use of the MLX east mine pit for petroleum coke storage, Sincruide will need to apply to the AER for the extended use of this facility with the necessary supporting information.

Terrain and Soils

[557] Sincruide is responsible for conserving and reclaiming specified land and obtaining a reclamation certificate under *EPEA* and applicable regulations. The *Conservation and Reclamation Regulation* states the objective of conservation and reclamation of specified land is to return the land to equivalent land capability.

[558] Mitigating the effects on terrain and soils is fundamental to successfully reclaiming the landscape to meet reclamation outcomes. The goal of reclamation for the project is to create self-sustaining, stable landforms with soils that establish moisture and nutrient regimes that will support locally common boreal-forest ecosystems. Sincruide's approach to conservation and reclamation is further discussed in the MLX Reclamation and Closure Plan section.

[559] Guidance for reclamation material conservation is found in the *Best Management Practices for Conservation of Reclamation Materials in the Mineable Oil Sands Region of Alberta* (Alberta Environment and Water, 2012). Recent oil sands mine *EPEA* approvals and *SED 003* have referenced the best management practices in soil conservation planning sections.

Project Effects on Terrain and Soils

[560] MLX project construction will alter topography, site elevation, and drainage patterns within the MLX project footprint. Sincruide said most of the soil from the development area will be salvaged and stockpiled for use during reclamation.

[561] The terrestrial local study area used for the terrain and soils assessment encompassed the MLX project footprint plus a buffer of 2 km. For MLX west the terrestrial local study area was 13 487 ha and for MLX east it was 6673 ha. Potential acid input was also assessed for the terrestrial regional study area, which was 1 144 330 ha. The terrestrial regional study area was based on a number of factors including watershed and wildlife boundaries, approved oil sands leases, and potential areas of increased acid deposition. Sincruide conducted soil surveys at survey intensity level 2 for MLX west and MLX east to identify baseline soil conditions and landscape features, as well as to develop maps on which the environmental impact assessment was based. About 10 per cent of MLX west and 34 per cent of MLX east terrestrial local study areas were classified as existing disturbance.

[562] The EIA terms of reference required Sincruide to map and describe terrain and soils conditions, discuss how the MLX project could affect soil quality, and provide mitigation and monitoring plans for

terrain and soils. In the EIA for terrain and soils, valued components and indicators were identified and the following MLX project effects were assessed for the terrestrial local study area:

- Extent of terrain and surficial geology disturbance
- Changes in surface expression
- Extent of soil disturbance on both mineral and organic soil series
- Soil quality indicators (potential admixing, contamination, erosion)
- Soil acidification
- Changes to land capability classification for forestry

[563] Overall effects ratings for the terrestrial local study area were low or neutral, except for soil acidification, which was moderate. Syncrude said the MLX project does contribute to cumulative effects in the terrestrial regional study area for terrain disturbance, soil series disturbance and soil acidification; however, as the MLX project contributes less than one per cent of terrain and soil disturbance, the contribution to cumulative effects was low.

[564] The primary mitigation for MLX project effects on terrain and soils is by implementation of the closure and reclamation plan. Syncrude provided soil conservation and soil placement information in applications for the MLX project that aligned with Syncrude's *EPEA* approval 26-02, as amended, and with the 2011 life-of-mine closure plan. Syncrude has since prepared and submitted a 2016 life-of-mine closure plan for the entire Mildred Lake site and includes an updated reclamation and closure plan for the MLX project. Syncrude said the updated 2016 life-of-mine closure plan has fully integrated the reclamation and closure planning for the MLX project with the main Mildred Lake site closure plan.

[565] Syncrude provided reclamation material balances for MLX west and MLX east in the applications. Syncrude said it will ensure that there is sufficient reclamation material for all the reclamation area and to meet the prescriptions as required for the entire Mildred Lake site.

[566] Syncrude's closure plan included management of petroleum coke and centrifuge treated tailings with a reclamation cap. Syncrude said that the substrate and reclamation cap depth planned for centrifuge cake and petroleum coke are science-based recommendations based on information collected from Syncrude's existing reclamation and research programs, as Syncrude's current *EPEA* approval does not outline a capping depth requirement for these substrates.

[567] Athabasca Chipewyan proposed a condition for Syncrude to "conduct or participate in research that increases our understanding of how soils can be amended such that they retain the nutrients and structure needed to support the establishment and growth of the diversity of boreal forest plant species and communities. Implement any findings into MLX project reclamation plans." Syncrude is of the view that current reclamation practices are sufficient to meet equivalent land capability, and current

reclamation research indicates that the reclaimed land is performing similar to natural areas. Syncrude said that the use an adaptive management approach for reclamation, and specific concerns, could be explored at the reclamation engagement focus group. Athabasca Chipewyan concerns related to conservation and reclamation are discussed in the MLX Reclamation and Closure Plan section.

Analysis and Findings

[568] We find Syncrude provided information to satisfy the EIA terms of reference. We understand Syncrude conducts additional soil surveys at a higher soil survey intensity level (i.e., SIL1) ahead of disturbance to refine their soil salvage plans. As a requirement of *SED 003*, Syncrude will gather additional soil information for the MLX project before disturbance, to refine its soil salvage plans.

[569] We agree the reclamation material balances for MLX west and MLX east show that enough material is available to meet placement requirements. Details of soil conservation, soil placement and material balance will be required in future conservation and reclamation submissions, under *SED 033*, that will include the MLX project areas.

[570] The reclamation and closure plan in the *EPEA* application contained capping strategies that included petroleum coke and centrifuge cake. Centrifuge cake and coke are not considered suitable as reclamation material and will require capping before placement of reclamation material. As a condition of the approval, Syncrude is required to cap coke and centrifuge cake before placing cover soil and subsoil.⁴⁵ This condition is to protect the rooting zone and does not consider other objectives of placing capping material on tailings deposits, such as geotechnical stability and settlement, management and control of water treated tailings, and drainage.

Socioeconomic Effects

Economic Effects

[571] Syncrude said that the MLX project is a sustaining mine project—it will sustain about 2000 direct Syncrude jobs, provide about 50 per cent of the bitumen feed into Syncrude’s upgrader for 14 more years of operation, and generate billions of dollars of economic benefit for Albertans and for the Canadian economy.

[572] To estimate the gross economic effects of the MLX project, Syncrude used an input-output model developed by Statistics Canada. The input-output model estimates impacts from an expenditure on the economy, including impacts such as gross domestic product, labour income, and employment.

⁴⁵ *EPEA* Amendment Approval Conditions – 6.1.34(d)(ii), 6.1.34.11

[573] Syncrude provided its original estimates as part of its application in 2014, which used Statistics Canada's model and economic multipliers from 2010. In 2018, at the request of the panel, Syncrude provided updates to its initial cost and output estimates.

[574] In its 2018 updates, Syncrude reported the aggregate costs of engineering and management, equipment and materials, and labour costs totalled \$3.271 billion for the preproduction phase and \$15.699 billion during the operations phase for a total of \$18.97 billion compared with the \$17.4 billion estimated in 2014.

[575] Based on the input-output modelling, Syncrude estimated the total direct, indirect, and induced economic effects of the preproduction phase to be as follows:

- Gross domestic product: \$2.213 billion in Alberta and \$1.107 billion for the rest of Canada
- Labour income: \$1.459 billion in Alberta and \$736 million for the rest of Canada
- Jobs (full-time equivalent): 18 382 in Alberta and 10 561 for the rest of Canada
- Taxes: \$123.2 million in Alberta and \$100 million for the rest of Canada

[576] Based on the input-output modelling, Syncrude estimated the total direct, indirect, and induced effects of the operations phase to be as follows:

- Gross domestic product: \$14.614 billion in Alberta and \$3.622 billion for the rest of Canada
- Labour income: \$10.581 billion in Alberta and \$2.083 billion for the rest of Canada
- Jobs (full-time equivalent): 81 862 in Alberta and 32 933 for the rest of Canada
- Taxes: \$857.3 million in Alberta and \$1.211 billion for the rest of Canada

[577] Syncrude said that preproduction capital expenditures for the MLX project were estimated to be \$3.271 billion, of which 26 per cent will be spent in the RMWB and 54 per cent will be spent in the rest of Alberta. During operations, direct annual expenditures are estimated at \$383 million with over 60 per cent spent in the RMWB and 34 per cent in the rest of Alberta.

[578] Syncrude said that the most recent economic multipliers used for the 2018 updates used a 2013 reference year. Compared with the 2010 multipliers, the effect of investment on gross domestic product, labour income, and employment had declined by 7 per cent and 10 per cent for the oil and gas extraction industry.

[579] Syncrude acknowledged that the economic impacts of the project could be overstated by the input-output modelling but that more recent economic models were not available.

[580] Syncrude noted that in the original MLX project application in 2014, it estimated royalties to be in the range of \$11.9–\$15.5 billion. These royalties were based on the assumption that the Syncrude sweet

premium price benchmark would range between US\$102 to US\$125 per barrel (/bbl). The 2018 royalty estimate was revised downwards to between \$7.2 billion and \$9.4 billion, based on a lower forecast price for Sincruide Sweet Premium of US\$58.50/bbl to US\$93.50/bbl.

[581] Sincruide confirmed that until the project recovers its capital investment, the project would be subject to a gross prepayment royalty of 1 per cent to 9 per cent, depending on oil prices. After payout, the project would pay royalties at a rate of 25 per cent to 40 per cent, depending on net revenue.

Employment Effects

[582] Sincruide estimates the size of the preproduction construction workforce to be 1159 workers, with 40 per cent of the workforce being existing residents of Fort McMurray and Fort McKay and 60 per cent new hires. Sincruide estimated that 60 per cent of the preproduction workforce will live in camps, 30 per cent in Fort McMurray, and 10 per cent in Fort McKay.

[583] Sincruide indicated that the average workforce during the operations phase will be about 669 annually. Sincruide expects that up to 83 per cent of the operations workforce will be transferred from existing mining operations at Sincruide's Aurora North and Mildred Lake North Mines, and the remaining 17 per cent will be new hires.

[584] Sincruide noted that 2000 jobs support the company's existing Mildred Lake North Mine, which includes 669 heavy equipment direct mining jobs and 1300 support workers.

[585] In total, during the pre-production year, the project is expected to create the equivalent of 830 direct jobs, 844 indirect jobs, and 368 induced jobs annually in Alberta. In total, during each operations year, the project is expected to create the equivalent of 669 direct jobs, 714 indirect job and 567 induced jobs annually in Alberta.

[586] Sincruide anticipates that most of the operations workforce will live in the region and less than 5 per cent will live in the Mildred Lake village camp, which is beside the existing Mildred Lake operations. Sincruide noted the vast majority of its 4700 employees, including all operational personnel, are based in the region.

[587] Sincruide said it expects to hire most of its workforce from the region and elsewhere in Alberta, with a preference to hire from the region using its existing initiatives and programs.

[588] Sincruide said that indigenous people comprise about 10 per cent of its workforce. It said it has an indigenous recruitment specialist and ongoing initiatives related indigenous recruitment and retention such the rotational employment program and indigenous participation program.

[589] Sincruide reported a total business volume of \$186 million with companies owned by indigenous entrepreneurs and First Nations in the Wood Buffalo region in 2013. The average amount of procurement

between 2007 and 2013 is \$154 million. Syncrude said it has nearly doubled its spending with indigenous businesses over the previous year, setting a new record in 2017 at \$342 million of spending in one year and that its cumulative procurement from indigenous suppliers now totals more than \$3 billion.

[590] Syncrude said that it had addressed the concerns of local communities, including First Nation and Metis communities, by entering into formal agreements, such as comprehensive benefit agreements, or by otherwise agreeing to provide some form of mitigation to address project-related impacts.

[591] Syncrude estimated the total change to population within the socioeconomic study area to be about 198 families, or a total of 594 people assuming three persons per family. Syncrude submitted that arrival of 594 people to the region could result in a minor change in its demography, but that the region can accommodate the change.

[592] Proposed mitigation includes a number of initiatives and programs that Syncrude operates. In addition to establishing collaborative educational and community partnerships with the region, Syncrude offers a variety of education and training opportunities and incentive programs to its employees. Syncrude says that it has an indigenous awareness program, provides housing support for Fort McMurray employees, and incorporates a retention program for Fort McMurray employees to secure and retain a skilled workforce. Syncrude also provides higher-education awards focused on recognizing scholastic achievement of employee- and retiree-dependent children and provides ongoing financial support for education.

[593] Syncrude said that if the MLX project were not approved, it would need to immediately consider downsizing its workforce, and adverse job impacts could occur as early as 2019, as there are no alternative mining areas that could be brought into production by the time reserves associated with the north pit are exhausted. Syncrude said that the loss of about 50 per cent of the bitumen supply to its upgrader provided by Syncrude's mining operations would have notable effects on its entire employment strategy, and the job losses would be far in excess of the 669 direct mining jobs.

[594] Athabasca Chipewyan noted that in the current labour market, the employment benefits estimated by Syncrude do not reflect the ability of people to find other work if MLX does not go ahead.

[595] Syncrude responded that regardless of a tight labour market, people's desire is still to come and work for Syncrude.

[596] Syncrude submitted that overall, MLX project effects on the provincial economy (i.e., on gross domestic product, income, and employment) will be provincial in extent, positive in direction, moderate in magnitude, long-term in duration, and continuous. The final effect will be moderate. Nationally, the final effect will be low.

Economic Modelling Approach

[597] Athabasca Chipewyan retained Dr. Joseph to conduct a review of Suncrude's responses to the panel's information request for an updated economic assessment for the MLX project. Dr. Joseph identified three key issues with Suncrude's economic assessment:

- Suncrude's economic impact assessment does not help the panel determine the net economic benefits of the project, given its reliance on input-output modelling. A cost-benefit analysis is required for such an assessment.
- By Suncrude's own admission, its economic assessment has likely over-estimated the project's economic effects.
- Changes to economic conditions, including oil price forecasts and carbon pricing policies for large emitters are likely to adversely affect the project's economic benefits.

[598] Dr. Joseph noted that the input-output modelling approach used by Suncrude only estimates gross economic effects of the project, not net economic benefits. He said that the input-output modelling approach tends to be a listing of a project's capital and operational expenditures and associated gross domestic product contributions, employment requirements and associated labour income, and tax revenue. The approach of using an economic impact assessment does not consider future oil prices, discount rates, inflation, jobs, labour, and capital opportunity costs and does not address uncertainties.

[599] Dr. Joseph also argued that Suncrude's analysis relied on historical and outdated data and economic conditions that have changed significantly since the 2014 environmental assessment. Dr. Joseph noted that even in Suncrude's 2018 updates to the economic assessment, the input-output model used relied on 2013 assumptions and data.

[600] Dr. Joseph submitted that as a result, the panel should exercise great caution in interpreting Suncrude's economic assessment as it is not possible to generate a sufficient understanding of the project's net benefits and its ability to contribute to the public interest.

[601] Dr. Joseph believed that a more appropriate approach would be to use cost-benefit analysis to measure the net benefits of the project. Although Dr. Joseph submitted that this was a better approach, he did not produce his own cost-benefit analysis for the project.

[602] Dr. Joseph also criticized Suncrude's tax and royalty estimates for likely being overestimated, which he attributed to poor and pessimistic forecasts for future crude oil demand and prices.

[603] Suncrude submitted its updated analysis, which used 2013 data produced from Statistics Canada's input-output model and was available as of April 2017. Dr. Joseph noted the latest data available from Statistic's Canada would actually be from 2014, as it was released in April 2018.

[604] Regarding Statistics Canada's input-output model, Syncrude noted that the model release that occurred in April 2018 used 2014 data and that the model released in April 2017 used 2013 data. Syncrude acknowledged that the output numbers would be different if different multipliers were used.

[605] While Dr. Joseph criticized the input-output model for using historical data, he acknowledged there is typically a lag between when data is available and when Statistics Canada's input-output model is updated.

[606] In its application, Syncrude acknowledged several limitations of input-output models, including

- an inability to predict the exact impact of expenditures within an economy;
- use of fixed coefficients and multipliers that do not account for economies of scale, constraint capacities, technological changes, externalities, or price changes; and
- over- or under-estimating impacts, depending on whether a closed or open model is used.

[607] Syncrude acknowledged that the input-output model is a structural model that deals primarily with resource allocation in the economy corresponding to a given demand. It does not provide an exact measure of the impact of an investment on the level of use of resources in the economy. Syncrude also confirmed that input-output modelling does not take into account economies of scale, constraint capacities, technological change, externalities, or price changes, and this makes it less accurate for long-term and large impacts as firms adjust their production technology and input-output technological coefficients become outdated.

[608] With respect to the limitations of input-output modelling, Syncrude responded that the socioeconomic impact assessment wasn't intended to evaluate project economics. It was intended to show the effect of the project on the economy rather than the effect of different factors on project economics.

[609] Syncrude confirmed that it has its own internal and non-public economic and financial assessments, which include evaluating project economics using proprietary price forecasts (including third-party consultants) and discount rates. Syncrude acknowledged that oil prices would affect the economics of the project but that it had modelled project economics based on a robust range of reasonable crude oil price forecasts that consider the Alberta Government's forecast, the Government of Canada's forecast, the US Department of Energy's West Texas Intermediate (WTI) forecast, and the advice of two external expert consultants. Syncrude confirmed that this modelling supported the business case for developing the MLX resource. Syncrude also noted that technology improvement over time has the potential for positive economic impact on a project where technology creates significant operational improvements and cost savings.

[610] Syncrude said that its approach for the economic assessment was consistent with previous oil sands applications and the expectations of the AER. Syncrude noted that nothing in the terms of reference

for the environmental impact assessment required the use of a cost-benefit analysis and that the use of the Statistics Canada input-output model was over and above what was required.

[611] Syncrude said that the absolute numbers produced by the input-output model are less important than the fact there was a large positive effect on gross domestic product, labour, and jobs resulting from the project over the long run.

[612] Syncrude said that regulators have refused to use cost-benefit analysis as a tool to assess private energy projects. Syncrude argued that Canadian regulators have rejected second-guessing the assessment of project costs and benefits assumptions used by market participants in the oil and gas industry.

[613] Syncrude referenced ERCB *Decision 2010-036: Taylor Processing Inc., Applications for Three Pipeline Licences and a Facility Licence Amendment, Harmattan-Elkton Field* in support of its view that the use of cost-benefit analysis should be rejected by the AER for private energy projects. The decision report says the following:

The Board notes that it is possible for a project to be in the public interest and yet have a negative net impact on the province. It acknowledges that a number of problems exist when using a CBA in making decisions, such as a lack of consistent methodologies, time frames, or formats, reliance on detailed forecasts and assumption, and inability to quantify certain cost and benefits, and a tendency to focus on numbers instead of overall public interest. The Board notes that several of the recommended factors influence CBA calculations but others, such as competition, are difficult to quantify. Given these difficulties, the board does not consider a CBA necessary in its assessment of the applications.

[614] Syncrude argued that the use of a cost-benefit analysis would require the AER to adjudicate the reasonableness of numerous assumptions, including oil prices, currency exchange rates, discount rates, tax rates, royalty rates, employment rates, and carbon costs and that this was not an appropriate role for the AER.

Cost of Carbon

[615] Syncrude said that MLX would replace existing production, and it estimated greenhouse gas emissions associated with the project to be about 3618 kt CO₂E/y.

[616] Syncrude confirmed that it is compliant with Alberta's Climate Leadership Plan and has incorporated those costs into its business model. Syncrude estimated the cost of complying with carbon pricing policies to be about \$864 million over the life of the project.

[617] Athabasca Chipewyan questioned how Syncrude arrived at its \$864 million estimate for carbon costs and whether it includes damages caused by greenhouse gas emissions from the project. Athabasca Chipewyan suggested that it is necessary to consider the full range of costs and project greenhouse gas emissions, including payments to government for carbon emissions as required under carbon policy and

the social costs of carbon representing the damages and monetary terms incurred by society from carbon emissions.

[618] Dr. Joseph noted that ECCC estimates that the social cost of carbon damages would be between \$53 and \$223 per tonne of CO₂E by 2020. Using ECCC's social cost of carbon, Athabasca Chipewyan estimated the project's carbon costs to range between \$3.2 billion and \$13.8 billion. Dr. Joseph estimated carbon costs to the globe using ECCC's social cost of carbon estimates would equate to a net present value -\$13.8 billion to -\$10.1 billion for the project.

[619] Syncrude confirmed that its calculated cost of carbon is based on Alberta's *Carbon Competitiveness Incentive Regulation*, which currently uses a carbon price of \$30 per tonne, reaching \$50 per tonne by 2024, which is when production from MLX is expected to commence. Syncrude confirmed that the \$864 million estimate for carbon costs includes carbon emissions associated with mining, extracting, and upgrading bitumen from the MLX west and MLX east areas. Syncrude confirmed that it did not use the social cost of carbon because it is not a provincial regulatory requirement and was not required by the terms of reference for the environmental assessment.

[620] Athabasca Chipewyan believed that Syncrude has not clearly or completely outlined the greenhouse gas emissions of the project in its materials and that Syncrude's modelling of its carbon tax liability is opaque and likely underestimated. Athabasca Chipewyan noted that ECCC has developed values for the social cost of carbon, providing both high and low values to account for the potential range in magnitude of climate change impacts, and that these values will rise over time. While Environment Canada's approach is not required by Alberta regulatory guidelines, it is a useful metric developed by an established authority to understand the impacts of greenhouse gas emissions.

Analysis and Findings

[621] The panel recognizes that there are advantages and limitations of both input-output and cost-benefit modelling.

[622] The use of an input-out model, such as the Statistics Canada model used by Syncrude, allows the gross economic effects of a major investment to be predicted using independent and objective data. However, as the model does not account for all possible costs and benefits, it does not allow for an assessment of the net value of the project or investment. Furthermore, because the data used in some published input-output models lags behind changes to the economic climate by several years, these models might not reflect current conditions and might over- or under-estimate economic effects.

[623] While a cost-benefit analysis considers both benefits and costs and can help with the estimation of the net value of a project or investment, the analysis can be quite subjective and vary for each assessment conducted. There is a wide spectrum of values and choices that can be used for the inputs and assumptions, and these can produce a wide range of model outcomes.

[624] We find that the economic assessment approach used by Syncrude is consistent with the approach used in other oil sands and environmental assessments in Alberta and satisfies the terms of reference for the environmental-assessment and provincial-regulatory requirements. There is no regulatory requirement for Syncrude to conduct a cost-benefit analysis for the project.

[625] We agree with Syncrude that requiring the use of cost-benefit analysis for individual projects would require the panel or the AER to make decisions on a wide range of inputs and assumptions, some of which are highly uncertain (e.g., future oil prices) while others are more properly the role of government (e.g., the social cost of carbon). To date, Alberta has not provided any direction or guidance on the role or use of cost-benefit analysis as part of the environmental assessment process or to support applications for oil sands projects.

[626] The panel accepts that Syncrude has completed its own internal economic analysis with its own assumptions and proprietary information. Syncrude has confirmed that under its forecast economic conditions, the project is commercially viable, and the panel sees no reason to doubt this claim. The panel would not expect Syncrude to sanction a project that it believed would not generate a profit. While the panel recognizes that there are some risks and uncertainties associated with the assumptions and value determined by Syncrude, current regulations do not require Syncrude to place its internal economic evaluation on the public record.

[627] The panel also accepts that Syncrude makes use of a number of independent oil price forecasts in its economic analysis, including the AER's ST98 outlook and forecasts by Alberta, the National Energy Board, and the US Energy Information Administration. While the exact prices in Syncrude's future price forecast were not disclosed, these sources are independent and credible for forecasting purposes. Furthermore, the range of oil prices provided identified by Syncrude in its 2018 updates to the economic assessment is generally aligned with these forecasts.

[628] We find that the approach used by Syncrude to estimate the carbon cost for the MLX project appears to be sound and is consistent with current regulatory requirements for carbon pricing. The \$864 million cost estimate is based on Alberta's *Carbon Competitiveness Incentive Regulation*, which currently uses a price of \$30 per tonne, increasing to \$50 per tonne by 2024. Syncrude used a number of conservative assumptions in developing its carbon-price estimate, including forecasting its emissions based on peak levels of existing mining and upgrading operations, which would be replaced by MLX as current production diminishes at the North mine, and by assuming that there would be no technological improvements or lower emission intensities over the life of the project.

[629] We acknowledge that the carbon price estimate provided by Syncrude does not include any potential damages resulting from greenhouse gas emissions that might be included in the higher costs associated with the social cost of carbon concept. While the panel understands that ECCC has developed estimates for the social cost of carbon, currently there are no requirements or guidance on how this

approach should be applied within the context of the environmental assessment process or regulatory applications for oil sands or other energy projects. As a result, application of this approach is beyond the AER's current regulatory mandate and not a requirement for the MLX project.

[630] After the hearing, Alberta announced its intention to make changes to Alberta's *Carbon Competitiveness Incentive Regulation*. While these changes may result in a change to the cost of carbon for the project under this regulation, the panel accepts that Syncrude will need to comply with the cost of carbon requirements in effect over the life of the project.

[631] Overall, the panel finds that the project will have a positive economic effect on the regional, provincial, and Canadian economy with respect to gross domestic product, labour income, employment, taxes, and royalties. The effect will be moderate in magnitude and long-term in duration and will contribute to the overall economic sustainability of the region and province. The panel notes that the preproduction and operation costs are higher in the 2018 update to the economic assessment than in the 2014 assessment, which results in higher and positively correlated economic effects. In contrast, royalties are significantly lower in the 2018 update due to lower forecast oil prices. The panel recognizes that there will always be some uncertainty when predicting the economic effects of a project, as economic conditions change over the life of the project. The panel considers the approach used by Syncrude to estimate the total direct, indirect, and induced economic effects of the project to be reasonable. The aggregate of all three categories of benefits can be considered an upper bound that can overestimate impacts, while consideration of only direct and indirect effects may be considered a lower bound that might underestimate impacts.

[632] While the number of new jobs during the operations phase created as a result of the project will be modest, approval of the MLX project will allow Syncrude to sustain about 2000 positions. The panel understands that without the MLX project, Syncrude will experience a shortfall in available resources to mine and upgrade, which would require Syncrude to consider downsizing its workforce.

[633] The panel finds that the social effects on the region of more people resulting from the MLX preproduction and operations phases will be low. The panel recognizes that Syncrude has entered into benefit agreements with several indigenous groups that presumably address any concerns they have had about social effects of the project.

Treaty Rights, Traditional Land Use Activities, and Culture

[634] To decide whether to approve the applications, the panel must take into account potential impacts on Athabasca Chipewyan, including impacts on their treaty rights as affirmed by section 35 of the *Constitution Act, 1982*. And since the MLX project is within the *LARP* area, any approval must be consistent with *LARP* strategies, including the ability of First Nations to exercise their rights in "reasonable proximity of First Nations' population centres."

[635] If approved, the MLX project will be located within Athabasca Chipewyan’s traditional territory, an area of about 6.6 million ha in northeast Alberta. Athabasca Chipewyan members use the territory for hunting, trapping, fishing, plant harvesting, and related cultural and spiritual activities. Athabasca Chipewyan has eight reserves downstream of the MLX project and along the south shore of Lake Athabasca. About one-third of Athabasca Chipewyan members live in Fort Chipewyan, a large percentage live in Fort McMurray, and about 70 members live in Fort McKay, which is 10 km north of the MLX west and 7 km northeast of MLX east. Athabasca Chipewyan said that close to 50 per cent of its population live in and around the MLX project area.

Treaty Rights

[636] As a signatory to Treaty 8, Athabasca Chipewyan has treaty rights to hunt, fish and trap as affirmed by section 35 of the *Constitution Act, 1982*. Athabasca Chipewyan asserted that treaty rights also include incidental rights to allow them to continue “traditional patterns of activity and occupation” to preserve their culture.

[637] Athabasca Chipewyan also asserted that “continuity” is central to the Supreme Court of Canada’s interpretation of Treaty 8 rights in *Mikisew Cree First Nation v. Canada* 2005 SCC 69, and quoted as follows:

Continuity respects traditional patterns of activity and occupation. The Crown promised that the Indians’ rights to hunt, fish and trap would continue “after the treaty as existed before it.” This promise is not honoured by dispatching the Mikisew to territories far from their traditional hunting grounds and trap lines.

[638] At the hearing Athabasca Chipewyan sat a panel of elders, community members, and expert witnesses. Collectively, Athabasca Chipewyan is opposed to the MLX project for the following reasons:

- The project will have unacceptable negative impacts on its ability to access areas that are important for exercising traditional rights, in particular hunting and harvesting.
- It will impact an important burial site at the confluence of the Athabasca and Dogrib Rivers.
- It will damage the ecological health of the region, thus impeding Athabasca Chipewyan’s ability to sustain traditional practices and cultural integrity.
- Sincruide’s assessment of impacts on Athabasca Chipewyan’s traditional land use is patently deficient.

Crown Consultation

[639] First Nations and Metis settlements in Alberta must be consulted on Crown decisions to take up land in areas where a potential impact on treaty rights is contemplated. The AER does not conduct consultation nor can it determine whether the Crown’s consultation is adequate. The AER receives advice

from the ACO regarding the adequacy of the Crown’s consultation. The ACO may also recommend mitigations to address impacts on treaty rights or traditional activities for consideration by the AER.

[640] The ACO provided a preliminary report to the AER on February 23, 2018, with regard to the applications made under the *Environmental Protection and Enhancement Act* and the *Water Act*. ACO said that consultation was adequate for these specific applications, pending the outcome of the hearing. They said Athabasca Chipewyan’s written submissions had not identified any site specific concerns about impacts of the project on the continued exercise of their treaty rights and traditional uses.

[641] The panel received the ACO’s final report on February 28, 2019. ACO said the hearing revealed information suggestive of site specific concerns about impacts of the project on the continued exercise of Athabasca Chipewyan’s treaty rights and traditional uses that had not been previously addressed by the consultation process. The ACO determined that consultation was adequate and recommended that the AER consider “avoidance or mitigation measures” to address these impacts. They specifically recommended that the AER consider widening the river corridors in consideration of potential adverse impacts on Athabasca Chipewyan’s hunting concerns.

[642] The ACO’s adequacy report did not include Public Lands MSL applications 170423 and 170430. On July 8, 2019, the ACO informed us that it will determine an adequacy of consultation assessment for the MSL applications once Sincruide submits a request. They said that this hearing report and the advice in it is part of the record of consultation considered by the ACO for making an adequacy decision for the MSL applications.

[643] The panel considered the evidence we received about potential impacts on Athabasca Chipewyan’s treaty rights and traditional use activities.

Traditional Use Activities

[644] Sincruide’s evidence is that an area of Athabasca Chipewyan’s traditional territory will be disturbed by construction and operation of the MLX project. The area disturbed—6700 ha—is equal to 0.1 per cent of Athabasca Chipewyan’s traditional territory and would be unavailable for wildlife habitat, hunting, and traditional use activities throughout the life of the project.

[645] In its initial application, Sincruide used information from EIAs and traditional use studies conducted for other oil sands projects to assess impacts on treaty rights. They said they did not find sufficient detail to identify traditional use activities. Sincruide subsequently entered into arrangements that enabled Athabasca Chipewyan to conduct a traditional land use study, including providing funding to Athabasca Chipewyan for the study and for technical reviews of the applications.

[646] Sincruide received Athabasca Chipewyan’s traditional land use study late in 2017 and a follow-up knowledge and use summary report in November 2018. They said the reports did not provide enough

details about Athabasca Chipewyan members' use of the project footprint for traditional use activities. Syncrude said that the studies didn't change the outcome of its EIA and that the MLX project would have little-to-no impact on Athabasca Chipewyan treaty rights and traditional uses.

[647] Athabasca Chipewyan's submission is that their treaty rights and traditional activities will be affected by the taking up of lands that have been, and continue to be, used by its members. They said that their right to hunt, trap, fish and harvest includes the right to sufficient "Quality and quantity of resources in preferred harvesting areas, including... migratory birds, caribou, moose and bison."

[648] In its knowledge and use summary, Athabasca Chipewyan found that its members reported homes, cabins, temporary campsites, and winter picnic and gathering sites within the Syncrude local study area. They also reported key wildlife trails, a hunting route, river routes used to access the area for hunting, and plant harvesting areas within the project footprint.

[649] Syncrude's view of the traditional land use study is that Athabasca Chipewyan did not identify specific locations for the various sites, or proximity of the sites to the project, or the timeline for when its members used the area. It said the study did not show current or recent use of the local study area for plant harvesting. Syncrude's interpretation is that the traditional land use study describes "concerns that are general and/or regional environmental concerns." They said the impacts of the MLX project are well documented in its EIA and the effects would be mitigated through reclamation in the closure stage, and by the Birch River conservation offset.

[650] Athabasca Chipewyan asserted that we should not rely on Syncrude's EIA because it dismisses traditional knowledge, does not use the best existing data from their traditional land users, and draws conclusions that are unsubstantiated and incorrect. They said that choosing a regional study area of 113 000 km² for its terrestrial effects assessment led Syncrude to underestimate the impacts of the MLX project in a local area that holds traditional and ecological value for its members.

[651] Athabasca Chipewyan used a 5 km (local) and 25 km (regional) zone around the MLX project to conduct its traditional land use study. They selected these zones because cabins, hunting camps, a burial site, and gathering sites used by Athabasca Chipewyan members are present in these areas.

[652] Athabasca Chipewyan said hunting and harvesting hold vital cultural value for its members, and these activities will be directly and adversely affected by the MLX project. They identified the project footprint, and the corridors along the Athabasca and MacKay Rivers as important habitat areas that they use to hunt moose, beaver, caribou, and other furbearers, and to carry out related cultural activities.

Hunting

[653] Athabasca Chipewyan described a number of impacts on the species they hunt. It is their view that the clearing of land for the MLX project will result in destruction of valuable caribou and moose

habitat. Noise and other sensory disturbances such as smells, lights and pollution will cause animals to avoid the project area. They said fewer animals use river corridors that are impacted by industrial disturbance thus leaving fewer for hunting. Additionally, linear disturbances and industry corridors introduce predators to an area, resulting in increased mortality and less animals available for hunting.

[654] Athabasca Chipewyan said hunters are going further away to hunt for moose because of the perception that oil sands facilities pollute the land and contaminate the wildlife. Noise and disturbance also diminish Athabasca Chipewyan's members' sense of place, solitude, and the "peace and quiet" many of them seek when they go out on the land. They said all of these effects combine to cause adverse impacts on their treaty rights and subsistence uses.

[655] Sincruide did not dispute that the MLX project will disturb wildlife habitat. Their terrestrial assessment confirmed that moose, deer, elk, small mammals, and some furbearers use the project footprint and slopes of the Athabasca and MacKay Rivers. Sincruide found that in the application case, the MLX project will remove 58 per cent of moose habitat at MLX west and 5 per cent within the regional study area.

[656] Sincruide acknowledged that Athabasca Chipewyan reported that most of its hunting takes place along the MacKay and Athabasca River corridors. Athabasca Chipewyan provided evidence of their historic use of river corridors as a primary means of transportation for visiting family, berry picking, transmitting knowledge to children, and hunting and fishing. They said they hunt beaver, muskrat and waterfowl in the spring from boats. In the fall they hunt moose on land and from boats.

[657] Athabasca Chipewyan said its knowledge and use study identified a number of project-specific impacts, including destruction of important moose habitat in preferred hunting and harvesting areas adjacent to the MacKay and Athabasca Rivers.

[658] Sincruide said moose frequently forage along the edges of corridors created by roads and other linear features because of the shrub species that predominate in those areas. As a result, moose can be exposed to higher mortality risks from hunting and predation within the development areas. They maintained, however, that the traditional land use study shows no specific impacts on Athabasca Chipewyan's traditional activities.

[659] During the hearing, Athabasca Chipewyan traditional land users told us that the shores and corridors along the Athabasca and MacKay Rivers in proximity to the MLX project are important wildlife areas that they use to carry out traditional activities.

[660] Elder Roy Ladouceur said that he gathers traditional medicines throughout the Athabasca watershed. He said he hunts a moose at MLX west every year; that one moose can feed many people, and he described taking moose back to the community to share with elders.

[661] James Ladouceur, an active land user, said he uses the MacKay River in summer and winter to hunt moose and to collect medicines like rat root, bulrush, and mint. He said he currently uses the MLX east area to hunt moose and go trapping. He described his fear that one day he would have to go way up north to hunt moose so that he does not have to worry about running into a gate, workers, or security.

[662] In final argument, Athabasca Chipewyan said that its four witnesses at the hearing do not represent the totality of Athabasca Chipewyan land users who use or rely on traditional resources from the area around the MLX project.

[663] Athabasca Chipewyan submitted that a corridor of 2 km alongside both rivers is needed for moose, wolves, and other animals, and for its members to travel by water or trail to hunt. They said fewer animals will use narrow corridors that are impacted by industrial noise and sensory disturbances.

[664] Dr. C. Candler described various studies he conducted for Athabasca Chipewyan, and said these studies found that Athabasca Chipewyan members hunt moose and other animals from boats along the river corridors. He described walking the land and going on the Athabasca and MacKay Rivers in canoes with community members, and said that the area of the MacKay River near MLX west is of cultural importance for the spring beaver hunt.

[665] In a report titled *Impacts to ACFN Cultural Practice and Use of Land and Resources*, Dr. Candler said that the “ecological function that river corridors serve for moose, combined with the regional accessibility that rivers provide to Athabasca Chipewyan results in the importance of major river corridors, including the MacKay and Athabasca, as unique and highly valued cultural landscapes that are fundamental to Athabasca Chipewyan cultural practices and land uses.

[666] Dr. Candler also said that “wolves use areas where moose, caribou, or other game are compressed or funneled into a confined corridor.” This results in “mortality sinks” or areas of disproportionately high predation, and alteration of predator-prey relationship.

[667] The MLX project would be setback 100 m from the escarpment above both the MacKay and Athabasca Rivers. Syncrude said the 100 m setback, along with wildlife passage mitigations and monitoring, will maintain the integrity of the river corridors as follows:

- The average width of the MacKay river corridor would be 980 m from the top of the escarpment, with a minimum width of 600 m.
- For the Athabasca River, the average width is 3370 m with minimum widths varying between 595 m and 2890 m.

[668] To measure the corridors, Syncrude calculated the distance from the 100 meter setback from the escarpment at one side of a river to the 100 m setback at the other side of the river. Athabasca Chipewyan

disagreed with including the river channel in the measurement, and said that corridors should be measured from the edge of a river to the top of the escarpment.

[669] Syncrude also informed the panel of an application it has made under the *Public Lands Act* to return to the Crown a portion of mineral surface lease 352 along the Athabasca River. If approved, Syncrude's lease area would be pulled back adjacent to the Athabasca River, and 876 ha of undisturbed land would be returned to the Crown. Syncrude said this would increase the width of the corridor and protect the area for wildlife.

Analysis and Findings

[670] The evidence from Dr. Candler and the traditional land users is that Athabasca Chipewyan members currently hunt moose, trap beaver, harvest plants, and collect medicines at MLX west and at MLX east.

[671] We accept Syncrude's evidence that 58 per cent of moose habitat will be disturbed in the local project area. We find that 58 per cent loss of moose habitat in an area where Athabasca Chipewyan members currently carry out traditional activities is not an insignificant loss to the community.

[672] Sensory disturbances associated with the MLX project will alter the use of the area by Athabasca Chipewyan members and by wildlife. The moose population is likely to shift to adjacent land. While wildlife use of the area is likely to change we do not know the magnitude of impact on the moose population.

[673] We recognize that the Athabasca River corridor holds traditional and cultural significance for Athabasca Chipewyan; however, the evidence that the corridor in proximity to MLX east is currently used for hunting is weak. One elder said he avoids the area because he perceives it is already contaminated. We also heard Athabasca Chipewyan's experts say that moose tend to avoid areas within 300 m of mines, and that traditional users prefer to hunt away from industrial activity.

[674] We acknowledge that hunting occurs in the MLX west area and that Athabasca Chipewyan members hunt moose and beaver from the MacKay River and along the corridor. Moose will be displaced at MLX west, thus impacting their distribution and accessibility to Athabasca Chipewyan. We can extrapolate that loss of habitat and displacement will cause some interruption to Athabasca Chipewyan's traditional hunting activity in the area.

[675] What Syncrude describes as a general or regional environmental concern may be correct in the context of all of Athabasca Chipewyan's traditional territory, or the 113 000 km² used to conduct the terrestrial impacts assessment. However, that characterization doesn't account for impacts on traditional use activities experienced in an area that holds traditional value for Athabasca Chipewyan.

[676] We heard that about 20 Athabasca Chipewyan families reside at the nearby hamlet of Fort McKay. Even if the number of traditional land users is declining, hunting and harvesting continue to occur, and each traditional land user is providing moose for family and other community members.

[677] We are also cognizant of the temporal nature of impacts associated with the MLX project. As discussed in other parts of this document, the project area will not be fully restored and suitable to support wildlife habitat and traditional use until 2130. This is a period of over 100 years when the land will not be available for traditional use activity.

[678] The panel finds that the MLX project will impact the ability of Athabasca Chipewyan land users to continue to hunt in the area of MLX west and along the MacKay River corridor adjacent to MLX west.

[679] We considered whether this impact can be mitigated. The ACO recommended that we consider avoidance or mitigation measures, specifically whether widening the river corridors would address impacts on Athabasca Chipewyan's hunting activity.

Widening River Corridors

[680] The panel sought the parties' views on the ACO recommendation; specifically, we asked them to address the implications of an additional 100 m setback from the Athabasca and MacKay Rivers. Alberta Environmental Protection (AEP) has established minimum requirement for setbacks for an industrial facility lease boundary. The setback for the MLX project is 100 m from the top of the escarpment to the lease boundary, as per the Master Schedule of Standards and Conditions.

[681] Syncrude submitted that widening the corridors by an additional 100 m would sterilize an additional 33 million barrels of bitumen at the MacKay River corridor and 14 million additional barrels at the Athabasca River corridor. In total, 47 million barrels of resources worth \$3.4B would be sterilized. This figure is additional to bitumen that will be sterilized because of Syncrude's decision to not mine through the MacKay and Athabasca River valleys. That decision leaves behind 200 million barrels at the Athabasca River and 600 million barrels through the MacKay River valley.

[682] Syncrude also submitted that an additional 100 m setback would shorten the life of the project by 6 to 12 months and create an equivalent shortfall of bitumen to the Mildred Lake upgrader.

[683] Syncrude submitted that increased setbacks would have negligible benefits to moose. An additional 100 m setback would conserve just 33.3 ha of land at MLX east and 75.3 ha at MLX west. They described this as a small incremental change in habitat that would be unlikely to make a noticeable difference to wildlife use of the river corridors.

[684] Syncrude said the scientific literature supports their observations that a 100 m setback is adequate to facilitate effective wildlife movement, including movement of moose. They referred to the Wildlife Habitat Effectiveness and Connectivity report which found it is unlikely that the Athabasca River

represents a natural habitat corridor for moose. The authors of the report said there are large widely distributed tracts of moose habitat well outside of the river valleys, and any loss of habitat in the Athabasca corridor would be unlikely to cause a significant disconnect between moose populations located north or south of current mining activities. They concluded that prescribing setback distances for mining operations would provide very limited conservation value for moose in the region.

[685] The Wildlife Habitat Effectiveness and Connectivity report also found that there is some data to indicate that moose avoid the use of buffers that were less than 300 m in width. The report concluded that protecting moose habitat along rivers by prescribing setback distances provides limited conservation value for moose in the oil sands region. The authors also calculated the number of moose ranges that would be protected by setback distances of various widths. They found that a 500 m setback from a river would provide 87 km² of habitat, which is roughly equivalent to a single moose home range.

[686] Syncrude said that its experience, and that of another oil sands operator in the area, is that wildlife can move effectively through a corridor as narrow as 200 m and that moose regularly cross rivers. It said this is strong evidence that the substantially wider corridors proposed in the MLX application will effectively support wildlife movement.

[687] In Athabasca Chipewyan's submission on river corridors, they said that an increase from 100 m to 200 m is a step in the right direction, but is insufficient to ensure that the corridors remain ecologically and culturally functional. They said "Athabasca Chipewyan evidence indicates that wildlife need more than 200 m between a mine pit and edge of the escarpment to move... and Athabasca Chipewyan land users need more than a 200 m setback to exercise their constitutionally protected rights in the river corridors."

[688] Athabasca Chipewyan said that Syncrude's corridor would corral wildlife into the MacKay river valley where they cannot easily escape predators especially in places where the escarpments are steep. They said their traditional land users have spent decades on the land and their intimate knowledge of the land informs what a functional river corridor looks like.

[689] J. Ladouceur said that on the MacKay River animals need at least a 2 km corridor, not including the river. He said moose will not jump in the middle of a river to take off from wolves but will only use it to cross over to the other side when ice thickens. He said moose need a corridor to escape; that there are steep banks on the east side (of the MacKay River) that moose won't go up. This is corralling the animals.

[690] Elder Roy Ladouceur said a wildlife corridor of 2 kilometres is needed along both sides of the river to protect moose and other animals, and for Athabasca Chipewyan members to hunt. He thinks a 2 km buffer would allow for continued cultural practices. He also said the 2 km should be on land and not include the river. He said animals do not travel up and down the river.

[691] Dr. Candler also spoke of the need for a 2 km corridor to protect ecological and cultural functions of the river corridors. He said that pressures associated with industrial development—wolf predation, bird deterrents, restrictions on firearms, and no shooting perimeters in vicinity to oil sands facilities, industrial noise, openings and clearings—all support his opinion that traditional use of the river corridors will be eliminated without appropriate setbacks.

Analysis and Findings

[692] We accept that the river corridors hold ecological and cultural significance for Athabasca Chipewyan members. They use the river corridors for more than hunting; they also use them for gathering berries and medicinal plants, visiting with family, and passing on traditional knowledge to children.

[693] As we noted in our discussion of MLX project impacts on wildlife, the area near MLX east in proximity to the Athabasca River is already heavily disturbed. Syncrude's main processing facilities and Base Mine Lake are near the corridor. There are other disturbances nearby—a gravel pit, work camp, road, and utility right-of-way. Land users told us that they can see, hear, and smell these facilities and tend to avoid these areas. We were also told that moose avoid areas within 300 m of a disturbance. Based on the evidence, it is likely that Athabasca Chipewyan's use of the Athabasca River corridor for hunting occurs further downstream from Mildred Lake.

[694] We do not accept Athabasca Chipewyan's proposal to widen the river corridors by 2 km as this would sterilize a substantial amount of the resources associated with the MLX project. This is not a reasonable option given the magnitude of economic loss to Syncrude, and to Albertans. Syncrude purchased its leases knowing that the area is a mineable oil sands area. Syncrude deserves reasonable opportunity to develop the resources in a safe and environmentally responsible manner in the public interest.

[695] We agree with Syncrude's evidence that widening corridors by 100 m creates a small incremental impact on moose. We also note that Athabasca Chipewyan agrees that an additional 100 m, although a step in the right direction, would not effectively mitigate impacts from an ecological or cultural use perspective.

[696] We accept Syncrude's evidence that the amount of bitumen sterilized would equal 13 per cent of recoverable reserves if both corridors were widened by 100 m. We took into account Syncrude's evidence and determined that widening only the MacKay River corridor by 100 m would sterilize 6 per cent of recoverable bitumen at MLX west ($33\text{M}/550\text{M} = 6$ per cent). Using Syncrude's \$72 bbl for unprocessed bitumen the economic loss would be \$2.376B. At the time this decision was being written, the WTI price is roughly \$53.70 bbl which translates to a potential loss of \$1.772B.

[697] The panel weighed all of the above evidence, particularly the finding that an additional 100 m setback does not provide an appreciable benefit for moose or for Athabasca Chipewyan land users. We

find that widening the MLX west corridor has a more detrimental impact on Syncrude than any incremental improvement that would be gained by Athabasca Chipewyan. This finding does not mean that impacts on Athabasca Chipewyan's traditional hunting activities should not be mitigated. We considered Syncrude's assertion that reclamation and conservation offsets would mitigate impacts on traditional land use activities. We also considered mitigations suggested in Athabasca Chipewyan's submissions, including the use of conservation offsets.

Reclamation

[698] Based on the evidence presented, the MLX west mine pit is expected to remain open for operations until 2064. The MLX east mine pit will not be reclaimed until after 2090 as Syncrude plans to keep the pit open for coke storage until 2090. Syncrude anticipates the entire site will be reclamation certifiable by the year 2130.

[699] Elsewhere in this decision, we have considered the ecological aspects of Syncrude's reclamation and closure plan. Syncrude said its end goal for traditional land use is that the reclaimed land will be suitable for hunting, trapping, fishing and harvesting. They expect to achieve this goal through their work with the reclamation engagement focus group.

[700] Athabasca Chipewyan state that the reclaimed landscape will contain fewer species of traditional plants than currently exists, because of Syncrude's poor understanding of how to reclaim native plant species.

[701] Syncrude and Athabasca Chipewyan were asked to comment on an approval condition that would require Syncrude to report to AER on how input received from the reclamation engagement focus group had informed or been used in Syncrude's reclamation plans. Syncrude responded that the reclamation engagement focus group is a forum for open and candid dialogue, and for Syncrude to learn more about how to apply traditional knowledge to its reclamation and closure strategies. Ms. Flynn expressed the view that an approval condition would hinder the participation of many communities because of concerns about how the dialogue would be used. Syncrude also said that they have committed to providing an annual report back to the communities. Athabasca Chipewyan said it would encourage such an approval condition but would want to work with Syncrude on the report back to the AER.

Analysis and Findings

[702] While the *LARP* encourages timely and progressive reclamation, Mildred Lake will not be reclaimed for over 100 years. Syncrude's proposed reclamation activities are aimed at restoring a traditional use landscape at final closure. Their plans do not address the loss, during the intervening period, of Athabasca Chipewyan's ability to use the land.

[703] The regulatory requirement to return the MLX project area to equivalent land capability does not necessarily mean identical land uses as existed before the project. Reclamation and closure planning for an oil sands mine is a multi-decade dynamic process that is expected to evolve as new technologies, policies and regulations are developed. Ongoing research by Syncrude will also inform reclamation activities and cause reclamation and closure plans to be adjusted.

[704] Syncrude is required to provide an updated, detailed mine closure plan every 10 years as part of its *EPEA* approval. They are also required to report on their reclamation activities as part of this plan.

[705] Elsewhere in this decision, we recommend that Syncrude engage Athabasca Chipewyan with a view to obtaining input from its traditional land users and using that input in its reclamation and closure plans. We also imposed a condition requiring Syncrude to report to the AER on its reclamation engagement focus group activities.

[706] We find the timeline for reclamation of the MLX project presents a serious challenge to Athabasca Chipewyan's ability to hunt and access wildlife in an area they identify as a preferred harvesting area. We also find that standard mitigations, such as monitoring and land reclamation, do not address the interruption to Athabasca Chipewyan's hunting activities during the time period between the clearing of land for the MLX project and the time the land is reclaimed to a traditional use landscape.

[707] We considered whether Syncrude's other proposed mitigation, conservation offsets, will address this impact.

Conservation Offsets

[708] The panel considered Syncrude's offer of the Birch River conservation offset credits as mitigation for impacts on Athabasca Chipewyan's traditional use activities.

[709] Syncrude referred to a report prepared by the Alberta Biodiversity Monitoring Institute to support its statement that the Birch River Provincial Park and the area disturbed by the MLX project are ecologically the same. Both are boreal forest ecosystems. Syncrude said that 43 305 ha of Athabasca Chipewyan traditional territory is within Birch River Park and that Athabasca Chipewyan did not present any evidence that its members won't use the park.

[710] Athabasca Chipewyan agrees that the two areas may be ecologically similar but said they are not the same from a traditional use perspective to support cultural and spiritual practices. Athabasca Chipewyan said its members would not use the park as it is too hard to get to. Their witnesses made the following comments about the Birch River conservation initiative:

[711] Mr. J. Ladouceur said the Birch River area is very hard to get to, and "Giving them a little piece to go harvest is unacceptable."

[712] Elder Laviolette said he would not use the offset area as he is not familiar with it. He also said that because of marsh and muskeg “access is a real challenge especially compared to what is currently available along the river.”

[713] Elder Trippe de Roche said “that whole area was all ours. And giving it back to us is a slap in the face.” Elder Trippe De Roche and Dr. Candler explained that in the past Athabasca Chipewyan members were evicted from land in what is now Birch River Provincial Park to make room for Wood Buffalo Provincial Park.

[714] Dr. Candler said he was reminded of Chief Adam’s opening comments to the panel about being forced from land at Moccasin Flats. Dr. Candler said that even if the Birch River area is ecologically functional, the window for it to be culturally functional has passed.

[715] Ms. Tsessaze also said that the area is difficult to access and doesn’t hold the same ecological or cultural value for Athabasca Chipewyan as land near the MLX project. She said being forced to accept the face value of the offset is a poor example of consultation and that Syncrude is “telling ACFN what is good for them, without asking or considering input from ACFN.”

[716] In final argument, Syncrude explained that it regularly provides packaged meat from between four and six bison from its wood bison ranch to the nearby Fort McKay First Nation. They proposed this could be a reasonable model to mitigate Athabasca Chipewyan land users concerns. As an alternative, they offered to fund an annual hunting trip, up to a maximum amount, for land users on record as using the MLX project footprint for hunting. We find these gestures on Syncrude’s part to be well-meaning but inadequate.

Alberta Approach to Conservation Offsets

[717] There is increasing use in Alberta of conservation offsets as a policy and regulatory tool. Alberta relies on Canada (i.e., DFO) offsetting strategies to mitigate loss of fish and fish habitat from oil sands development. The *Alberta Wetland Mitigation Directive* provides a framework for replacement of wetlands if standard mitigations such as avoidance and minimization of impacts cannot be achieved.

[718] The *Alberta Land Stewardship Act* provides the legal basis for Alberta to establish a conservation-offset program for land disturbance, but to date none has been established. Syncrude’s evidence regarding the Birch River offset initiative contains mention of a draft Alberta Conservation Offset Policy Framework; however, that document is not before the panel.

[719] The Alberta *Land-use Framework* and the *LARP* also envision strategies to encourage conservation and stewardship on public land. The *LARP* contemplates coordinated industry planning of access corridors and associated development infrastructure, reuse of existing linear disturbance, and progressive and timely reclamation of linear disturbances.

[720] All these initiatives demonstrate a growing trend in Alberta for the use of conservation offsets; however, a regulatory gap exists with respect to using offsets to address land disturbance and wildlife impacts.

Analysis and Findings

[721] It is clear from Athabasca Chipewyan's submissions that its land users are more concerned about the loss of a traditional activity that holds cultural significance than the loss of moose meat. It is the act of hunting in a preferred harvesting area, of being on the land, and the potential to share that activity with younger generations, that is of most concern to them.

[722] If only two Athabasca Chipewyan land users each hunt a moose in the MLX area every year, there is a potential loss over 100 years, to harvest 200 moose. It is a loss of opportunity over two or more generations for a core of Athabasca Chipewyan members to continue to practice a traditional activity and to share it with subsequent generations in an area that has cultural significance to Athabasca Chipewyan.

[723] The Birch River credits are acceptable compensation for loss of biodiversity and wildlife habitat at the MLX project until such time as reclamation is completed. The Birch River offsets do not mitigate for impacts on traditional or cultural use activities given the location of the Birch River Park, and the difficulty Athabasca Chipewyan members described in accessing the park. The panel finds that these effects need to be mitigated.

[724] Athabasca Chipewyan proposed that as a condition of approval Syncrude should develop conservation offsetting strategies that are culturally and ecologically relevant to them. We considered Athabasca Chipewyan's proposal in some detail.

[725] Syncrude has shown that it can be innovative in mitigating effects of its operations. They also have valuable experience in designing offset initiatives—the calculation methods, selection of offsetting location, implementation, and monitoring. Our view is that it would be an easy stretch for them to use their expertise to develop a culturally relevant offset to address the residual impacts that will occur at the MLX project until the area is restored to traditional use activities.

[726] The panel considered the evidence presented regarding the Alberta Biodiversity Monitoring Institute human footprint disturbance in the MLX project area. From that information it appears there are numerous disturbances that could be available for restoration/offsetting opportunities. Athabasca Chipewyan expert Dr. Candler said there are numerous opportunities for restoration within 2 km of the Athabasca River that would be culturally relevant. Based on the oral evidence, it's also likely that there are culturally relevant restoration opportunities along the MacKay River corridor.

[727] We consider the lack of policy and regulation to be particularly unfortunate in the context of this project. Syncrude has demonstrated considerable leadership in creating the Birch River and Owl River

offsetting initiatives. Syncrude also demonstrated its willingness to create a further conservation offset for the MLX project to provide a more localized offset for impacts on fish.

[728] The AER has wide ranging environmental legislation and a strong mandate to protect the environment and to make decisions that are in the public interest. The Government of Alberta has anticipated circumstances where the standard mitigation hierarchy of avoid, mitigate, and reclaim would not be sufficient, and that additional mitigations would be needed to address residual impacts. The work on the draft Alberta Conservation Offset Policy Framework and Syncrude's leadership in the Birch River initiative all point to support for the use of conservation offsets.

[729] As the minister of Environment said in the letter to Syncrude, AEP is using the Birch River Park offset as an opportunity to learn and test the process. Our expectation is that a requirement for Syncrude to develop an additional offset for the MLX project will contribute to the learning and testing process.

[730] The panel agrees with Athabasca Chipewyan and Syncrude that the 108.6 ha of habitat disturbance (33.3 ha at MLX east and 75.3 ha at MLX west) that could be conserved if the river escarpment setback is increased by 100 m is of minimal cultural or ecological benefit. However, the panel finds that this value of 108.6 ha is a sound base value to use for an offset calculation.

[731] Given the evidence presented, the panel finds the following:

- There is a significant lag between the time the MLX project begins and when final reclamation is completed.
- There is a loss of about 2500 ha of good to high quality moose habitat which results in loss of opportunities to hunt moose during development and operation of the MLX project, opportunities that will not be replaced until after reclamation.
- Evidence provided during the hearing imply that an impact is occurring and needs mitigation, as noted in the ACO report.

[732] Therefore, Syncrude is required to develop a conservation offset specifically for the impacts on traditional use activity from MLX development in proximity to the MacKay and Athabasca River corridors.⁴⁶ Taking our lead from direction provided by Alberta Environment, the goal of this offset is net positive improvement. To achieve this goal, a 4:1 offset ratio is required for the 108.6 ha of new disturbance, for a total of 434.4 ha that must be restored.

[733] The 4:1 ratio was selected by taking into account uncertainties in restoration effectiveness and the time lag between the MLX project development and offset completion. The ratio also reflects the value of the 2500 ha loss of good to high quality moose habitat from a traditional use perspective.

⁴⁶ EPEA Amendment Approval Condition – 6.1.87.11

[734] The panel is optimistic that the effective impact of this offset will be greater than the 434.4 ha physical footprint given consideration of zones of influence which Athabasca Chipewyan raised during the hearing.

[735] Syncrude is required to prepare and submit an offset plan to the AER for approval by June 30, 2020.⁴⁷ If the offset plan is not submitted to the AER by June 30, 2020, the setback for the MLX west lease boundary from the top of the escarpment of the MacKay River will increase from 100 m to 200 m.⁴⁸ No clearing or construction, with the exception of the bridge crossing, is permitted within the 200 m setback until the offset plan has been approved.⁴⁹

[736] The offset plan must result in restoration of 434.4 ha of culturally relevant wildlife habitat, the locations of which are to be selected through engagement with Athabasca Chipewyan. Restoration of 434 ha is anticipated to achieve a net positive improvement to habitat which would be consistent with direction provided by Alberta to Syncrude for the Birch River offset initiative.⁵⁰

[737] Locations selected for restoration may reflect a range of disturbed sites, including

- disturbed areas within 2 km of the MacKay River and the Athabasca River,
- areas disturbed by seismic lines or other linear features, and
- any other disturbed areas acceptable to both Syncrude and Athabasca Chipewyan.

[738] Syncrude shall engage Athabasca Chipewyan for the purpose of selecting restoration locations that are acceptable to Athabasca Chipewyan. Syncrude and Athabasca Chipewyan are encouraged to collaborate on the selection of locations with potential for restoration. Failure to agree on specific locations shall not prevent Syncrude providing its proposed offset plan to the AER for approval on the date specified above.

[739] Once completed, the offset must provide opportunity for Athabasca Chipewyan traditional use of the restored areas until such time as the MLX project is reclaimed and available for traditional use.⁵¹

[740] The offset plan must include the following:

- Location of specific restoration sites within an Athabasca Chipewyan culturally relevant area, including their location, area, description, and site-specific restoration plans
- Specification drawings for implementation of restoration methods at each site

⁴⁷ EPEA Amendment Approval Condition – 6.1.87.11

⁴⁸ EPEA Amendment Approval Condition – 6.1.87.12

⁴⁹ EPEA Amendment Approval Condition – 6.1.87.13

⁵⁰ EPEA Amendment Approval Condition – 6.1.87.14

⁵¹ EPEA Amendment Approval Condition – 6.1.87.14(c)

- A quantitative and qualitative assessment of the total area of wildlife habitat that will be restored and how these restoration sites are culturally relevant and equivalent to 434.4 ha
- A time schedule for when the offsetting measures will be initiated and are anticipated to be completed
- A detailed monitoring plan that will quantitatively and qualitatively measure the effectiveness and trajectory of restoration
- An adaptive management plan that details steps to be taken should the monitoring show that the restoration sites are not on trajectory for effective restoration
- A summary of discussions, and feedback from Athabasca Chipewyan on their perspective of offset plan progress and success⁵²

[741] Syncrude is required to report on the monitoring, effectiveness and trajectory of the offset plan within the *EPEA* comprehensive wildlife reports.⁵³

Culture

[742] Athabasca Chipewyan said that land use is at the heart of its culture—the land is where traditional users feel free and good about their lives and their livelihoods, and using the land is the means by which they feed their families and community.

[743] Dogrib Creek is described as one of those places that holds “special importance to ACFN because of its historical connection, unique importance in Athabasca Chipewyan oral history, and contribution to a cultural and sacred sense of place that is central to their cultural practices and land uses, including knowledge transmission.”

[744] Dogrib Creek, also called Beaver River, is located about half a kilometre downstream from the northern boundary of MLX east. Athabasca Chipewyan said the area where Dogrib Creek meets the Athabasca River is a culturally important area. They provided a study that described the presence of cabins, a burial site, and other sacred areas within the confluence area. They said their members have oral stories and place names associated with the confluence area and that the area includes archaeological sites that are valued at the highest level.

[745] Athabasca Chipewyan submitted that MLX east will impact its members’ sense of place at Dogrib Creek. They said the burial site is of high cultural significance and that Athabasca Chipewyan oral history contains knowledge of the site. Their evidence suggests that its location is unknown and could be on the south side of the confluence on higher ground.

⁵² *EPEA* Amendment Approval Condition – 6.1.87.14

⁵³ *EPEA* Amendment Approval Condition – 6.1.87.8(k)

[746] Athabasca Chipewyan said that changes in the flow and function of Dogrib Creek, sensory disturbance, erosion at the confluence area, and the visibility of the mine all impact their continued use of Dogrib Creek.

[747] Athabasca Chipewyan requested culturally appropriate protection for the confluence area. They asked AER to require Sincruide to protect the area to allow current and future generations to visit the site without disturbance from MLX east operations. Athabasca Chipewyan also said Sincruide should be required to work with Athabasca Chipewyan and other indigenous groups to implement urgent support for Athabasca Chipewyan language, oral history, and cultural practice in the area of the project and downstream.

[748] In final argument, Athabasca Chipewyan requested Sincruide to modify its plans by providing a significant buffer around the burial site and cultural artifacts so as to allow Athabasca Chipewyan members to visit the site without disturbance.

[749] Athabasca Chipewyan said Sincruide did not provide a cumulative impact assessment of how MLX east would interact with other regional changes and the continued traditional practices of its members with connections to the confluence area.

[750] Sincruide said that Athabasca Chipewyan's earlier traditional land use study, submitted in 2017, showed no current use at Dogrib Creek, and as a result no mitigations were needed. They maintained that the December 2018 study did not provide any additional information that would change the results of their analysis of Dogrib Creek.

[751] Sincruide submitted that the Dogrib Creek confluence area is outside of the MLX project footprint and not impacted by MLX east. They provided evidence to show existing industrial activity—a mine camp, utility rights of way, a gravel operation—north of the creek. They said these activities are closer to Dogrib Creek than Sincruide's footprint. At the hearing, Sincruide said it would be willing to work with Athabasca Chipewyan and other indigenous communities to assess the area with a view to identifying culturally important sites, and if any were found to taking action to protect the site.

Analysis and Findings

[752] Impact on culture was sometimes expressed by Athabasca Chipewyan traditional land users as fears about the ability of members to pass on teachings about traditional activities to their children and subsequent generations.

[753] Athabasca Chipewyan considers the burial site and other cultural artifacts at Dogrib Creek to be vital to its members' experience and transmission of their culture, today and into the future. Several pieces of evidence point to the spiritual significance to Athabasca Chipewyan of this area, as well as the sense of place its members experience at this location. However, the panel has very little evidence that

Athabasca Chipewyan members currently use the confluence area for cultural transmission or other traditional activities. The location of the gravesite is unknown although we do understand that burial places were traditionally alongside rivers.

[754] We find that Athabasca Chipewyan has demonstrated the unique contribution of Dogrib Creek to its culture, and that the area is downstream of MLX east. The area is in proximity to Syncrude's existing facilities at Mildred Lake and as Athabasca Chipewyan submitted is already exposed to sensory disturbances including the visibility of the mine and other nearby development such as a work camp, gravel pit, and road.

[755] Syncrude offered to work with Athabasca Chipewyan to assess any possible overlap between the MLX east development and this cultural area and identify ways to minimize project effects on cultural practices, if any are identified. The panel acknowledges Syncrude's offer to continue to work with Athabasca Chipewyan and encourage them to continue to further assess the site and ensure community access to this culturally important site.

Harvesting Fish

[756] Athabasca Chipewyan presented evidence that fishing was a widespread activity along both rivers in the 1960s but has declined greatly due to fishing regulations. In interviews conducted for its traditional land use study, members reported harvesting pickerel and jackfish at the confluence of the MacKay and Athabasca Rivers, which is about 7 km downstream from the MLX project.

[757] Athabasca Chipewyan members said that pickerel, a species important to them, go to the MacKay River to spawn when the water is good and return to the Athabasca River when waters get low. If the MLX project reduces groundwater flow to the rivers, the pickerel might not spawn successfully in the future. They also said that construction and mining operations would cause the areas to become unappealing to them, thus further impacting their use of the area for traditional fishing activity.

[758] Syncrude's evidence is that 56 ha of fish and fish habitat will be destroyed or otherwise impacted by the MLX project. They said that while the project would remove forage fish habitat, especially above the escarpment at MLX west, it was habitat that does not support traditionally harvested fish species.

[759] To compensate for this loss, Syncrude has developed a fish offset initiative at Owl River near Lac La Biche to satisfy requirements under the federal *Fisheries Act*. As an additional offset, Syncrude proposed to modify a water diversion channel at MLX west to create additional fish habitat. The ditch will divert clean water from MLX west towards the MacKay River and will support a fishery of some 63 000 habitat units. The fish provided to the channel would be bait/forage-type species and would be expected to reach the MacKay River watershed and potentially be used by traditional fishers for bait.

Analysis and Findings

[760] The Owl River offset initiative is 350 km from the MLX project, which is about a three-hour drive from the MLX project area. It is also outside of Athabasca Chipewyan traditional territory. The panel agrees with Athabasca Chipewyan that an offset in an area outside its traditional territory and 350 km away does not compensate for impacts on Athabasca Chipewyan's right to be able to fish. However, the panel has no persuasive evidence before us to demonstrate that Athabasca Chipewyan members harvest fish within the MLX project area or that their ability to carry on a traditional fishing activity will be restricted by the MLX project.

[761] Athabasca Chipewyan did not present evidence that its members currently fish at the MacKay River in the vicinity of MLX west. The evidence before us is that Athabasca Chipewyan members have in the past harvested fish downstream of the community of Fort MacKay near the confluence of the McKay and Athabasca Rivers. We also found that water quantity and water levels in the Athabasca River will not be impacted by the MLX project. There will be a small decrease in water quantity in the MacKay River but not enough to impact water levels or fish habitat or where Athabasca Chipewyan members fish.

[762] We find that the MLX project will have no impact on Athabasca Chipewyan's traditional fishing activities. We have no evidence that Athabasca Chipewyan members harvest fish near MLX west. Even if they did, we have no evidence that fish habitat, for the species they harvest, would be impacted. Impacts on water levels will be so negligible as to not interfere with sport or traditional fishing activities. Athabasca Chipewyan members and other fishers would be able to continue to fish on the MacKay River.

Navigability

[763] Athabasca Chipewyan submitted that navigation is incidental to its treaty rights and necessary for access to its traditional lands. They described the lower Athabasca River and the Peace-Athabasca Delta as an important transportation link that they use to access river shores, adjacent lands, tributaries, reserve lands, and culturally-important resources. They said Athabasca Chipewyan harvesters have developed boat-reliant hunting skills that are essential to the practice of their traditional rights across expansive portions of their lands.

[764] Athabasca Chipewyan said that the Athabasca River and its tributaries are often the only means for its members to access traditional territory to hunt. They said that flows on the Athabasca River have decreased since the late 1970s, causing low levels that in turn have obstructed or eliminated access to many cultural resource use sites. Other traditional use sites are no longer accessible by boat due to mud flats, sand bars, and log jams.

[765] Athabasca Chipewyan explained that two hunting seasons depend on river flows: a short spring hunt, which happens after spring breakup and involves beaver, muskrat, and waterfowl, and a longer fall hunt from late August to the end of October that involves moose and waterfowl. Athabasca Chipewyan said several factors hinder their ability to navigate:

- Continued water withdrawals by industry exacerbate low water levels and impede Athabasca Chipewyan members' ability to access areas along the river to hunt, trap, fish, and gather and carry out cultural practices on the land.
- Climate change has impacted flows resulting in less access to Athabasca Chipewyan's territory. They presented a summary of projected climate change simulations that predict river flows to continue to decrease by 20–40 per cent through the 21st century.
- Inadequate thresholds in the *Surface Water Quantity Management Framework* under *LARP*. Athabasca Chipewyan said thresholds don't recognize aboriginal flows and are not sufficient to support navigation.

[766] Athabasca Chipewyan's community-based monitoring program has identified relationships between river flow at Fort McMurray and water depth downstream in the Peace-Athabasca Delta. The data shows that depths at key tributary and distributary points in the delta are often less than 120 cm when flow at Fort McMurray is less than 500 m³/s, and are usually more than 120 cm when flow at Fort McMurray is above 700 m³/s.

[767] Athabasca Chipewyan said this data supports their request that Syncrude should be required to reduce or stop water withdrawals when flow at Fort McMurray is at what they call the aboriginal extreme flow of 500 m³/s. They said that as flows in the river between Fort McMurray and the Peace-Athabasca Delta decline from 800 m³/s to 300 m³/s, there is a progressive loss of access to side and back channels. At a river flow rate of 500 m³/s, loss of access was described as widespread.

[768] Athabasca Chipewyan asked that Alberta be required to make significant changes to the *Surface Water Quantity Management Framework*. One of those changes would be to incorporate the aboriginal extreme flow which would allow for a navigation depth of 1.2 m for a fully loaded, outboard motor boat, including startup.

[769] Athabasca Chipewyan did not identify any concerns about its ability to navigate on the MacKay River. In fact, their evidence is that they currently use the MacKay River to hunt from boats and to carry out other traditional activities.

[770] Syncrude presented evidence on navigability in response to concerns raised by Athabasca Chipewyan. Its analysis compared the baseline case (current conditions on the Athabasca River) which included Syncrude's water withdrawals from the Athabasca, with the application case, and found they could not distinguish any difference in flows between the baseline and application case. They concluded

that the MLX project will not impact flows and navigation on the Athabasca River. They also submitted that the MLX project would have little impact on water levels in the MacKay River, and as a result would not impact Athabasca Chipewyan's ability to navigate on the MacKay.

Analysis and Findings

[771] Athabasca Chipewyan did not provide any evidence that would link water flows on the Athabasca River directly with the MLX project. Athabasca Chipewyan's analysis focused on historical and potential future trends in river flows and described how navigability and traditional land access decreases with river flow.

[772] The MLX project does not include any application to withdraw water from the Athabasca River. The licence applied for in the MacKay River watershed is not expected to result in any measurable change to water levels at the MacKay River.

[773] Athabasca Chipewyan asserted that navigability is a protected treaty right or an incidental right. Even if it were, the panel does not have to consider the question, as we have no evidence that Athabasca Chipewyan's ability to navigate in the Athabasca River is impacted, directly or indirectly, by the MLX project.

[774] We accept Athabasca Chipewyan's analysis that water levels in the Athabasca River are decreasing and are predicted to continue to decrease. We agree with Syncrude that navigation on the Athabasca is a long standing regional issue that is not impacted by the applications before us. We have discussed water quantity elsewhere in this decision where we note that traditional navigation is an item identified for further work under the *LARP Surface Water Quality Management Framework*. Athabasca Chipewyan's concerns about the adequacy of the *Surface Water Quality Management Framework* are outside of our jurisdiction.

Plant Harvesting

[775] Based on community traditional land use studies provided, Syncrude found that plant harvesting and berry picking occurred throughout the local and regional study areas. The traditional land use studies showed that these activities have declined from historical levels but did not contain any information about specific harvesting locations or current plant harvesting activities.

[776] Athabasca Chipewyan said in its written submissions that members historically picked cranberries and blueberries. They reported plant harvesting in the project footprint but did not note the specific types of plants harvested. Roy Ladouceur said he gathers traditional medications in the Athabasca River watershed; however, he did not indicate whether this is done near the MLX project. James Ladouceur told us he collects plants for medicines in the MacKay River corridor.

[777] Syncrude said the project will remove 2175 ha of moderate potential traditional land use plant habitat, 117 ha of highly ranked habitat, and 899 ha of medium-ranked edible-berry-producing habitat. Its assessment looked at traditional-use-plant potential and berry potential using data collected from 190 vegetation survey plans. Syncrude said that under the final closure scenario, traditional use plant potential will increase by 39 per cent for moderate-ranked areas.

[778] In response to information requests from Athabasca Chipewyan, Syncrude acknowledged that the MLX west local study area is a moderate host of traditional plants, including Labrador tea, diamond willow fungus, black spruce, rat root, yarrow, poplar, and birch, and that traditional plants are gathered throughout the regional study area.

[779] Athabasca Chipewyan expressed concern that the MLX project area is very unlikely to be reclaimed to support traditional native plant species equivalent to pre-disturbance conditions. They believe Syncrude's reclamation plans will result in a less diverse plant system with significantly fewer species and communities.

[780] Athabasca Chipewyan provided research conducted by Management Solutions and Environmental Sciences (MSES) to state that disturbed areas and reclaimed areas are prone to facilitate invasive plants and non-native plant species, and that changes in vegetation composition could have lasting effects on ecosystem function. MSES indicated that any changes in the ecosystem could have consequences for numerous wildlife species, but particularly to old-growth-dependent species such as caribou and fisher.

[781] Athabasca Chipewyan also said dust from construction and operation of the MLX project might gather on vegetation and plants ingested by wildlife or harvested by community members for medical or other traditional use purposes.

[782] Syncrude said it has committed to several mitigation and monitoring measures to reduce MLX project effects on vegetation, including its reclamation plans at closure of the project. One of Syncrude's objectives is to provide a diverse range of plant species at the start of reclamation in order to increase the potential for reclaimed sites to evolve to biodiversity levels consistent with the pre-development stage.

[783] Syncrude said its plans for revegetation meet the minimum requirement in Cumulative Environmental Management Association revegetation guidelines, which include planting 8 species of trees and 25 shrub species. Syncrude said it will achieve the minimum requirements and that any additional planting will be based on the needs of the area and moisture regime. Syncrude also said that the reclamation engagement focus group will provide input to ensure the traditional species are included in reclamation plans.

[784] Syncrude spoke of its research efforts into reclamation activities that would support plant habitat and wildlife habitat in the final closure landscape. They have also committed to providing annual reports to the reclamation engagement focus group on the results of this work.

[785] Athabasca Chipewyan proposed that Syncrude should support community based programs, including monitoring of vegetation, to increase Athabasca Chipewyan confidence in wild foods.

Analysis and Findings

[786] Syncrude's evidence is that the MLX project will disturb roughly 100 ha of highly ranked habitat and over 2000 ha of moderate-potential plant habitat. This is a significant amount of plant habitat that won't be reclaimed for over 100 years. Athabasca Chipewyan has valid concerns that at final reclamation the site might not present an ecologically diverse ecosystem sufficient to support traditional plant harvesting activities equivalent to pre-disturbance.

[787] Athabasca Chipewyan did not provide evidence of its members using specific locations in proximity to the project to harvest plants. At the hearing two traditional land users said they collect plants for medicine and traditional foods along the river corridors.

[788] The panel finds that efforts are needed to increase Athabasca Chipewyan's confidence in Syncrude's research and monitoring activities related to reclamation of the MLX project. Athabasca Chipewyan has traditional knowledge that can be used by Syncrude to support its goal of reclaiming the site to an ecologically diverse ecosystem, equivalent to pre-disturbance stage. Therefore, the panel has made a condition requiring Syncrude to consult with Athabasca Chipewyan as described in the Wildlife section of this decision.

Cumulative Impacts on Treaty Rights and Traditional-Use Activities

[789] Athabasca Chipewyan maintained that the project-specific consultation conducted by the ACO on behalf of the Crown does not result in meaningful consideration of cumulative impacts on treaty rights and traditional use activities. They submitted that the cumulative impact from oil sands development puts them at a tipping point in terms of being able to continue to practice traditional activities and preserve their culture.

[790] In its February 2019 report, the ACO noted that Athabasca Chipewyan raised concerns with the *LARP*'s lack of regulatory indicators, thresholds or limits, and incompleteness of the *LARP*'s management frameworks. The ACO said these are general policy concerns that are more appropriately addressed in forums other than the project-specific consultation process. It also recommended that the AER consider Athabasca Chipewyan's evidence on cumulative effects to the extent it may inform the panel's regulatory decision.

[791] Athabasca Chipewyan said the panel has a duty to protect them from project and cumulative effects. In support of this, they said the Supreme Court of Canada decision in *Clyde River (Hamlet) v. Petroleum Geo-Services Inc.*, 2017 SCC 40, give rises to a “special public interest” that supersedes other concerns typically considered by tribunals tasked with assessing the public interest.

[792] Syncrude objected to Athabasca Chipewyan’s assertion that its treaty rights give rise to a special public interest. It said treaty rights do not trump its right to take up land for mining. Syncrude added that its ability to develop the resource is in fact acknowledged by Alberta’s requirement that First Nations should be consulted on the development of those resources.

[793] Syncrude’s position is that a hearing on the MLX project is not the appropriate forum to consider the adequacy of the *LARP*, any of its frameworks or establishment of caribou ranges. They proposed that the panel’s jurisdiction is limited to considering project-level effects. They also said they had completed the project’s EIA in accordance with the terms of reference issued by the AER.

[794] Athabasca Chipewyan said Syncrude’s EIA did not properly consider cumulative impacts and as a result impacts of the project are underestimated. They maintained that the cumulative incremental impacts from MLX are so significant that they must be offset with appropriate “no net loss” benefits.

[795] Athabasca Chipewyan pointed to the amount of industrial disturbance in the regional study area to demonstrate what they described as an ecological tipping point: using their “zone of influence” methodology, 65 per cent of the terrestrial regional study area was disturbed in 2016, and the number of habitat patches increased by 33 per cent between 2014 and 2016. Their expert said that at the current rate of disturbance, by 2039 the regional study area would be completely disturbed. At that point in time there would be no area in the terrestrial regional study area where a person or animal is further than 250 m from an industrial activity.

[796] Athabasca Chipewyan said that cumulative sensory impacts—noise, smell, visibility, nearness—of multiple developments have significant qualitative impacts on their enjoyment of the land and on their quality of life. All of these impacts combine to disrupt their members’ connection to the land and to their sense of place.

[797] Syncrude disagreed that its EIA did not adequately assess the cumulative effects of the MLX project. Mr. Hartman explained that each of the scenarios assessed—baseline, application, and planned development cases—as defined, are cumulative. The baseline case considered the impacts—land disturbance, air emissions, water use, and terrestrial impacts—of all existing and approved projects. The next level, the application case, determined the effects of the MLX project added to the baseline case, which, in effect, is a cumulative impact on the baseline case. The planned development case assessed the additional impacts of future known projects to determine the overall or cumulative impact.

[798] Athabasca Chipewyan's traditional territory is 6.6 million ha (about 66 000 km²) compared with the 6731 ha that will be taken up by the MLX project. The amount of land taken up for the MLX project equates to roughly 0.1 per cent of Athabasca Chipewyan's traditional lands. Syncrude's analysis showed that in the application case, total regional disturbance to Athabasca Chipewyan's traditional territory would be 191 931.8 ha, or 2.9 per cent.

Analysis and Findings

[799] A traditional land use activity, such as hunting, cannot be reasonably exercised without intact ecosystems and access to traditional resources. Also, Athabasca Chipewyan members must be able to practise their traditional activities in order to transmit traditional knowledge—about plants for food or medicine; about areas where ancestors lived or are buried; and about locations for preferred species and places that offer sanctuary.

[800] In our pre-hearing scoping decision we informed the parties that cumulative effects on the participants' aboriginal and treaty rights and traditional land uses, to the extent those affects may arise from or be caused by the proposed project, are in scope.

[801] We are convinced by the evidence before us that in the baseline assessment case there is already a significant and adverse effect to Athabasca Chipewyan's ability to carry out traditional activities in the mineable oil sands region. The fact that there is no evidence of caribou sightings in the MLX area is one example of an impact on a species that holds cultural and traditional value to Athabasca Chipewyan.

[802] In the evidence we found some thresholds—for example, ambient air quality standards for NO_x—to be exceeded at the regional level. Low water levels in the Athabasca River are also a concern; however, this condition is also long-standing, seasonal, and impacted by climate change. Industrial withdrawals exacerbate the situation during low flows. However, we find no impact on water levels in the MacKay or Athabasca Rivers or on Athabasca Chipewyan's ability to navigate as a result of MLX.

[803] Athabasca Chipewyan raised concerns about impacts at Dogrib Creek, but we have no evidence that those impacts are connected to the MLX project. There is probably sensory impact from the existing Mildred Lake facility, but that is not before us.

[804] Based on the evidence before us, we find that the MLX project does not make much of an incremental impact in the application case, or the planned development case. Where we found incremental impacts—e.g., in NO_x emissions—we have made approval conditions to address these impacts. We found there is an incremental impact on Athabasca Chipewyan's ability to hunt moose and harvest plants for traditional use in locations that will become the MLX project footprint, particularly at MLX west. We have made approval conditions to mitigate this impact.

[805] From an ecological perspective we do not agree that the ecosystem is at an ecological tipping point. We understand a tipping point to mean that there is no going back, or no correction. The cumulative effects of oil sands development in the area near the MLX project are significant. However, Syncrude's EIA shows only small incremental effects as a result of the MLX project. Where impacts exist, such as NO_x exceedances, or low water levels in the Athabasca River, these are being dealt with regionally under *LARP*. We also acknowledge that one of the outcomes of the *LARP* is to maximize the economic potential of oil sands.

[806] We are not persuaded that development of the MLX project will interfere with Athabasca Chipewyan's ability to exercise its treaty rights at the regional level or throughout its traditional territories. In reaching this decision, we balanced Athabasca Chipewyan's treaty rights against Syncrude's ability to develop its resources in an area for which the desired outcome, as designated under the *LARP*, is to optimize the economic potential of the oil sands resource. We find that any incremental impacts on Athabasca Chipewyan can be mitigated by standard regulatory conditions and by conditions made in this decision.

[807] We encourage Alberta to continue its work on establishing thresholds and limits to address ecological impacts in the Lower Athabasca region, and to also continue to engage Athabasca Chipewyan in these activities.

Decision – Mildred Lake Extension Project

[808] Syncrude applied under section 13 of the *Oil Sand Conservation Act (OSCA)* to construct, operate, and reclaim the Syncrude Mildred Lake Extension (MLX) project. The MLX project is designed to sustain bitumen production after the current Mildred Lake mine pit is depleted. In support of its *OSCA* application, Syncrude provided its mine plan and identified the infrastructure necessary for the MLX project. The *OSCA* application was assessed based on the requirements of AER *Directive 082*, AER *Directive 023*, AER *Directive 038*, and AER *Directive 071*.

[809] To approve an application under *OSCA*, the AER must find it to be in the public interest. One of the purposes in *OSCA* is to “ensure orderly, efficient and economical development in the public interest of the oil sands resources of Alberta.” Also, section 15 of *REDA* and section 3 of the *REDA General Regulation* require us to consider the social and economic effects, environmental effects, and effects on landowners of a project.

[810] Section 30 of *REDA* requires us to act in accordance with *LARP* and its sub-regional plans. In particular, we must decide whether approval of the MLX project is consistent with the regional outcomes identified in the *LARP*. Relevant outcomes are to optimize the economic potential of oil sands resources and to ensure that the landscape can maintain ecosystem function and biodiversity taking into account

land disturbance and habitat impact. *LARP* also requires us to consider impacts on the ability of First Nations to exercise their rights in “reasonable proximity to First Nations population centres.”

[811] To determine whether the project is in the public interest, as required under *OSCA*, we considered all the submissions, evidence, and relevant legislation, Syncrude’s proposed mitigations and commitments, as well as the conditions imposed by this panel. We weighed impacts on Athabasca Chipewyan’s treaty rights and traditional use activities, the social and economic impacts of the MLX project, and the impacts on the environment.

[812] We find that the economic and employment benefits of the project in terms of their contribution to the regional and provincial economy and to the local and provincial tax base are considerable. We find that adverse impacts on Athabasca Chipewyan, in particular on their ability to continue to conduct traditional activities can be adequately mitigated through standard approval conditions and conditions imposed by the panel.

[813] We also find that potential impacts on Athabasca Chipewyan are not enough to outweigh the economic benefits that will accrue to Alberta from the MLX project.

[814] Taking all the above into consideration, we find the Syncrude MLX project is in the public interest.

[815] We find the MLX project to be consistent with the *LARP* objective of optimizing Alberta’s oil sands resources and ensuring First Nations’ ability to continue to carry out traditional activities within reasonable proximity to population centres.

[816] Where the MLX project contributes to regional cumulative impacts, we find that the conditions imposed by the panel are sufficient to mitigate these impacts. We were not persuaded by evidence presented by Athabasca Chipewyan that the MLX project presents a “tipping point” to the ecological integrity of their traditional lands or to their ability to continue to exercise their treaty rights. Any impacts that do arise from MLX and potentially impact Athabasca Chipewyan have been considered in our weighing of the public interest balance under *OSCA*. We also find that some regional environmental impacts, in particular low water levels in the Athabasca River, are pre-existing, not attributable to the MLX project, and are more appropriately addressed in processes established under the *LARP*.

[817] Based on the evidence provided within the filed application and through the proceeding, together with conditions imposed by this panel, Syncrude’s *OSCA* application is consistent with the purposes of the *OSCA* including but not limited to ensuring the orderly, efficient, and economic development in the public interest of the oil sands resources of Alberta.

[818] As a result, the panel approves *OSCA* Application No. 1820856 for the MLX project, subject to the conditions listed in the approval, which is attached at the end of this report. The panel requires Syncrude to comply with the *OSCA* approval during the life cycle of the Syncrude MLX project.

[819] Based on the evidence provided within the filed applications and through the proceeding, together with standard approval conditions and conditions imposed by this panel, Syncrude's *Environmental Protection & Enhancement Act (EPEA)* application to construct, operate, and reclaim the MLX project meets the general provisions of *EPEA* to protect the environment while promoting responsible resource development. In arriving at this decision, we took into account *EPEA* requirements and applicable AER directives, standards, and guidelines. We considered mitigations proposed by Syncrude to meet the regulatory requirements and to address Athabasca Chipewyan's concerns, particularly their concerns about land disturbance, habitat loss and their ability to continue to practise traditional activities.

[820] The panel has imposed additional conditions that we believe will result in meaningful outcomes for Athabasca Chipewyan. We find that with conditions from the panel, the impacts on Athabasca Chipewyan can be adequately mitigated. As a result, the panel approves *EPEA* Application No. 034-00000026 for the MLX project, subject to the conditions listed in the approval, which is attached at the end of this report. The panel requires Syncrude to comply with the approval during the life cycle of the project.

[821] Based on the evidence within the filed applications and through the proceeding, together with standard approval conditions and conditions imposed by this panel, Syncrude's *Water Act* application for the MLX project is consistent with the purpose of the *Water Act* to support and promote the conservation and management of water, including the wise allocation and use of water. These conditions will address Athabasca Chipewyan concerns related to water quantity. As a result, the panel approves *Water Act* applications No. 005-00263298 and No. 001-00363203 for the MLX project, subject to the conditions listed in the approval and licence, which are attached at the end of this report. The panel requires Syncrude to comply with the *Water Act* licence and approval during the life cycle of the MLX project.

[822] Based on the evidence within the filed applications and through the proceeding, together with standard approval conditions and conditions imposed by this panel, Syncrude's *Public Lands Act* applications to expand its mine, reduce its current mine boundary and construct a temporary and then a permanent bridge crossing the MacKay River are consistent with the principles of the *Alberta Land Use Framework*, *Lower Athabasca Regional Plan (LARP)* and the integrated resource plans in the region taking into account economic growth, maintaining a healthy environment and the local communities recreational and cultural opportunities. As a result, the panel approves the amendment to MSL 352.

[823] The ACO has not provided advice to the AER regarding the adequacy of Crown consultation for MSL 170423 and MSL 170430, and therefore the panel cannot approve those applications. Except for the absence of advice from the ACO with regard to MSL 170423 and MSL 170430 which meet all relevant

requirements, we did not identify any reasons that these applications should not be approved, though approval would be subject to the following conditions:

- Syncrude provides detailed engineering plans for the temporary and permanent MacKay River bridges prior to construction.
- In order to ensure notice is provided to the registered trappers within the project area which may be impacted by activities, Syncrude will be required to contact the registered trappers identified on an activity standing search report by registered mail at least days prior to commencing any activity.

[824] The panel remits MSL 170423 and MSL 17430 back to the AER.

[825] Also, the panel recommends that in addition to adhering to the Alberta Trapper Compensation program, that Syncrude should maintain ongoing communication with the affected trapline holders to minimize impacts.

[826] The panel requires Syncrude to comply with the Public Lands approval (disposition) for MSL 352 during the life cycle of the MLX project.

[827] The panel's decisions on the TMP are summarized in the beginning of the next section.

Mildred Lake Tailings Management Plan

Summary and Decisions

[828] This section provides a summary of the panel's consideration and decisions for the tailings management plan for the existing Mildred Lake operations and the MLX project. Our analysis and findings, decisions, and relevant conditions for each topic are discussed within subsequent sections of this report.

Mildred Lake Tailings Management Plan

[829] We find that several items in the Mildred Lake tailings management plan do not meet the intent of the *TMF* or *Directive 085: Fluid Tailings Management for Oil Sands Mining Projects (Directive 085)*. The end of mine life for Mildred Lake and the MLX project is near. To address these deficiencies and provide a comprehensive tailings management plan, we require Syncrude to submit to the AER an updated tailing management plan on or before January 31, 2023. This updated tailings management plan must be aligned with the intent of the *TMF* and *Directive 085* and address the issues raised in the report.⁵⁴

[830] The updated tailings management plan must ensure that fluid treatment capacity is equal to or greater than the production rate of fluid tailings. Treatment capacity equal to production capacity must be achieved by December 31, 2025, ten years after the Tailing Management Framework was issued.

⁵⁴ OSCA Amendment Approval OSCA – 17

Base Mine Lake

[831] Base Mine Lake is a previously approved demonstration lake and should continue as a demonstration. We recognize that extensive research on water-capped tailings continues and Alberta will likely be developing direction and performance criteria for water-capped pit lakes. For Base Mine Lake, Syncrude is required to meet future direction and performance criteria for water-capped pit lakes. Although Syncrude has identified 2023 as a date by which water capping of fluid tailings might be successfully demonstrated at Base Mine Lake, there is significant uncertainty about whether the technology will be successfully demonstrated by this date.

[832] By September 30, 2020, Syncrude is required to provide a conceptual alternative technology plan that will demonstrate the treatment of 173.7 Mm³ of fluid tailings currently placed in Base Mine Lake to satisfy the requirement set out in section 4.6 of *Directive 085* and if Base Mine Lake demonstration does not prove viable.⁵⁵

North Mine Centre Pit

[833] Syncrude proposed to store a substantial volume of fluid tailings, 250.5 Mm³, at North Mine centre pit and to treat this volume via water-capping. The final configuration of the lake and water-capping of these tailings is not approved at this time as Syncrude has not demonstrated the sustainability of the proposed lake.

[834] Placement of untreated fluid tailings in pit starting in 2027 is not approved at this time. Deposition of centrifuge cake in North Mine centre pit can start in 2020, but water capping of the centrifuge cake is not approved at this time.⁵⁶

[835] Syncrude is required to provide an updated design for North Mine centre pit by September 30, 2020, that addresses the issues set out in the North Mine Lake section, including the ability of the watershed to support the proposed lake, and including the requirements of section 4.6 of *Directive 085*.⁵⁷

[836] Also, by September 30, 2020, Syncrude is required to provide a detailed alternative technology plan to treat the 250.5 Mm³ of fluid tailings currently planned to be placed in North Mine centre pit. This alternative technology plan is a requirement set out in section 4.6 of *Directive 085*, when water-capping is proposed as the primary technology. The plan may include any or a combination of the alternative technologies. The plan must include a detailed implementation timeline, costs, risks, benefits, and an assessment of implications for the mine plan. If, by 2023, water capping has not been demonstrated as

⁵⁵ OSCA Amendment Approval Condition – 22

⁵⁶ OSCA Amendment Approval Condition – 41

⁵⁷ OSCA Amendment Approval Condition – 20

viable and has not been approved, this plan must be capable of treating all new and legacy tailings at the Mildred Lake site within 10 years of the end of mine life as required by the *TMF* and *Directive 085*.⁵⁸

Treatment Technologies

[837] Syncrude identified a number of technologies that it is planning to use for treatment of fluid tailings. In addition to water capping, the technologies that are proposed to treat significant volumes of tailings are composite tailings and centrifugation.

[838] Continued use of composite tailings technology is approved as proposed for South West In-Pit, North Mine South Pit-Sand, and North Mine north pit.

[839] Continued use of centrifugation to treat fluid tailings is approved. Demonstration of deep centrifuge cake deposits is approved for North Mine south pit. Deposition of deep centrifuge cake in North Mine centre pit and in MLX west dedicated disposal area 1 and dedicated disposal area 2 is conditionally approved⁵⁹, subject to satisfying monitoring and reporting requirements for deep centrifuge cake deposits and incorporating learnings into deposit design and operation. Water capping of centrifuge deposits is not approved at this time.⁶⁰

Profile

[840] There are a number of concerns with the fluid tailings profiles as proposed. Continued growth in new fluid tailings accumulation to end of mine life (i.e., by 2036) is not consistent with the *TMF*. Greater effort is required to ensure tailings treatment capacity is equivalent to tailings production. The profiles rely heavily on water-capping technology that is subject to further assessment and government direction.

[841] The fluid tailings profiles are approved to the end of 2023. Syncrude is required to provide, by January 31, 2023, updated legacy and new fluid tailings profiles. The updated profiles must reflect all available information on water-capping technology (i.e., water-capping technology demonstration by Base Mine Lake) and decisions on North Mine centre pit and Base Mine Lake. The updated profiles must be supported by evidence to justify the technology assessment and associated ready-to-reclaim criteria, including the timing when ready-to-reclaim status is achieved. The updated profiles must also be aligned with *TMF* guidance.

Ready-to-Reclaim Criteria, Sub-Objective 1

[842] For water-capped deposits at Mildred Lake, Syncrude is required to submit, by January 31, 2023, an assessment of the applicable ready-to-reclaim criteria and ready-to-reclaim trajectory for fluid tailings

⁵⁸ OSCA Amendment Approval Condition – 21

⁵⁹ EPEA Amendment Approval Conditions – 3.3.43 and 3.3.45

⁶⁰ OSCA Amendment Approval Condition – 19

in a water-capped lake. The ready-to-reclaim criteria and trajectory must include water-cap stratification, water quality, and other aspects of performance. The ready-to-reclaim criteria and ready-to-reclaim trajectory must account for the specific tailings streams in the lake.

[843] Sincruide cannot remove water-capped tailings from the fluid tailings profile until ready-to-reclaim criteria have been approved by the AER and the deposit satisfies the ready-to-reclaim criteria.

Composite Tailings

[844] We accept using solid content as the ready-to-reclaim criterion for composite tailings subject to conditions. Sincruide is required to update ready-to-reclaim criteria for composite tailings deposits to reflect other meaningful measures that Sincruide already employs to guide composite tailings deposit operation, capping, and reclamation.

Centrifuged tailings

[845] We accept using solids content as a measure for ready-to-reclaim criteria sub-objective 1 for centrifuged cake material, subject to conditions. We accept 50 per cent solids content by weight for treated fluid tailings as the initial ready-to-reclaim criterion. We do not accept the ready-to-reclaim trajectory as proposed.

Ready-to-Reclaim Criteria, Sub-Objective 2

[846] The criteria proposed for protection of seepage to groundwater and surface water and monitoring of groundwater are accepted.

Ongoing Stakeholder and Indigenous Community Engagement

[847] Both the *TMF* and *Directive 085* highlight the importance of involving stakeholders and indigenous communities in tailings management. Given this overarching principle, Sincruide is required to

- engage with stakeholders and indigenous communities on the activities undertaken in respect of tailings management, including research and monitoring;
- engage with stakeholders and indigenous communities on its water-capping technology demonstration, including research and monitoring;
- conduct an annual forum; and
- report to the AER on its engagement activities.⁶¹

⁶¹ OSCA Amendment Approval Conditions – 15, 16

Background

[848] Tailings are a by-product of the process used to extract bitumen from mined oil sands and consist of water, silt, sand, clay, and residual bitumen.

[849] In December 2014, Syncrude submitted the MLX project application, including the MLX tailings management plan. The tailings management plan was intended to respond to the requirements of the AER's 2009 *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes (Directive 074)*. In March 2015, Alberta published the *TMF*. The *TMF* provides policy direction to the AER to manage fluid tailings volumes during and after mine operations. Subsequently, AER published *Directive 085* to replace *Directive 074*. *Directive 085* sets out requirements for managing fluid tailings volumes for oil sands mining projects that are consistent with the *TMF*.

[850] In 2015, there was 470 Mm³ of fluid tailings accumulated at Mildred Lake. Continued mining operations at Mildred Lake and the development of the MLX project will generate new fluid tailings. To avoid the addition of any new external tailings areas for MLX, Syncrude proposes an integrated tailings management operation for the existing Mildred Lake operations and the MLX project. In early 2016, to respond to the requirements of *Directive 085*, the integrated tailings management plan for Mildred Lake and MLX was combined with the MLX application process.

[851] Athabasca Chipewyan testified that its members do not trust tailings facilities due to perceptions of pollutants entering the Athabasca River. Athabasca Chipewyan members expressed fear that reclamation will not be successful in restoring pre-disturbance conditions and said during the hearing that they would not consider the reclaimed areas they toured for traditional land uses.

Fluid Tailings Treatment Technology

[852] The objective of the *TMF* is to minimize fluid tailings accumulation by ensuring that fluid tailings are treated and reclaimed progressively during the life of a project. The *TMF* requires that all fluid tailings must be treated with an accepted technology.

[853] The *TMF* contemplates reclamation to a stable landscape that comprises a diverse, locally common, and self-sustaining ecosystem.

[854] *Directive 085* requires operators to justify selected technologies as the best available for the project and to provide sufficient information for the AER to assess the appropriateness of the technologies. *Directive 085* section 4.6 outlines the requirements for each proposed technology and states that the associated risks, benefits, and trade-offs must be understood and have contingencies identified and risks mitigated. Section 4.6 also requires that in cases where water-capped fluid tailings technology is used to generate the inventory forecast in the profiles, an alternative treatment technology to treat equivalent volumes of fluid tailings with associated implementation time frames, must be provided.

[855] End of mine life for Mildred Lake, including MLX, is only 17 years away (2036) and is fast approaching. The volume of fluid tailings on the Mildred Lake site is extensive, and the existing Mildred Lake North Mine and MLX project will continue generating fluid tailings. In 2019, the total volume of fluid tailings on the Mildred Lake site is 495 Mm³.

[856] Syncrude evaluated a number of technologies for treatment of fluid tailings, including fluid tailings water capping, fluid tailings centrifuging, composite tailings, fluid tailings and overburden co-mixing, and accelerated dewatering. Syncrude compared these technologies using factors such as availability of existing processing facilities, technology footprint, closure plan, technology risk, net environmental impacts, and economic factors. After considering these factors, Syncrude proposed to use fluid tailings water-capping, fluid tailings centrifugation, and composite tailings technology as preferred tailings treatment technologies.

[857] To reduce the volume of fluid tailings, Syncrude mainly relies on water-capping and centrifugation technology. Syncrude proposed to place a total of 424.2 Mm³ of fluid tailings in water-capped deposits and treat about 282 Mm³ via centrifugation from 2019 to 2047, 10 years after end of mine life. Syncrude will also treat about 28 Mm³ via composite tailings from 2019 to 2031. Syncrude did not specify the volume of tailings that will be treated using overburden co-mixing or accelerated dewatering. Syncrude said that it would continue exploring different tailings treatment technologies.

[858] Syncrude proposed additional centrifuge capacity, co-mix, and accelerated dewatering as alternatives for water-capping without providing the required details set out in section 4.6 of *Directive 085*.

[859] Syncrude maintained that there is sufficient flexibility in operations and the closure plan to accommodate any of the alternative technologies in order to create a viable closure landscape.

[860] We discuss the technologies for treatment of fluid tailings evaluated by Syncrude, including alternatives to water capping, in the sections below.

Centrifugation of Fluid Tailings

[861] The fluid tailings are removed from the tailings ponds, and a small amount of additive is added to bind the particles together. The mixture is then pumped into a centrifuge where the water is spun out, and dewatered tailings or centrifuge cake is produced and placed in different deposits.

Evidence

[862] Syncrude currently uses centrifugation technology to treat fluid tailings. Syncrude proposes to operate its centrifuge plant to treat about 9.5 to 11.0 Mm³ per year of fluid tailings from the Mildred Lake and MLX projects. Syncrude is proposing to continue operating the centrifuge plant after MLX end of mine life until 2064 to treat froth fluid tailings from Aurora North and Aurora South. Syncrude will place

the resulting centrifuge-treated tailings in MLX west. However, Syncrude expressed concern about the high cost of long-hauling centrifuge cake to MLX west and will be looking for opportunities in future plans to reduce the amount of the cake hauled to MLX west.

[863] Syncrude said that the capping design and reclamation of centrifuge cake in deep deposits is in the demonstration stage and requires management of deposit settlement. Syncrude is currently placing centrifuge cake in North Mine south pit-cake deposit, and proposes to place cake in North Mine centre pit-cake, and MLX west dedicated disposal area 1 and MLX west dedicated disposal area 2.

[864] In 2014, Syncrude started a field test to investigate the capping and subsequent trafficability of centrifuge cake in deep deposits. The test deposits were filled with 10 m of centrifuge cake material sourced from Syncrude's fine fluid tailings Centrifuging Commercial Demonstration Plant (at an initial solids content of 50 per cent). To test potential mitigation measures for future full-scale deposits, one of the test cells was constructed with a geotextile layer installed on top of the cake surface. Shortly after the deposits were filled with cake, the test cells were mechanically capped with coke. In 2015, the deposits were successfully capped with a layer of Kc clay to form a trafficable surface. Syncrude will continue to monitor the performance of these deposits.

[865] Syncrude maintained that the operation of centrifuge technology is energy intense and produces the most greenhouse gases compared with other technologies. Syncrude also indicated that expanding centrifuge capacity will require high capital and operational costs. Syncrude said that the capital cost of the existing centrifuge plant at Mildred Lake was about \$1.9 billion and the capital cost for the expansion of centrifuge capacity would not be as high, but still high.

Analysis and Findings

[866] We accept that the use of centrifuge technology to treat fluid tailings has been commercially demonstrated by Syncrude. Syncrude is in the process of scaling up deep centrifuge-cake deposits and testing the capping of deep deposits. Some uncertainties remain with the long-term consolidation performance of deep centrifuge cake deposits, deposit settlement, and the ability to establish functioning ecosystems over such deposits.

[867] The quality of the water expressed from the centrifuge cake is also uncertain and may contain contaminants that could adversely affect reclamation materials or enter the final ecosystems, such as wetlands or end pit lakes.

[868] We note that the use of Kc material has the potential to improve centrifuge cake deposit performance by improving trafficability and deposit settlement uncertainties. Syncrude is required to continue evaluating the application of Kc material in centrifuge cake deep deposits.

[869] We understand that Suncrude is currently conducting a demonstration of a deep centrifuge cake deposit in the North Mine south pit. We expect Suncrude to continue this demonstration and to use learnings from the demonstration to evaluate or resolve uncertainties about cake performance, capping techniques, capping designs and performance, and capping material needs, and to provide information to better understand progressive reclamation timelines and reclamation outcomes.

[870] Suncrude is required to monitor and report on performance modelling and performance criteria for the deep centrifuge cake deposit demonstration in the North Mine south pit including consolidation modelling/performance, capping research, reclamation research, each deposit plan, and material tracking. Suncrude is also required to monitor and report to the AER the progress and performance of the deep centrifuge cake deposits planned for the North Mine centre pit and MLX west.

Co-Mixing of Fluid Tailings with Clay Overburden

Evidence

[871] Suncrude has identified fluid tailings and clay overburden mixing (co-mix) as a potential alternative fluid tailings treatment technology. The mixing process results in the absorption of pore water from fluid tailings into the clay lumps of the overburden material. Since 2012, Suncrude has conducted a series of tests ranging from laboratory testing to field pilots. Suncrude indicated that the implementation time frame for co-mix is from 2026 to 2035. Currently, Suncrude is planning to begin construction of a commercial demonstration of the technology from May to October 2019.

[872] Suncrude has identified the North Mine centre pit and the MLX west pit as potential deposition areas. Suncrude said that application of co-mix would most likely provide terrestrial or wetland ecosites in the closure landscape.

Analysis and Findings

[873] We acknowledge that Suncrude is currently conducting a commercial demonstration of co-mix technology. We encourage Suncrude to continue the assessment of this technology. If successful, Suncrude is expected to apply the technology to treat larger volumes of tailings and reduce its reliance on water capping.

[874] Suncrude did not provide all of the information about co-mixing technology as set out in section 4.6 of *Directive 085*. Suncrude also did not identify the volume of the fluid tailings that could be treated by co-mixing. If Suncrude chooses to apply co-mixing as a technology to treat fluid tailings, it will be expected to provide the AER with a co-mixing plan that satisfies the requirements of *Directive 085*.

Accelerated Dewatering

Evidence

[875] Syncrude identified accelerated dewatering as another potential technology option for treatment of fluid tailings. Syncrude indicated that the implementation time frame for this technology is after 2027. Currently, a field pilot for accelerated dewatering has been completed. Syncrude identified the North Mine centre pit as a potential deposition area. Syncrude said that application of this technology would provide terrestrial or wetland ecosites in the closure landscape.

[876] During the hearing, Syncrude identified consolidation rate and duration as the primary uncertainty about this technology. Current demonstration requires 15 years for the results to be ready.

Analysis and Findings

[877] Syncrude did not provide all of the information about accelerated dewatering technology as set out section 4.6 of *Directive 085*. Syncrude also did not identify the volume of fluid tailings that could be treated by this technology. Due to lack of information and the unproven nature of accelerated dewatering, we do not accept accelerated dewatering as a viable technology at this point.

Composite Tailings

Evidence

[878] Composite tailings technology combines a densified coarse sand tailings stream with controlled amounts of fluid tailings and gypsum to form composite tailings. The produced composite tailings is expected to have limited fines segregation and will release water as it consolidates.

[879] Syncrude plans to continue treating a relatively small volume of fluid tailings, roughly 30 Mm³, using composite tailings technology. Since 2000, Syncrude has been using composite tailings technology at a full commercial scale. Syncrude has placed composite tailings in East In-Pit, South West In Pit, and North Mine South Pit-Sand. Several composite tailings areas have been capped, including part of East In-Pit (Sandhill fen, King Fisher area) and part of South West In Pit (South West In Pit Junior), which comprise an area for which reclamation has been completed (e.g., Sandhill fen). This area is being monitored to evaluate ecosystem establishment.

[880] Syncrude proposes to continue use of composite tailings until 2033 and to place the treated tailings in South West In Pit, North Mine South Pit-Sand and North Mine north pit. For the composite tailings deposits, Syncrude proposes targeting mainly upland ecosites with some wetland features.

[881] Syncrude says that while fluid-tailings treatment by composite tailings technology is a mature commercial operation, the efficiency of treating fluid tailings using this technology is limited due to the expected high level of fine grains in the new ore. Furthermore, composite tailings technology capacity is

constrained by limited sand availability as Syncrude also needs sand for other priorities, such as construction of dams and capping of composite tailings deposits.

Analysis and Findings

[882] Syncrude has a long and proven record of success with composite tailings technology, including success with capping these deposits and with reclamation to a variety of target ecosites, particularly as compared to other technologies that Syncrude assessed. We accept Syncrude's plan to continue using composite tailings to treat fluid tailings, and to deposit the treated tailings in the proposed locations, subject to performance monitoring and reporting conditions.

[883] For composite tailings deposits, the panel requires that Syncrude monitor and report on consolidation modelling/performance, capping research, reclamation research, each deposit plan, and material tracking.

[884] We accept that the capacity of fluid tailings treatment using composite tailings is limited by sand availability. Therefore, composite tailings is not considered an alternative technology for the treatment of large volumes of fluid tailings currently proposed to be capped with water.

Water-Capping of Fluid Tailings

[885] Water-capping involves the placement of water above untreated or treated fluid tailings and aims to create a water-capped deposit (i.e., a pit lake) as a closure landscape feature.

Evidence

[886] Syncrude proposed water capping as its primary technology for fluid tailings treatment through placement of a substantial volume of its fluid tailings into two water-capped fluid tailings deposits:

- Base Mine Lake: Syncrude's existing water-capping demonstration began in 2012 at Mildred Lake, storing 204 Mm³ of fluid tailings.
- Proposed North Mine Lake: a proposed water-capped pit lake at Mildred Lake North Mine centre pit to store 251 Mm³ of untreated fluid tailings.

Base Mine Lake

[887] Base Mine Lake is the first full-scale demonstration of a water-capped deposit and was approved in 1993 by the Energy Resources Conservation Board. Placement of fluid tailings began in 1995 and was completed in late 2012. The Base Mine Lake demonstration began on December 31, 2012. In 2013, fresh water and oil sands process water were added to the existing oil sands process water upper layer of the lake to attain a final water elevation of 308.7 m above sea level. Infrastructure has been installed to pump water in from the Beaver Creek reservoir and pump water out to the tailings recycle water system until a more substantial upstream surface watershed is reclaimed and connected to Base Mine Lake, and until

outflow is established into the Athabasca River. This process dilutes the Base Mine Lake water cap over time.

[888] Base Mine Lake has a surface area of 7.7 km² and an average depth of 53 m. Syncrude clarified that at closure, a watershed with a surface drainage area of 387.6 km² will drain into Base Mine Lake.

[889] Syncrude indicated that since Base Mine Lake was commissioned in 2012, water quality has improved based on reductions in toxicity from acute to chronic levels. Syncrude said that normal stratification of the lake has been occurring and water-cap depth has been continuing to increase. Syncrude said that it continues to assess overall water-quality changes, fluid tailings settlement, and water-cap stratification over time.

[890] Syncrude identified a number of parameters that remain elevated, such as chloride levels that are in excess of chronic guidelines for the protection of aquatic life, and naphthenic acids. However, Syncrude is confident that through addition of fresh water and by pumping out the recycled water resulting in dilution of the water cap, chloride levels at Base Mine Lake will be reduced over time. Syncrude also said that through bioremediation of organic compounds, the naphthenic acids will be reduced over time.

[891] Syncrude indicated it has been facing challenges at Base Mine Lake, including turbidity and the presence of oil sheen and bitumen on the surface of the lake and on its shorelines. Therefore, Base Mine Lake currently requires ongoing adaptive management practices to assess and mitigate these challenges. Syncrude has assessed and applied different methods of hydrocarbon removal from the water surface and shorelines as part of its adaptive management efforts. Also, alum was added to Base Mine Lake for the management of the mineral turbidity in the lake. The addition of alum resulted in an increase in dissolved aluminum concentrations in the lake.

[892] Syncrude proposed a technology assessment milestone in 2023. Syncrude maintained that by 2023, ten years of demonstration will have occurred and a body of evidence gathered to demonstrate the viability of water-capping technology for implementation in other pit lakes. This date also coincides with Syncrude's proposal to remove 173.7 Mm³ of fluid tailings from its legacy profile in 2023. However, during the hearing, Syncrude characterized the 2023 date as an "artificial date" or a "checkpoint" rather than as a fixed date for proving the technology.

[893] Syncrude targets lakes that support ecological functions, including small-bodied fish populations for both Base Mine and North Mine Lakes. Syncrude identified a second phase of monitoring and research following the technology assessment decision in 2023. The second phase will focus on understanding lake progress toward an acceptable lake in the closure landscape that supports the ecological functions.

[894] Syncrude identified the projected date of reclamation certification for Base Mine Lake as 2057.

North Mine Lake

[895] Syncrude proposed a second water-capped deposit at Mildred Lake, located in the Mildred Lake North Mine centre pit. Syncrude proposes to begin depositing 92.2 Mm³ of centrifuge cake in the southeast portion of the North Mine centre pit in 2020 and to start placing 250.5 Mm³ of untreated fluid tailings in the North Mine centre pit in 2027. Water capping of the entire deposit begins in 2036. Syncrude proposes to fill North Mine Lake with process wastewater, specifically recycled water, and if needed, to supplement it with Athabasca River water.

[896] Syncrude said that the demonstration results from Base Mine Lake will be used to assess the viability of future water-capped lakes, including North Mine Lake, and any information from Base Mine Lake would be applied to North Mine Lake. This is the basis of the proposed removal of 250.5 Mm³ of fluid tailings from its fluid tailings profile in 2036, when water capping in North Mine centre pit begins.

[897] Syncrude identified the projected date of reclamation certification for North Mine Lake as 2084.

[898] North Mine Lake is proposed to be larger than Base Mine Lake with a surface area of 13.1 km² and an average depth of 48 m. Syncrude clarified that at closure a watershed with a surface drainage area of 91.9 km² will drain into North Mine Lake. This watershed includes the 13.1 km² lake surface area.

[899] Syncrude said that the watershed contributing to the closure lake could be increased in size, if necessary, by directing sub-watersheds that would otherwise drain to Base Mine Lake. Syncrude acknowledged that the size of watershed that would flow into North Mine Lake needs to be verified to ensure it is of an adequate size to support the lake as currently proposed.

[900] To assess the long-term sustainability of lake water levels, Syncrude used the integrated groundwater-surface water model, MODFLOW-NWT. Syncrude acknowledged that the model has not been fully calibrated or validated. The modelling was performed under historical conditions, and the climate-change scenarios are still in the early stages of development.

[901] Syncrude said that although further optimization is required, Syncrude is confident that North Mine Lake remains a viable element of the closure plan for the Mildred Lake site.

[902] Syncrude said that the water volume and quality in a pit lake containing tailings is affected by the input of fluid tailings pore water released as the tailings dewater. The water quality in a pit lake water cap, among other factors, is also affected by the volume and quality of other inflows into the lake and outflows from the lake.

[903] To evaluate surface water quality in the conceptual closure drainage plan, Syncrude used a simple mass loading approach based on source water chemistry and flow outputs from the MODFLOW-NWT hydrology model. Syncrude said that the model did not account for complex physical, chemical, or

biological processes such as aerobic degradation, sorption/desorption, oxidation/reduction, dissolution/precipitation, or flushing of deposits.

[904] Syncrude expects that these more complex processes would be included in the models for the next iteration of the closure plan, and that accuracy of water quality models will improve with time as more data is collected through monitoring programs.

[905] Based on current models, total dissolved solids and chloride concentrations in North Mine Lake are predicted to be elevated above concentrations typical for locally common boreal lakes. Syncrude provided an example model of North Mine Lake. The model predicts that in 120 years (wet or dry climate cycle) the concentration of chloride will range from 280 mg/L to 450 mg/L. The starting chloride concentration is 515 mg/L for the purpose of this model. The chloride level in the Beaver Creek reservoir is about 3 mg/L, and in the lower Athabasca River the mean chloride level is 20.2 mg/L and the peak level is 45.0 mg/L.

Analysis and Findings

[906] The panel understands that water-capping of treated or untreated tailings is subject to further assessment and research and, as set out in section 9.8.2 of *Directive 085*, Alberta will be developing more direction and performance criteria to support the assessment of water-capped fluid tailings technology.

[907] We acknowledge that Base Mine Lake is approved to demonstrate whether water-capping of fluid tailings is a viable tailings management, remediation, and reclamation option.

[908] Syncrude maintained that the demonstration results from Base Mine Lake will be used to assess the viability of future water-capped deposits, including North Mine Lake. Our analysis identified the following issues:

- The sustainability of North Mine Lake is uncertain.
- The water quality improvement of the North Mine Lake is uncertain.
- The North Mine Lake is not fully analogous to the Base Mine Lake.
- The Base Mine Lake demonstration project may not be completed in time to support selection of water capping for the North Mine centre pit.

[909] The sustainability of North Mine Lake with or without tailings placed in the pit is uncertain. The proposed North Mine Lake is larger than Base Mine Lake. However, the proposed watershed and catchment area draining into North Mine Lake is significantly smaller than the watershed that drains into Base Mine Lake. The current modelling has not been fully validated or calibrated, and seasonal changes, climate scenarios, and drought cycles weren't assessed fully in the modelling.

[910] Water quality will be critical for achieving an acceptable lake that is capable of supporting various uses, such as indigenous traditional use or recreational use. The water quality improvement in water-capped lakes, particularly North Mine Lake, remains uncertain due to many factors.

[911] In addition to uncertainties about the sustainability of the lake, the amount of water directed to a water-capped lake will affect the lake's water quality. The evidence indicated a much smaller catchment area associated with North Mine Lake than with Base Mine Lake, resulting in less water going through North Mine Lake. Furthermore, North Mine Lake is larger. Given the differences in watershed size to lake area ratios—50:1 for Base Mine Lake and 7:1 for North Mine Lake—Base Mine Lake is expected to experience a greater degree of flushing than North Mine Lake. Thus, the effect that dilution (flushing) will have on conservative parameters, such as chlorides, will be lower in North Mine Lake.

[912] Suncrude's water quality model currently cannot address more complex in-lake processes, so it is uncertain whether the model can reliably predict future water quality in North Mine Lake.

[913] In the absence of confirmation of sufficient water in the watershed, and without refined modelling approaches and supporting monitoring data, it remains uncertain whether future water quality of North Mine Lake would approach that of locally common lakes. For example, Suncrude's model indicates that after 120 years, the chloride content would exceed the chronic toxicity guideline of 120 mg/L that protects freshwater aquatic life from chloride, as defined by the Environmental Quality Guidelines for Alberta Surface Waters. Chloride concentrations are also predicted to be significantly higher than in water bodies in the region. The lack of certainty in water quality predictions and improvements could remain for many years, and in some cases, after closure.

[914] Suncrude proposes to fill North Mine Lake with different source water than Base Mine Lake. Suncrude also proposes to place centrifuge cake that contains additives and chemicals into North Mine Lake. As the pore water of centrifuge cake is released, it might create different water chemistry in North Mine Lake than in Base Mine Lake, which makes it difficult for us to accept that the results of Base Mine Lake apply directly to North Mine Lake should Base Mine Lake demonstrate that water capping is a viable tailings treatment technology by 2023.

[915] We note many differences between Base Mine Lake and North Mine Lake. While water quality in Base Mine Lake may be improving, many uncertainties remain about whether water quality will support the outcome of developing ecological functions and supporting small-bodied fish populations in North Mine Lake.

[916] There is only four years between the results of Base Mine Lake in 2023 and the start of fluid tailings placement in North Mine centre pit in 2027. Approval of water capping as a tailings treatment technology remains subject to future government and regulatory direction and to the results of the Base Mine Lake demonstration, which might not be in place before 2023.

[917] More data about the viability of water-capped lakes will become available as the initial ten-year demonstration period at Base Mine Lake concludes in 2023. However, Syncrude was uncertain about this date and qualified it as arbitrary. A demonstration of this size could take longer. If more time is required to prove the viability of Base Mine Lake as a closure feature, the time window between results of Base Mine Lake and the start of tailings placement in North Mine centre pit shrinks.

[918] In light of the above, we aren't confident that Syncrude has enough time to change course and deploy alternative technologies to treat the volume of fluid tailings proposed to be placed in North Mine centre pit.

[919] Base Mine Lake has experienced challenges and required adaptive management techniques. Such challenges include turbidity, fines suspension, and release of hydrocarbons to the lake surface and shorelines.

[920] While the need for adaptive management is not unexpected, these techniques require financial resources, extensive monitoring, and management. Sustainability of lakes beyond end of mine life and into the closure landscape is a key factor in accepting a technology. We are uncertain about the effectiveness of these techniques, how long these challenges will persist, and what will require management.

[921] We do not approve the water capping of untreated fluid tailings, deep deposit centrifuge cake, or any other treated fluid tailings at North Mine centre pit at this time.⁶² North Mine Lake, as proposed, presents uncertainties. These uncertainties do not result in confidence that the closure landscape will include a stable lake that is locally common and self-sustaining, which is the intended outcome of the *TMF*.

[922] Deposition of centrifuge cake in North Mine centre pit can begin in 2020, but water capping of centrifuge cake is not approved at this time.⁶³ Placement of untreated fluid tailings in North Mine centre pit starting in 2027 is also not approved at this time.⁶⁴ The currently proposed configuration of the North Mine lake is not approved because Syncrude has not demonstrated that the watershed can support a lake of this size.

[923] In addition to the issues with North Mine Lake discussed above, Base Mine Lake is a demonstration project, water-capping technology has not yet been proven, and Alberta will be developing more direction and performance criteria to support the assessment of water-capped fluid tailings technology. These matters will affect any future decisions on the water-capping of fluid tailings.

⁶² EPEA Amendment Approval Condition – 4.3.39

⁶³ EPEA Amendment Approval Conditions – 4.3.32, 4.3.33, OSCA Amendment Approval Condition – 18

⁶⁴ EPEA Amendment Approval Condition – 4.3.34

[924] Syncrude is required to provide an updated design for North Mine centre pit by September 30, 2020, that addresses the issues set out above and that meets the requirements of *Directive 085*, including section 4.6.⁶⁵ We recognize that the September 30, 2020 date is approaching quickly, although in setting the date we considered the limited time available to Syncrude to deploy an updated design to North Mine Lake or any potential alternative technologies to treat the volume of fluid tailings proposed to be placed in North Mine Lake.

[925] As part of the updated design for North Mine End Pit Lake, Syncrude is required to evaluate alternative scenarios for the North Mine Lake closure plan to alleviate the risk that not enough water will be available to sustain the end pit lakes at the Mildred Lake site.⁶⁶

[926] Syncrude is also required to develop a calibrated and valid hydrologic model that can be used to assess the impacts of climate change on the sustainability of North Mine Lake and other proposed end pit lakes under a wide range of late-21st-century climate scenarios. This assessment must be submitted by September 30, 2020. If this work finds that under some scenarios the lake does not have enough drainage area to reliably support sustainable water levels, Syncrude will identify how the closure plan can be adjusted to provide sufficient inflows to support North Mine Lake, adjust the lake design to a lake that can be sustained, provide modelling results supporting these changes, and evaluate potential impacts on other end pit lakes.

[927] We recognize that extensive research on water-capped tailings continues and that Alberta will likely be developing direction and performance criteria for water-capped deposits. Therefore, for Base Mine Lake, Syncrude is required to meet such future directions for water-capped deposits.

Alternative to Water-Capping

[928] *Directive 085* requires that, where water-capped fluid tailings technology is used to generate the inventory forecast in the profiles, an alternative tailings treatment technology for treatment of equivalent volumes of fluid tailings is provided, including time frames for implementation.

Evidence

[929] Syncrude said that it currently has three technologies which could be implemented to treat additional fluid tailings volumes:

- Fluid tailing centrifugation
- Fluid tailing and clay overburden mixing (co-mixing)
- Accelerated dewatering

⁶⁵ EPEA Amendment Approval Condition – 4.3.35, OSCA Amendment Approval Condition – 20

⁶⁶ EPEA Amendment Approval Condition – 4.3.36

[930] Syncrude said that since 2015, fluid tailings centrifugation at a commercial scale has been in operation at the Mildred Lake site. Syncrude also said that co-mixing of fluid tailings with overburden clay and advanced dewatering are technologies that have undergone field pilot testing. Syncrude considers centrifugation of fluid tailings as the main alternative to water-capping. Syncrude said that scaling up centrifuge technology would be its first choice, if a decision was required today.

[931] Syncrude indicated that it will require five years to construct more centrifuge capacity and that the earliest it would have more capacity is 2028, which is five years after the currently proposed water-capping decision point of 2023. However, with current plans for water capping in North Mine centre pit, Syncrude is planning to start placing centrifuged cake in North Mine centre pit between 2020 and 2030. Syncrude's plans indicate starting to place fluid tailings and water over the centrifuge cake in North Mine centre pit in 2027.

[932] Syncrude maintained that a combination of the alternative technologies could be used to treat additional fluid tailings volumes. Syncrude notes that implementation of these alternatives would result in additional energy use, land disturbance, and cost. If the Base Mine Lake demonstration outcomes in 2023 indicate that significant tailings plan changes are required, Syncrude will optimize tailings plans based on the findings and apply for appropriate amendments as required.

[933] Syncrude said that if an amendment to the tailings plan is required, it would do a study to select appropriate technology alternatives based on the latest research and development of all available technologies. According to Syncrude, the assessment would include consideration of impacts of alternatives on the closure plan. The optimal plan is likely to include the use of several technologies. The amendment application would provide a revised tailings management strategy and associated changes to the mine and closure plans, including updated capping and closure design features. The capping design and reclamation soil prescription for alternative tailings treatment scenarios could vary with the technology used.

[934] Syncrude indicated that at the end of mine life, the treatment cost of residual tailings would be \$9.09/tonne (as of 2017), which it said is not based on a specific technology but on a reasonable projection of unit cost for a range of existing tailings treatment technologies that would be available at the time of treatment. Syncrude said that the tailings volume remaining on the Mildred Lake lease at the end of mining in 2036 would be 87.5 Mm³, or 63.8 Mtonnes.

Analysis and Findings

[935] To reduce environmental liabilities achieving *TMF* requirements is paramount. The *TMF* calls for treatment of all legacy fluid tailings by end of mine life and of new fluid tailings by ten years after the end of mine life. The water-capping demonstration is planned to have a checkpoint in 2023, although that date is uncertain and the demonstration might require more time. Furthermore, 2036 is the end of mine life for the MLX project and is fast approaching. Syncrude's plans rely heavily on water capping. A significant

volume, 173.7 Mm³, has been placed in Base Mine Lake for demonstration, and an additional 250.5 Mm³ of untreated fluid tailings are proposed for water-capping in North Mine Lake.

[936] If Base Mine Lake water capping is not proven to be viable or is not considered acceptable as a result of government direction on performance criteria, it is not clear how these volumes will be treated by any of the alternative technologies. Syncrude only provided conceptual information and implementation timelines for the alternative technologies, and it didn't identify the volume of tailings that could be treated by any of the technologies. Syncrude didn't define the implementation criteria or any cost estimate, benefits, or risk assessment of individual or combined alternative technologies it is planning to employ.

[937] We accept that Syncrude has proven experience operating centrifuge plants and note that Syncrude is conducting demonstrations to eliminate uncertainties associated with cake deposits. Accordingly, we accept centrifuge technology as an alternative technology that has the potential to treat some portion of the fluid tailings.

[938] Co-mix is advanced enough for a full-scale demonstration, so we accept it as an alternative technology that has the potential to treat some portion of the fluid tailings.

[939] Due to a lack of information, uncertain timelines and the unproven nature of accelerated dewatering, we do not accept accelerated dewatering as a viable alternative technology at this point. To satisfy the requirements of *Directive 085*, we accept that Syncrude may use a combination of alternative technologies in place of water capping, should that be required. However, without more information about implementation of either, or about a combination of the proposed alternative technologies, we are not confident in Syncrude's plans for managing the volumes of fluid tailings by the timelines required by the *TMF*.

[940] We find that Syncrude has not provided sufficient information to demonstrate how it would deploy the alternative technologies to treat all new and legacy tailings in accordance with the *TMF* should water capping not be proven and accepted. Considering that the end date for mining at MLX is in 17 years, time to implement an alternative approach to water capping of fluid tailings is limited.

[941] We are concerned about the potential volumes of residual tailings and about the cost of treating and reclaiming these volumes should the viability of water capping not be proven. Syncrude said that the residual tailings volume on the Mildred Lake lease at the end of mining in 2036 would be 87.5 Mm³, or 63.8 Mtonnes, which at \$9.09/tonne equates to about \$580 million in remaining liability at end of mine life. Syncrude's fluid tailings profile includes 424.2 Mm³ of fluid tailings in water-capped deposits—250 Mm³ in North Mine Lake and 173.7 Mm³ in Base Mine Lake. If water capping is not proven to be viable, given the limited time to implement alternatives, we expect that the cost of treating residual tailings that

would be otherwise water-capped at the end of mine life would significantly increase Syncrude's current estimate.

[942] The longer the delay in implementing alternative technologies to water-capping, the higher these risks and costs might become. Syncrude did not demonstrate that it has sufficiently emphasized development and implementation of a robust alternative to water capping of fluid tailings.

[943] We do not accept the proposed alternative-technology plan proposed by Syncrude due to the deficiencies described above.

[944] By September 30, 2020, Syncrude is required to provide a detailed alternative technology plan to treat the 250.5 Mm³ of fluid tailings that is currently planned to be placed in North Mine centre pit. The plan may include any or a combination of the alternative technologies. The plan shall include an evaluation of the potential to scale up the use of co-mix and other technologies to reduce reliance on water capping of fluid tailings. The alternative plan must include a detailed implementation timeline, cost, risk, benefit, and an assessment of implications for the mine plan. If by 2023, water capping has not been demonstrated as viable and approved, this plan must be capable of treating all new and legacy tailings at Mildred Lake site are treated within 10 years of the end of mine life as required by the *TMF* and *Directive 085*.

[945] This plan must be executable and if required be implemented by no later than 2027 in place of North Mine centre pit water-capping. If any changes to mine plan or closure plan are needed for the implementation of this alternative plan, Syncrude is required to identify and discuss any associated changes to the mine plan and identify changes to the most recent Life of Mine Closure Plan by September 30, 2020.

[946] By September 30, 2020, Syncrude is required to provide a separate high-level and conceptual alternative-technology plan for treatment of 173.7 Mm³ of fluid tailings currently placed in Base Mine Lake, to address the possibility that the Base Mine Lake demonstration doesn't prove the viability of water capping technology. The plan must include any, or a combination of, alternative technologies that may include centrifugation and co-mix. The plan must include a detailed implementation timeline and the cost, risk, and benefits, and a discussion of possible implications to the mine plan and closure plan. The alternative plan must be implementable, if by 2023 water capping has not been demonstrated and approved. This plan must be capable of treating fluid tailings within the timelines required by *TMF* and *Directive 085*.⁶⁷

⁶⁷ OSCA Amendment Approval Condition – 22

Ready-to-Reclaim Criteria

[947] The *TMF* and *Directive 085* state that fluid tailings are considered ready to reclaim when they have been processed with an accepted technology and placed in their final landscape position, and when they meet performance criteria (i.e., ready-to-reclaim criteria).

[948] Ready-to-reclaim criteria support the objective of reclaiming oil sands mining projects to self-sustaining locally common boreal forest ecosystems that are integrated with the surrounding area and consistent with the values and objectives identified in local, subregional, and regional plans.

[949] Ready-to-reclaim criteria are used to track the ability of a tailings deposit to be reclaimed as predicted and in the time predicted. Consequently, ready-to-reclaim criteria are critical in evaluating trends and managing performance.

[950] Two sub-objectives address different aspects of performance:

- Sub-objective 1: To ensure that the deposit's physical properties are on a trajectory to support future stages of activity
- Sub-objective 2: To minimize the effect the deposit has on the surrounding environment and ensure that it will not compromise the ability to reclaim to a locally common, diverse, and self-sustaining ecosystem

[951] *Directive 085* section 9.5 states that in the application, operators must select and justify the proposed ready-to-reclaim performance criteria. The proposed performance criteria must demonstrate that sub-objectives continue to be met over time and ensure progression towards deposits' intended outcomes.

[952] Syncrude provided ready-to-reclaim criteria only for composite tailings and centrifuge technologies.

Ready-to-Reclaim Criteria for Water-Capped Tailings Deposits

Evidence

[953] Syncrude proposes to remove 173.7 Mm³ of fluid tailings currently in Base Mine Lake from its fluid tailings profile in year 2023, coinciding with the technology assessment milestone of 2023. Syncrude is also proposing to remove 250.5 Mm³ of fluid tailings from its fluid tailings profile in 2036, when water capping in North Mine centre pit begins.

[954] Syncrude did not propose ready-to-reclaim criteria for water-capped deposits.

Analysis and Findings

[955] We note that ready-to-reclaim criteria for water capping are subject to further assessment, research, and government direction. The AER at this time does not authorize ready-to-reclaim criteria for

water-capped deposits. In the absence of approved ready-to-reclaim criteria and confirmation that the deposits meet the approved criteria, water-capped fluid tailings deposits cannot be removed from the tailings profile. The *TMF* states that until fluid tailings deposits meet ready-to-reclaim criteria, they will be considered part of the total fluid tailings volume inventory.

[956] For any water-capped deposits on the Mildred Lake site, Syncrude is required to submit, by January 31, 2023, an assessment of applicable ready-to-reclaim criteria and of the ready-to-reclaim trajectory for fluid tailings in water-capped deposits.⁶⁸ The ready-to-reclaim criteria and trajectory must include water-cap stratification, water quality, and other aspects of performance. This ready-to-reclaim criteria and ready-to-reclaim trajectory must account for the specific tailings streams in the lake.

[957] Syncrude shall not remove water-capped tailings from the fluid tailings profile until ready-to-reclaim criteria have been approved by the AER and the deposit satisfies those criteria.

Ready-to-Reclaim Sub-objective 1 – Composite Tailings

Evidence

[958] Composite tailings is Syncrude's most mature and demonstrated technology. Syncrude places a sand cap 6.5–15 m thick over composite tailings deposits after tailings placement is complete. The sand cap contributes to further consolidation, mitigates variability in deposit performance, and provides a trafficable surface. Syncrude says the sand cap is designed and constructed to support Syncrude's identified reclamation outcomes, targeting predominantly upland ecosites and some wetlands for closure.

[959] Syncrude has three composite tailings deposits: East In Pit, South West In Pit, and North Mine South Pit. Syncrude plans to continue placing composite tailings in South West In Pit and North Mine South Pit and proposes placing composite tailings in a new mined-out pit, North Mine north pit.⁶⁹

[960] Parts of East in Pit, including the Sandhill fen and King Fisher areas and parts of South West In Pit, have been capped. Reclamation of these surfaces is either in progress or completed. Monitoring of the reclaimed areas is in progress and will continue.

[961] Syncrude's existing monitoring of composite tailings deposits includes solid-content measurement, pore pressure measurement over the depth of the deposit, passive Gamma reading, and strength and settlement change of the deposit over time. To determine when settlement is nearly complete, Syncrude uses hydrostatic condition as an indicator. Syncrude performs a trafficability test to determine whether the deposit is ready for reclamation soil placement.

⁶⁸ OSCA Amendment Approval Condition – 25

⁶⁹ EPEA Amendment Approval Condition – 3.3.44

[962] Sincruide proposes using solids content by weight of a deposit as the sub-objective 1 ready-to-reclaim criterion for composite tailings deposits. Sincruide defines the ready-to-reclaim criteria and trajectory as follows:

- One year after treatment, a solids content of 60–80 per cent
- Before capping, a solids content of 65–85 per cent
- At the start of reclamation, a solids content of 65–85 per cent

Sincruide's evidence demonstrated that it has primarily achieved a solid content of 65 per cent in one year after deposition of composite tailings, and 75 per cent solid contents at the start of reclamation and after capping.

Analysis and Findings

[963] Sincruide's existing monitoring of composite tailings deposits is more comprehensive than the single measure proposed for ready-to-reclaim criteria. For composite tailings deposit construction, capping, and reclamation, Sincruide measures multiple parameters in addition to measuring solids content.

[964] For sand dominated deposits, such as composite tailings, solids content alone may not be sufficient to measure a deposit's performance or its ability to meet future stages of reclamation activity. Solids content can remain constant while other deposit measures, such as effective stress, deposit consolidation, and pore-water pressure, can vary. The variation of these measures may be equally critical in determining the performance of the deposit, understanding ready-to-reclaim criteria, and determining the deposit's ability to enable future reclamation activity and achieve the *TMF*'s outcomes.

[965] *Directive 085* indicates that a trajectory or progression of ready-to-reclaim criteria over time may be necessary in order to successfully enable future reclamation activity. Sincruide's ready-to-reclaim trajectory lacks specific time frames for rate of improvement and the range of values is the same for each stage of the process.

[966] Sincruide is currently demonstrating its ability to reclaim composite tailings deposits to specific target eco-sites and has yet to verify the remaining settlement and implications of settlement for other reclamation outcomes. Mildred Lake is a mature mine with diminishing quantities of tailings sands available to mitigate settlement.

[967] We authorize the use of solid contents by weight of a deposit as sub-objective 1 ready-to-reclaim measure for composite tailings deposits.

[968] Sincruide said that it could cap composite tailings deposits when they achieve between 65 and 85 per cent solids content. Sincruide also indicated that it could commence capping of composite tailings deposits one year after the end of tailings placement. Therefore, Sincruide can achieve a minimum of 65

per cent solids content by weight within one year of tailings placement. We therefore set a ready-to-reclaim criterion of 65 per cent solids content by weight, based on deposit sampling, within one year of treated fluid tailings placement. We do not accept the use of a deposit-wide average and require the ready-to-reclaim criterion to be based on the deposit sampling. Syncrude provided data from its composite tailings deposits at Mildred Lake, with an entire deposit reaching over 75 per cent solids content by weight, following sand capping. Therefore, we set an RTR criterion of 75 per cent solids content by weight, based on deposit sampling, within one year after sand capping.

[969] The panel requires that for each treated tailings deposit, Syncrude continue monitoring of all the parameters it measures and report the AER on the results of this monitoring. The results of this monitoring could result in improvements or additions to subobjective 1 ready-to-reclaim criteria.

[970] Syncrude is required by February 28, 2020, to provide a detailed composite tailings deposit assessment report and research plan update in which Syncrude provides additional information, consolidation and settlement modelling, and rationale for defining capping requirements for landform development stability and settlement, and an update to the later stages of the ready-to-reclaim trajectory of composite tailings deposits.⁷⁰

[971] Syncrude may be required to update ready-to-reclaim criteria for composite tailings deposits in the future to reflect other measures to guide composite tailings deposit operation, capping, and reclamation.

Ready-to-Reclaim Sub-objective 1 – Fluid Tailings Centrifugation

Evidence

[972] Between 2012 and 2015, Syncrude operated its fluid tailings centrifugation demonstration plant. In 2015, Syncrude began operating its commercial fluid tailings centrifugation plant.

[973] Syncrude combined demonstration of centrifuge plant performance with demonstration of thin lift centrifuge cake deposits. Reclamation activities have been completed on the initial thin lift cake areas, and monitoring is in progress.

[974] In 2015, Syncrude began placing produced centrifuge cake in the North Mine South Pit cake area as its first demonstration of centrifuge cake performance in a deep deposit. Syncrude proposed to continue demonstrating deep centrifuge cake deposit performance, with centrifuge cake placement to be completed by 2020.

⁷⁰ OSCA Amendment Approval Condition – 27

[975] Sincruide proposes three additional deep cake deposits of increasing size and depth: North Mine centre pit cake beginning in 2020, MLX west dedicated disposal area 1, and MLX west dedicated disposal area 2, beginning in 2030.

[976] Sincruide said it is targeting predominantly upland forest with some wetland for closure for the North Mine south pit cake, MLX west dedicated disposal area 1, and MLX west dedicated disposal area 2. The centrifuge cake to be placed in North Mine centre pit cake is proposed to be covered with untreated fluid tailings in a water-capped deposit.

[977] For these deep centrifuge cake deposits, Sincruide proposed a deposit-wide average solid content by weight percentage as the sub-objective 1 ready-to-reclaim criterion and trajectory. The values for the solid content Sincruide proposed are as follows:

- Initial ready to reclaim of 50–60 per cent and trajectory
- Start of capping 50–60 per cent
- Start of reclamation 50–65 per cent

[978] Sincruide's initial ready-to-reclaim criteria coincide with initial placement of centrifuged cake in the deep deposit. The centrifuge plant is designed to produce centrifuged cake at a nominal 55 per cent solids by weight.

[979] The sub-objective 1 ready-to-reclaim trajectory for continued dewatering of centrifuge cake in deep deposits depends on the continued consolidation, settlement, and water-release performance of centrifuge cake after initial cake placement. Sincruide is monitoring the rate of consolidation in its demonstration centrifuge cake deep deposit, North Mine south pit cake, and indicated that it expects centrifuge cake to consolidate over decades.

[980] In 2014, Sincruide began small-scale field tests to test whether a trafficable surface can be attained on top of 50 per cent solids centrifuged cake by three different capping techniques. Sincruide proposed to continue monitoring the test centrifuge cake deposits and cap design tests for ongoing consolidation and settlement performance.

[981] Sincruide has not demonstrated capping techniques for 50 per cent solids content by weight on the deeper deposits with larger surface areas. The cake areas to be capped for terrestrial closure include 170 ha at North Mine South Pit-Cake (48 m thick) and 540 ha at MLX west cake (85 m thick).

[982] Sincruide proposed using three capping methods before placing reclamation material targeting an upland forest with a wetland feature for closure:

- Coke to cap North Mine South Pit -cake deposit, a method identified above currently being researched

- Thin lift centrifuge cake to cap MLX west dedicated disposal areas 1 and 2
- Untreated fluid tailings and recycled process water will be placed over the cake for North Mine centre pit

[983] Syncrude said the substrate cap enhances geotechnical stability and establishes the shape and drainage of the closure landform. Syncrude said that the minimum thickness of the substrate cap is 1.0 m over centrifuge cake to establish the water table below the vegetation root zone. The maximum thickness varies and is dictated by closure drainage requirements and anticipated deposit settlement. For the North Mine South Pit Cake deposit, Syncrude proposes a coke cap depth of 4.1 m for its substrate cap prior to its reclamation material cap. For the MLX west cake deposits, Syncrude does not indicate the thin lift centrifuge cake cap depth for its substrate cap prior to its reclamation material cap.

[984] Syncrude said that the centrifuge cake settlement rate is higher when a cap is applied, and that after capping, more consolidation occurs before reclamation.

[985] Cake settlement modelling predicts a longer period is required to realize total deposit settlement. Syncrude indicated that it expects continued consolidation and settlement of centrifuge cake will occur following reclamation activity completion, and the final solid content will be in the range of 70–75 per cent.

[986] Syncrude indicates its cake deposit capping is designed to ensure an acceptable closure outcome as the deposit achieves final settlement. Syncrude said it is monitoring the rate and degree of settlement for deep centrifuge cake deposits, with the North Mine South Pit cake deposit scheduled to be capped using petroleum coke shortly after placement so that the knowledge gained can be applied to the design and planning of future cake deposits.

[987] Syncrude expects that the ecosites might change over time due to settlement. Syncrude confirmed that it can access additional overburden materials and is willing to use this material to address settlement issues if required.

Analysis and Findings

[988] Syncrude proposed solids content as the measure for ready-to-reclaim criteria for deep centrifuge cake deposits. Centrifuge cake is fines-dominated material, and solids content has a strong correlation with its strength, which is important for capping and reclamation of deep cake deposits. Syncrude's initial ready-to-reclaim criteria are based on the capabilities of the centrifuge plant.

[989] Syncrude did not explain how it selected the ranges of values for solids content for its ready-to-reclaim trajectory. Syncrude's ready-to-reclaim trajectory doesn't demonstrate any improvement in solids content before capping or reclamation begins. The trajectory lacks specific time frames for rate of improvement, particularly following completion of the deposit.

[990] We accept using solids content as a measure for ready-to-reclaim criteria sub-objective 1. We also accept 50 per cent solids content by weight for treated fluid tailings as the initial ready-to-reclaim criterion for centrifuged cake deposits. We do not accept the ready-to-reclaim trajectory.

[991] We do not accept the use of a deposit-wide average and require the ready-to-reclaim criterion to be based on the deposit sampling.

[992] The in-deposit consolidation performance of centrifuge cake in deep deposits is currently being demonstrated. The panel encourages Sincruide to explore options to enhance consolidation performance, including deposit designs and drainage, cake placement, and use of additional materials that can enhance consolidation.

[993] Furthermore, centrifuge cake in deep deposits will require development of capping techniques to manage and achieve reclamation outcomes. While Sincruide has tested capping techniques, these techniques have not yet been applied to larger scale deposits.

[994] Sincruide confirmed that centrifuge cake deep deposits are predicted to settle over a long period and that the duration and degree of settlement might increase for larger or deeper deposits. The implications of settlement for deep centrifuge cake deposit cap design require more research. The implications of ongoing settlement to reclamation outcomes also require more research.

[995] Capping technology and capping material and thickness for large cake deposits will be evaluated by Sincruide and will inform consolidation behaviour and rate of settlement for future deposits. Capping techniques for centrifuge deep deposits and understanding of the implications of settlement on reclamation outcomes are expected to evolve over time. Thicker capping layers and more capping material than is currently considered by Sincruide might be needed.

[996] Sincruide is required to provide an updated ready-to-reclaim trajectory by September 30, 2020, that reflects Sincruide's most current research results and what it learned from the North Mine South Pit centrifuge cake operation and capping tests. Sincruide is required to provide a detailed centrifuge cake tailings deposit research plan by September 30, 2020, and outline its plan to update the ready-to-reclaim criteria and trajectory in its updated tailings management plan and closure plan required by January 31, 2023.⁷¹

[997] Sincruide did not provide a justification for the application of the ready-to-reclaim trajectory proposed for the centrifuge cake placed in North Mine centre pit, which will be covered with water in a water-capped lake. These volumes of treated fluid tailings are planned to be removed from the new and legacy profiles based on the same subobjective 1 ready-to-reclaim criteria and trajectory as for other deep centrifuge cake deposits, which target terrestrial closure landscape. From 2020 to 2023, we accept

⁷¹ OSCA Amendment Approval Condition – 25, *EPEA* Amendment Approval Conditions – 6.1.14 and 4.3.22

Syncrude's ready-to-reclaim criterion for North Mine centre pit. These ready-to-reclaim criterion can be used pending a decision on the closure outcome for North Mine centre pit in 2023. If in 2023 Syncrude plans to water cap centrifuge cake, Syncrude will be required to meet any resulting updates to the ready-to-reclaim criteria and trajectory, if needed.

Ready-to-Reclaim Sub-objective 2

[998] Sub-objective 2 is intended to minimize the effect of the deposit on the surrounding environment and ensure that it will not compromise the ability to reclaim to a locally common, diverse, and self-sustaining ecosystem.

Evidence

[999] Syncrude has proposed similar subobjective 2 ready-to-reclaim indicators, measures, and criteria for all treated tailings deposits and provided four general categories of risks and mitigations. These categories include conceptual risks and their mitigations to groundwater and seepage, surface water, stability, and erosion. Syncrude defined each risk and the proposed mitigation measures as follows.

[1000] Syncrude said that during and after the operational phase there is the risk of seepage from a tailings deposit to the basal aquifer or surficial aquifers. There is also the risk of seepage from these aquifers to the tailings deposits.

[1001] Syncrude proposed capping the base of the mined-out deposit with low-permeability material or leaving oil sands in place as an impermeable barrier, where appropriate, to prevent groundwater seepage. Syncrude also proposed installing cut-off walls and pumping wells as mitigating design features.

[1002] Syncrude intends to operate appropriate groundwater control measures until the land is reclaimed, and it has obtained certification from Alberta. Syncrude indicated that it will manage groundwater based on monitoring results.

[1003] Syncrude also said that during operations, soft tailings are placed in-pit to reduce seepage into surficial aquifers and reduce overland flow into adjacent water features, and it proposed as a subobjective 2 ready-to-reclaim criterion that treated tailings do not exceed design elevations.

[1004] Syncrude said that during the operational phase, there is a risk that process-affected water will be released to the environment, and a risk of not diverting clean water and storing extra-clean water in the deposit. As potential mitigations, Syncrude said that during the operational phase, ditches and sumps will be designed and operated to direct process-affected water to designated tailings deposits and to release clean water to the environment.

[1005] At closure, Sincruide identified that there is a risk of not draining the surface water to end pit lakes and having localized ponding. Sincruide submitted that closure topography for each deposit is designed to ensure that surface drainage is directed to an end pit lake.

[1006] Sincruide submitted that landscape capping and closure topography for each deposit is designed to establish the water table below the vegetation root zone and ensure that surface drainage is directed to an end pit lake prior to release offsite.

[1007] Sincruide did not provide indicators, measures, or criteria for the landscape capping and topography design features for these risks.

[1008] Sincruide intends to operate appropriate surface water control measures until the land is reclaimed and Sincruide has obtained certification from the Government of Alberta.

[1009] Sincruide identified instability of treated fluid tailings containment structures as one of the risks. It said that overall stability/containment of treated tailings deposits is not a concern because all of the deposits are below grade (in-pit), and deposits are contained by pit walls or licensed geotechnical structures (or both). Sincruide said that mitigations are determined and applied through regulatory application, approval, and monitoring of licensed dam structures.

[1010] Sincruide identified erosion risks during the operational phase as potential erosion from heavy rainfall. It said that any erosion during the operational phase of the deposit would be remediated.

[1011] At closure, Sincruide identified potential erosion risk from diversion of surface water and potential erosion along banks of end pit lakes. Sincruide said that management of licensed dam structures throughout their life cycles, consistent with licence requirements and best practices (e.g., Canadian Dam Safety Association, Toward Sustainable Mining, etc.), is one of the mitigations for erosion risk. Also, Sincruide's closure topography will be designed with appropriate gradients to prevent erosion from diverted surface water. The end pit lake banks in specific locations will be designed to withstand erosion from waves, depending on the surrounding land forms.

[1012] Sincruide did not provide indicators, measure, or criteria for the erosion landscape capping and topography design features for these risks.

Analysis and Findings

[1013] Protection of the surrounding environment and reclamation success depend on treated fluid tailings deposit performance and the performance of design features for treated fluid tailings deposits, which is demonstrated by meeting subobjective 2 ready-to-reclaim criteria.

[1014] Sincruide provided high-level and general mitigations to the risks it identified that could compromise the future success of reclamation. Of the proposed subobjective 2 ready-to-reclaim criteria,

the proposed groundwater monitoring and protection system is acceptable for protecting the surrounding environment. Therefore, we accept Syncrude's subobjective 2 criterion as follows: during operations, groundwater is monitored in accordance with the *EPEA* approval and is required to ensure there is alignment between the groundwater monitoring program and measurement system plan.⁷²

[1015] Syncrude proposed preventative design features such as capping the base of the mined-out deposit with low-permeability material or leaving oil sands in place as an impermeable barrier to prevent groundwater seepage. Where applicable, Syncrude is required to provide the design of preventative features Syncrude employs to prevent seepage to groundwater and the factors it considered in determining when those features are required.⁷³

[1016] Syncrude provided high-level and general mitigations, such as landform capping techniques and topography design, for the risks it identified to the surrounding environment or that could compromise the future success of reclamation. Syncrude did not identify how the design features contribute to surface-water quality and the success of differing target ecosites, such as wetlands or uplands, or provide specific subobjective 2 indicators, measures, or criteria for the target ecosites.

[1017] We note that some tailings deposits are near closure and Syncrude will undertake reclamation of all of Mildred Lake tailings deposits in the years to come. As each treated tailings deposit progresses toward a closure landscape, Syncrude is required to provide to the AER more details about its design of preventative design features for surface water and closure in the future submissions of its life of mine closure plans.

[1018] Syncrude is required to update subobjective 2 indicators, measures, and criteria in its 2023 update to the Tailings Management Plan to reflect any new knowledge it acquired and new design it has developed for different types of deposits.

[1019] We expect future life of mine closure plans will adapt to results of tailings deposits monitoring and evolve over time to ensure that reclamation is successful and meets equivalent land capability.

Soil and Capping Material

Evidence

[1020] Syncrude's total reclamation cap is composed of the soil cover (cover soil plus subsoil) and the substrate cap (subsoil plus suitable overburden or tailings sand). To reclaim the tailings features to equal land capability, Syncrude will use reclamation material including upland surface soil, peat mineral mix, peat, subsoil, suitable overburden, and tailings sand.

⁷² *EPEA* Amendment Approval Condition – 4.3.21

⁷³ *EPEA* Amendment Approval Condition – 4.3.26

[1021] The North Mine Lake area will be about 13 km², or 1300 hectares. Sincruide intends to use water capping of fluid tailings in North Mine Lake as a closure outcome, and it has not provided an alternative closure scenario. Sincruide stated that the reclamation material is sufficient and available for an alternative closure scenario for North Mine Lake, if needed. Sincruide stated that it does not expect the North Mine centre pit to be reclaimed to a terrestrial-only alternative, and a water feature still would be necessary to some extent. Sincruide said it will have the ability to go back for more overburden material in the North Mine pit until the mid-2020s. Sincruide said that reclamation material salvaged from the MLX project which is not needed for reclamation of the MLX areas could be brought over to the Mildred Lake site if required.

[1022] Sincruide said that direct placement of reclamation material is the preferred method for moving all reclamation-material types, but that stockpiling is necessary when direct placement is not possible. Sincruide is planning to extend the use of some of its tailings storage infrastructure at Mildred Lake beyond MLX end of mine life. The date deposition of tailings will be completed in South West Sand Storage is 2036 and in Mildred Lake Settling Basin is 2065. Sincruide emphasized there will be enough reclamation material to meet the placement requirements of its *EPEA* approval for the entire Mildred Lake site, including the MLX project areas and fluid tailings deposits, and confirmed its material-balance accounts for capping requirements of extended-use areas.

[1023] Tailings sand is used for capping over tailings as one of the methods to construct landform for reclamation and closure. Tailings sand is a by-product of oil sands extraction and will be produced at the Mildred Lake site until 2036. The volume of tailings sand available depends on oil sands production. Sincruide is therefore highly certain of the volume of tailings sand available over the life of the mine. Sincruide provided a breakdown of tailings sand production and use for composite tailings, dyke construction, sand capping, and closure infill.

[1024] Suitable overburden is used as a reclamation capping material. Sincruide said it will have the ability to salvage more suitable overburden material from the Mildred Lake mine site until the mid-2020s if more material is required.

[1025] For soil salvage, Sincruide did not provide an area of soil that is still available to salvage at the Mildred Lake site but said that soil salvage from Mildred Lake will be complete before 2020.

[1026] Sincruide said, “because there's a cost to moving and storing reclamation material, we strive to get as close as possible to the balance that we need so that we don't move additional material that doesn't have to be moved.” The evidence shows that peat material and subsoil material are available in MLX west and MLX east but are not currently scheduled for salvage.

Analysis and Findings

[1027] Material balance tables in the 2016 life of mine closure plan suggest the Mildred Lake site does not have sufficient reclamation material (cover soil, subsoil/suitable overburden) in stockpiles to meet Syncrude's reclamation objectives for its current land disturbance at Mildred Lake, including tailings deposits. However, Syncrude maintained that it will meet their objectives as the calculations for soil placement do not fully account for areas reclaimed to water features and do not include material that will be directly placed.

[1028] An alternative plan for the North Mine centre pit has not been provided. An alternative closure landform for North Mine centre pit may increase the reclamation material requirement. The volume of material required for reclamation of the North Mine centre pit will be reliant on the closure landscape. An alternative closure scenario for the North Mine centre pit needs to include a material balance to ensure the closure landscape will be realistic and achievable.

[1029] Syncrude's evidence shows that there are volumes of peat material and subsoil material available in MLX west and MLX east exceed the volume required for reclamation of the respective areas, and the surplus volume is not currently scheduled for use in reclamation. Should the reclamation material be necessary for reclamation of the North Mine centre pit, or other areas of the Mildred Lake site, hauling from the MLX project areas would be required. During the hearing, Syncrude indicated additional material from the MLX areas could be brought over to the Mildred Lake site if necessary. We note, as Syncrude said, that material transport and handling from the MLX site to the Mildred Lake site could be costly.

[1030] We acknowledge the volume of tailings sand is finite and will be completely used during operations and closure. Syncrude's evidence shows reclamation material placement through 2100. Based on the information provided by Syncrude, no tailings sand will be produced at the Mildred Lake site once mining and extraction at MLX is complete in 2036. Extended use of the Mildred Lake Settling Basin, South West Sand Storage, and other storage and deposit infrastructure will span beyond end of mine life for the MLX project. Syncrude may require other material besides tailings sand for infilling or capping.

[1031] Cover soil salvage has more restrictions in timing and availability. *EPEA* approval 26-02, as amended, requires Syncrude to salvage upland surface soil from all land to be disturbed, and salvage other cover soil where there is insufficient upland surface soil to meet the reclamation objectives. These soil salvage conditions will also apply to the MLX project areas. We note that the Mildred Lake site is approaching the end of mining, and the opportunity to salvage more reclamation material and capping material for reclamation of the Mildred Lake site tailings deposits is concluding.

[1032] Syncrude must ensure reclamation material is tracked and managed to meet the reclamation outcomes in relation to tailings deposits. Syncrude must ensure there is adequate tailings sand, or other types of capping material, available to support its activities at each closure landscape unit. This

information will be informing Syncrude's life of mine closure plan for the tailings features and needs to be provided to the AER as part of updated Tailing Management Plan by January 31, 2023, and updated design for North Mine centre pit end pit lake by September 30, 2020.

Fluid Tailings Profile and Project-Specific Thresholds

[1033] The *TMF* and *Directive 085* require that new and legacy fluid tailings be treated and progressively reclaimed during the life of a project.

[1034] The fluid tailings profile represents the volume of fluid tailings that are not ready to reclaim (e.g., do not meet ready-to-reclaim criteria). Both the new and legacy fluid tailings profiles are important tools by which the performance of an operator will be measured.

[1035] Legacy fluid tailings are fluid tailings that existed before January 1, 2015. All legacy fluid tailings must be ready to reclaim by end of mine life.

[1036] The *TMF* defines new fluid tailings as fluid tailings that are produced after January 1, 2015. All new fluid tailings must be ready to reclaim within ten years of end of mine life.

Evidence

[1037] Syncrude proposed removing, from profiles, fluid tailings treated by composite tailings, and centrifuge treatment technologies, capping with water, and natural consolidation of fine particles. When proposed ready-to-reclaim criteria have been achieved, fluid tailings treated by composite tailings or centrifugation technologies are taken off the profile. Syncrude proposed to remove 173.7 Mm³ of the untreated water-capped fluid tailings in Base Mine Lake in 2023.

[1038] Syncrude also proposed to remove 250 Mm³ of the untreated fluid tailings in 2036 from the profiles as soon as the water capping has begun in North Mine centre pit.

[1039] Syncrude's planned accounting for fluid tailing profile compliance reporting is based on the following principle. All fluid tailings reductions (treatment and consolidation) will be discounted from the legacy fluid tailings profile first. When the legacy fluid tailings inventory reaches zero, subsequent fluid tailings reductions will be applied to the new fluid tailings profile. Syncrude submitted that this is an appropriate, simplistic, and transparent accounting methodology for the Mildred Lake site since it is impossible to distinguish between new and legacy fluid tailings, and reduction thereof, in mixed deposits.

[1040] Syncrude used the following accounting methods for its proposed legacy fluid tailings and new fluid tailings profiles:

- Natural consolidation applied to legacy fluid tailings throughout the mine life
- Composite tailings and centrifugation treatments together with water-capping in Base Mine Lake applied towards legacy profile for the first 10 years.

- After 10 years (from 2025), composite tailings and centrifugation treatments will be applied to new fluid tailings profile.
- At the end of mine life, fluid tailings volume removal through water-capping in North Mine Lake will be applied to outstanding legacy fluid tailings profiles, and the remaining treatment credit will be applied to a new fluid tailings profile.

[1041] Syncrude stated by implementing this tailings management plan, Syncrude will reduce fluid tailings volumes of 678 Mm³ between 2015 and the end of mining for legacy and new fluid tailings combined. Syncrude has 470 Mm³ of legacy fluid tailings located in existing Mildred Lake tailings infrastructures. The proposed legacy profile declines to zero by 2036. Syncrude submitted that in order to begin reducing the relatively large starting legacy inventory, the new fluid tailings profile accumulates for 10 years prior to stabilizing for the remainder of mining. As a result, the new fluid tailings inventory peaks at 206 Mm³, a volume which can be treated and ready-to-reclaim by 2045, nine years after the end of mining, by a combination of centrifuging and water-capping technology.

[1042] Syncrude's profile depicts growth of new fluid tailings until end of mine life, 2036, followed by declines to zero by 2045, which is nine years after end of mine life. Syncrude acknowledges that the peak volume of the new fluid tailings profile, 206 Mm³, is equal to 6.8 years of accumulation. It exceeds the five-year guideline as stated in the *TMF*, but remains within the 10-year timeline to manage fluid tailings to a ready-to-reclaim state after the end of mine life.

[1043] Syncrude said, it is confident that the deviations do not pose significant risk of challenges to achieving safe, stable, and sustainable reclamation outcomes in the time frames required by the *TMF*.

[1044] Syncrude says that the proposed profiles include fluid tailings resulting from bitumen froth shipped to and treated at Mildred Lake from Syncrude's Aurora North and Aurora South leases. Syncrude will continue operating the centrifuge plant to treat the fluid tailings generated from froth transfer post-mining at MLX.

Analysis and Findings

[1045] New and legacy fluid tailings from Mildred Lake and the MLX project are stored in the same tailings ponds at the Mildred Lake site. As a result, Syncrude cannot distinguish between legacy fluid tailings and new fluid tailings deposits. For these situations, the Tailing Management Framework and *Directive 085* permit the operator to allocate the volume of fluid tailings to either its legacy fluid tailings volume inventory or its new fluid tailings volume inventory.

[1046] The legacy tailings profile proposed by Syncrude aligns with the requirements of *TMF*, and the profile demonstrates that by end of mine life, 2036, the legacy tailings volume is reduced to zero. However, this relies heavily on water-capping technology.

[1047] The proposed new fluid tailings profile follows *TMF* and Directive 085 profile guidance in the following ways:

- It grows, stabilizes, and declines, and all new fluid tailings are taken off the profile in 2046, ten years after the end of mine life.
- The peak volume of 206 Mm³ is equal to 6.8 years' accumulation, which is lower than 10-years' accumulation. *TMF* guidance allows 3–10 years of accumulation during phase 1.

[1048] The proposed new fluid tailings profile does not align with the following *TMF* and *Directive 085* guidance in the following ways:

- Syncrude proposed 206 Mm³ as the end of mine life volume, which is equivalent to 6.8 years of accumulation. The *TMF* specifies that the end of mine life volume is the equivalent of 5 years, or less, of fluid tailings volume accumulation.
- Syncrude is proposing growth in tailings accumulation until end of mine life in 2036. While the *TMF* acknowledges that it may take three to ten years to accumulate the peak volume from the start of *TMF* policy, Syncrude is proposing an additional twenty years to accumulate the peak volume from implementation of the *TMF* policy. This continued accumulation does not instill confidence that the rate of treatment of fluid tailings is similar to the rate of production of fluid tailings as required by *TMF* and *Directive 085*. New fluid tailings growth should be accompanied by more effort from Syncrude to increase the rate of treatment in order to meet the intent of the *TMF*.

[1049] Similar to the legacy fluid tailings profile, Syncrude relies heavily on water-capping technology to reduce accumulated fluid tailings on the new profile to zero by 2045. As discussed in the technology section, water-capping technology is being demonstrated at Base Mine Lake and is subject to further assessment, research, and future direction. The heavy reliance of Syncrude's proposed new and legacy fluid tailings profiles on water capping and limited mine life remaining pose significant risks to achieving *TMF* objectives, if water-capping is not proven and accepted by government.

[1050] According to the *TMF*, until fluid tailings meet ready-to-reclaim status criteria, they are considered part of the total fluid tailings inventory. Therefore, before tailings volumes in Base Mine Lake can be removed from the fluid tailings profile, Syncrude must demonstrate that Alberta has provided policy direction that permits water capping of fluid tailings and the creation of an end pit lake containing fluid tailings as an acceptable feature in the closure landscape, that ready-to-reclaim criteria for water-capped deposits have been developed and approved by the AER, and that Base Mine Lake and the associated water-capped tailings deposits meet those criteria.

[1051] We are also concerned that Syncrude has not demonstrated that the fluid tailings treatment capacity is equal to or greater than the new fluid tailings production rate as required by the *TMF* and *Directive 085*.

[1052] The *TMF* and *Directive 085* require profiles to be project specific. Profiles are required to track project-specific fluid tailings volume, regardless of fluid or treated tailings storage and final placement locations. Syncrude's proposed profiles include fluid tailings volumes generated from froth transferred from Aurora North and Aurora South to the Mildred Lake mine. The proposed profiles only account for froth tailings transfer until 2036, which only includes part of the volumes generated at Aurora North and Aurora South. Aurora North is planned to be completed by 2040, and Aurora South is proposed to be in operation between 2022 and 2064.

[1053] Syncrude commits to treat the fluid tailings generated from froth transfer by centrifugation treatment until transfer is complete, and the treated tailings will achieve ready to reclaim sooner than ten years after transfer is complete.

[1054] Up until 2023, Syncrude relies on centrifugation and consolidated tailings technologies to achieve the ready-to-reclaim criteria and to remove the volume of tailings from the profile. We have accepted the initial ready-to-reclaim criteria for these technologies. For this reason, we approve the new and legacy tailings profiles until the end of year 2023 as proposed. We note that a small volume of tailings is removed from the profile via natural consolidation. This fact does not change our decision. Given that in and beyond 2023 the profile relies on water-capping technology, and *Directive 085* does not permit removal of water-capped tailings from the profile pending further direction from Alberta, we cannot approve the profile beyond 2023. We note that this date aligns with Syncrude's technology assessment demonstration date at Base Mine Lake for water capping.

[1055] Syncrude is required to provide, by January 31, 2023, an updated legacy fluid tailings profile and new fluid tailings profile. The updated legacy and new fluid tailings profiles must be supported by evidence to justify the technology assessment and associated ready-to-reclaim criteria, including the timing when ready-to-reclaim status is achieved. In addition, the updated new profiles must align with *TMF* guidance. The revised profiles for new and legacy tailings must be representative of Mildred Lake Mine and MLX project mine fluid tailings only. Syncrude is also required to demonstrate in its updated 2023 tailings management plan that that fluid treatment capacity is equal to or greater than the production rate of fluid tailings by December 31, 2025.

[1056] While there are different considerations for legacy and new tailings profiles, given that we require an updated tailings management plan in 2023, these differences don't impact the panel's decision.

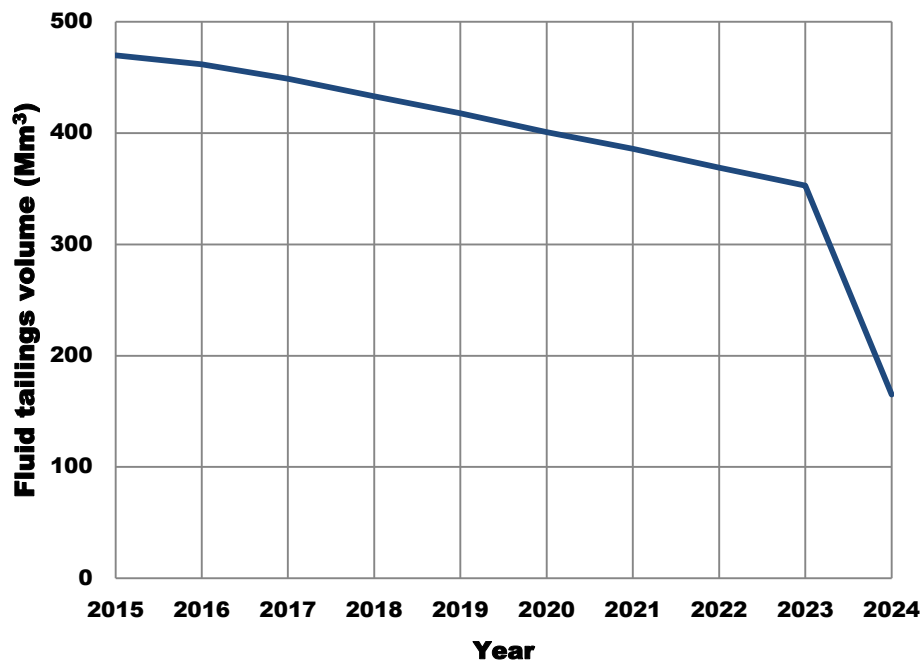


Figure 1. Approved profile for legacy fluid tailings

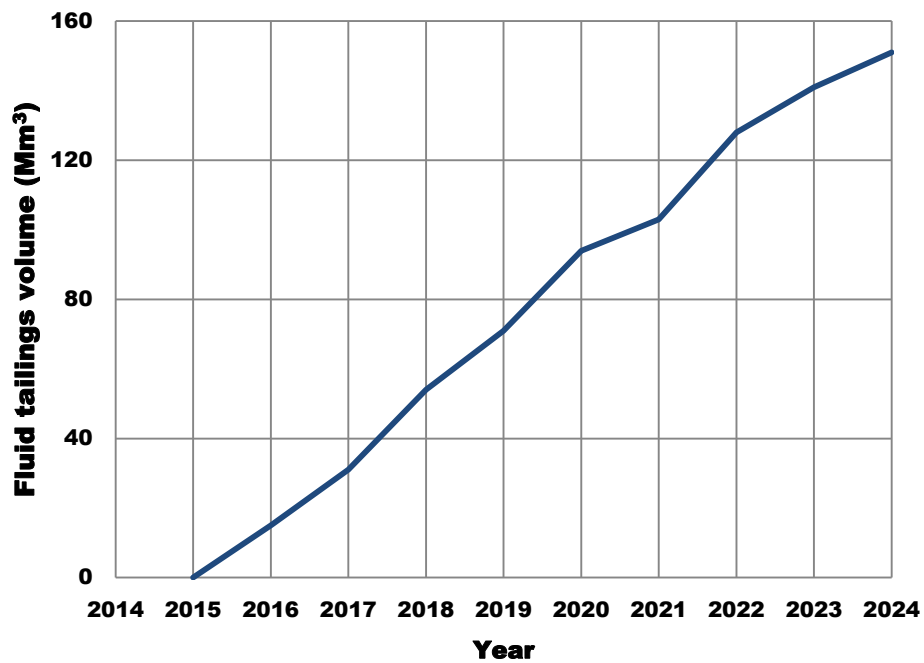


Figure 2. Approved profile for new fluid tailings

[1057] The volume of accumulated fluid tailings is the primary indicator in the *TMF* used to manage and decrease liability and environmental risk resulting from the accumulation of fluid tailings. Triggers and a limit (collectively referred to as “thresholds”) will be set relative to the fluid tailings profiles. The thresholds will ensure that fluid tailings are not accumulating beyond a volume or at a rate that precludes operators from meeting the *TMF*’s objective. These are tools to be used to manage risks associated with TMPs. Management actions are required when thresholds are exceeded.

[1058] Three project-specific thresholds are set based on an operator’s fluid tailings profiles in accordance with the *TMF* and *Directive 085*. The three thresholds are the profile deviation trigger, the total volume trigger, and the total volume limit:

- Profile deviation trigger
 - This trigger alerts regulators and operators when the volume of fluid tailings is growing 20 per cent faster than that approved for the profile. Additional management action is required when the profile deviation trigger is exceeded.
 - It is based on when the fluid tailings volume growth is 20 per cent higher than that in the approved profile.
 - The *TMF* states that the profile deviation trigger allows a five-year rolling average to account for year-over-year variability. The profile deviation trigger applies to both legacy fluid tailings and new fluid tailings profiles.
- Total volume trigger
 - This trigger indicates that the volume of fluid tailings has exceeded its approved maximum accumulation and requires additional management action.
 - The *TMF* states that this trigger is based on 100 per cent of the greater of the maximum approved fluid tailings volume profile and the end of mine life target.
 - The total volume trigger applies to the new fluid tailings profile.
- Total volume limit
 - This trigger indicates that the volume of fluid tailings presents an unacceptable risk to the environment and potential long-term liability. Exceedance of this limit will compromise the ability of an operator to have all of its fluid tailings in an acceptable management state (i.e., ready-to-reclaim) within ten years of the end of mine life. Therefore, the most severe management responses are initiated.
 - The *TMF* states that this limit is based on 140 per cent of the greater of the maximum approved fluid tailings volume profile and the end of mine life target.
 - The total volume limit applies to the new fluid tailings profile.

[1059] Sincruide said that in order to begin reducing the relatively large starting legacy inventory, the new fluid tailing profile accumulates for 10 years prior to stabilizing for the remainder of mining. As a result, the new fluid tailing inventory peaks at 206 Mm³.

[1060] By the end of 2023, the period that the profile is approved for, 151 Mm³ of new fluid tailings will be accumulated at the Mildred Lake site.

[1061] The *TMF* states that the profile deviation trigger would consist of a five-year rolling average to account for year-over-year variability. To allow for this variability, the profile deviation trigger is set as a five-year rolling average of the annual profile deviation. The profile deviation trigger is applicable to both the legacy fluid tailings and new fluid tailings profiles.

[1062] Sincruide is subject to a total volume limit and total volume trigger in addition to the profile deviation trigger.

[1063] The total volume trigger and limit are based on the greater of the maximum approved fluid tailings volume profile and the end of mine life target in accordance with the *TMF* and *Directive 085*.

[1064] As Sincruide's profile is approved only until the end of 2023, the total volume trigger will be 151 Mm³ and total volume limit will be 140 per cent of 151 Mm³. Therefore, the total volume limit will be 211 Mm³.

[1065] We set the total volume trigger at 151 Mm³ and the total volume limit at 211 Mm³.

Froth Treatment Fluid Tailings

Evidence

[1066] Sincruide's current *OSCA* approval contains a condition related to naphtha solvent losses, stating that Sincruide shall meet annual naphtha solvent losses of not greater than 4.3 volumes of naphtha solvent loss per thousand volumes of bitumen produced. Another *OSCA* approval condition states that Sincruide shall file a report every second year summarizing Sincruide's efforts to reduce naphtha solvent losses to a target of 3.6 volumes of naphtha solvent lost per 1000 volumes of bitumen produced. This last condition was based on Sincruide's commitments during a previous expansion application hearing in 1999.

[1067] Sincruide said that it strives to recover as much hydrocarbon resource as possible as it is both an economic and environmental outcome that Sincruide strives to achieve every day. Sincruide indicated it is striving to improve naphtha solvent recovery and that naphtha solvent losses were better than 3.6 four times since 2006. Sincruide submitted it did not believe that reducing naphtha solvent losses to 3.6 would be a reasonable approval condition as Sincruide had only achieved this level four times since 2006. Sincruide submitted that the MLX project required no changes to the naphtha solvent recovery units or any of the facilities the condition is based on. Sincruide noted the 3.6 target is intensity based, and any

upset in a given year resulting in low production would have an impact on naphtha solvent recovery performance.

[1068] In October 2018, Sincruide received a list of standard conditions prior to the oral hearing. In its reply submission to the standard conditions, Sincruide took no exception to the standard *OSCA* clauses. One of these conditions stated that no discharge of untreated froth treatment tailings is to go into the tailings ponds.

[1069] Sincruide submitted during the hearing that it misunderstood the question in its reply submission to the standard conditions. Sincruide further submitted it currently has a condition under the *EPEA* approval that allows it to operate without the naphtha solvent recovery units. Sincruide said it would not be able to accept an approval condition that does not allow for untreated tailings into the tailings ponds. Sincruide said that although infrequent, there are times when Sincruide needs to bypass the naphtha recovery unit.

[1070] Sincruide requested that the AER maintain the naphtha recovery approval clauses as they exist, and took the position that naphtha recovery is not related to the MLX project or the TMP, and thus is outside the scope of the proceeding.

[1071] Sincruide said that long-term environmental risks associated with froth treatment tailings are not well understood. This has not been identified as an issue in the past as froth treatment tailings have been consistently placed into the Mildred Lake Settling Basin, a water-saturated anoxic environment that minimizes oxidation and potential acid generation.

[1072] Sincruide said its preliminary assessment indicates that further research is required to fully evaluate the risks associated with the placement of froth treatment tailings in an environment where they are exposed to oxygen. Sincruide identified plans to model and assess closure effects of placement of froth treatment tailings in Mildred Lake Settling Basin by 2019, with a five-year research program into improving the understanding of the geochemical characteristics of reactive mine wastes and potential environmental impacts and mitigation strategies in a mine closure context. Sincruide indicated that research results will inform plans, closure designs, and targeted ecosites in Sincruide's next life of mine closure plan submission.

[1073] Sincruide said that it is an active participant in the froth treatment tailings assessment working group recently initiated through COSIA. The primary goal of the working group is to share knowledge about management of environmental effects associated with the froth treatment tailings stream.

Analysis and Findings

[1074] The MLX project will produce an additional 117 Mm³ of bitumen; therefore, additional naphtha solvent losses of up to 4.3 volumes per 1000 volumes of bitumen could be sent to the Mildred Lake

Settling Basin as a result of the MLX project. The additional naphtha solvent sent to the Mildred Lake Settling Basin from processing bitumen froth from the MLX project has not been considered in previous proceedings, nor have the effects of the additional volume of naphtha solvent on tailings ponds, on tailings deposits, or on the final closure of the Mildred Lake site.

[1075] The residual naphtha solvent in the froth treatment tailings may adversely affect performance of fluid tailings deposits and may contribute to environmental effects.

[1076] Untreated tailings have higher naphtha solvent content, which contains hydrocarbons that are lighter than water. While Syncrude is conducting research into the risks associated with placement of froth treatment tailings in the Mildred Lake Settling Basin and closure outcomes, the results of the research are not known at this time. However, the panel understands that when froth tailings are discharged into an aquatic system (such as a tailings pond), the light hydrocarbon content of the solution may float onto the surface of the water and create hydrocarbon sheen. This may contribute to fugitive emissions of volatile organic compounds.

[1077] Froth treatment tailings may also pose added uncertainties to reclamation outcomes.

[1078] We do not agree with Syncrude's argument that lowering naphtha solvent losses is outside of the scope of the MLX proceeding. While the naphtha solvent recovery unit is not part of this proceeding, the froth tailings stream, its composition, and its potential impact on the tailings deposit performance and closure outcomes is part of this proceeding. Continued production of bitumen from the MLX project will continue discharging froth treatment tailings and associated naphtha into the tailings deposits. While we accept that there is ongoing research in this area, we do not understand the full impact of froth treatment tailings on closure outcomes.

[1079] The additional volume of naphtha solvent, sent to the Mildred Lake Settling Basin and ultimately to tailings deposits, as a result of MLX operations, may have environmental implications and create uncertainties to the closure and reclamation of the tailings deposits. These uncertainties justify minimizing naphtha solvent release into tailings deposits.

[1080] We accept Syncrude's evidence that they cannot consistently meet 3.6 volumes of naphtha solvent loss per thousand volume of bitumen and will not impose that requirement. However, Syncrude shall submit to the AER a detailed plan that identifies the steps Syncrude will take to reduce site-wide naphtha solvent losses and particularly the naphtha solvent discharges to the Mildred Lake Settling Basin from Syncrude's current levels and the timelines in which it will take these steps. The plan shall be submitted by December 31, 2021, and commence the reduction of naphtha solvent losses stated in the plan by the start-up of the Mildred Lake Extension project in 2023.⁷⁴

⁷⁴ OSCA Amendment Approval Condition – 36, 37

[1081] We require Sincruide to provide its research plan to assess and resolve the risks and uncertainties with reclamation of froth treatment tailings. Sincruide is required to develop a measurement plan for froth treatment tailings, and report its results in its annual tailings management report. Pending its research results, Sincruide is permitted to continue placing froth treatment tailings only in Mildred Lake Settling Basin.⁷⁵

Extended Use

[1082] *Directive 085* states that operators may want to continue use of processing plants and associated infrastructures (e.g., water, waste, and tailings facilities) beyond end of mine life. In these cases, *Directive 085* says that the AER will consider the justification for the continued operation of the plant and the need for the associated infrastructure. If the justification meets the objective of the *TMF*, the AER will amend the mine scheme approval and will issue a new processing plant approval. Other enactment approvals may also need to be amended to reflect this change. Any new fluid tailings produced from the processing plant would be required to meet the *TMF*'s objective for the new project from which the bitumen was produced.

Evidence

[1083] Sincruide plans to continue using the following tailings facilities beyond the life of the MLX project, which is projected to end mining operations at Mildred Lake in 2036:

- Mildred Lake Settling Basin as a storage facility for froth tailings, coke, and processed affected water
- Mildred Lake west pit as an in-pit deposition facility for centrifuge cake

[1084] Sincruide's current plans indicate that the Aurora North Mine will continue producing bitumen froth until 2040 and the Aurora South Mine will produce bitumen froth until 2064. Sincruide plans to process the bitumen froth produced at both mines at the Mildred Lake site. The resulting froth tailings would be stored at the Mildred Lake Settling Basin. The froth tailings will continue to be processed through the centrifuge plant, with the generated centrifuge cake being deposited at the MLX west cake deposit storage facilities dedicated disposal area 1 and dedicated disposal area 2. Sincruide proposes that the two centrifuge cake storage facilities at MLX west remain open for cake deposition until 2064.

[1085] Sincruide maintained that Aurora South is approved; however, Sincruide said that Aurora South does not have any existing infrastructure and may need amendments to its approval.

[1086] Sincruide also proposed to continue operating the Mildred Lake upgrader until 2090. This will result in additional storage requirements and will extend the use of the Mildred Lake Settling Basin by 26 years.

⁷⁵ OSCA Amendment Approval Condition – 38

Analysis and Decision

[1087] Sincruide proposes to extend the use of the Mildred Lake Settling Basin until 2090, 54 years after end of mine life for the MLX project. Sincruide also proposes to extend the use of the MLX west dedicated disposal areas 1 and 2 until 2064, 28 years after end of mine life of the MLX project.

[1088] Sincruide did not provide information or justification for the continued operation of the plant beyond the end of mine life for Sincruide's Aurora North Mine, such as the design life of the plant or the need for processing future oil sands leases, as required by *Directive 085* to approve the extended use of tailings facilities beyond the life of mine of the MLX project. The panel acknowledges Sincruide's proposal of reducing disturbances by using existing tailings facilities, which is a preferred approach in tailings management. Sincruide's reliance on Aurora South does not provide adequate justification because it requires a future amendment for which it has not yet applied. For these reasons, at this time we are not able to approve the extended use of the Mildred Lake Settling Basin and MLX west cake deposition area beyond the ten years after the end of mine life for MLX project and Aurora North, 2050.⁷⁶

[1089] Should Sincruide require extended use of the Mildred Lake Settling Basin and MLX west cake deposition areas beyond 2050, Sincruide will need to apply in the future to the AER for the extended use of these facilities with the necessary supporting information.

Storage

[1090] *Directive 085* requires that the operator provide an explanation of how capacity will be available to hold water and fluid tailings within the onsite closed-circuit water system for the life of the project.

Evidence

[1091] Site-wide storage space is needed to contain and manage fluid tailings, treated tailings, and water, including industrial wastewater. Currently, there is no policy that allows for the release of process water from oil sands mining operations. Sincruide said that its fluid storage planning depends on a water release policy to be in place in the early 2020s. Sincruide is planning to implement a number of water efficiency initiatives to treat and reuse water. Sincruide will also use South West sand storage as contingency to store water if a water release policy is not in place by the early 2020s.

Analysis and Findings

[1092] Sincruide has not requested and the panel is not granting approval for any release of process-affected water as part of the current applications or decision.

[1093] We understand that Sincruide faces some constraints in continuing to manage its inventory of process-affected water on-site and that Sincruide is anticipating that forthcoming policy direction from

⁷⁶ OSCA Amendment Approval Condition – 39

Alberta will allow for the release of some process-affected water to the environment in the early 2020s. While the timing and nature of any policy direction remains uncertain, the panel accepts that Syncrude has a number of options to manage its inventory of process-affected water on-site and will continue to do so in a manner that minimizes the effects on the environment.

[1094] Given the importance of Syncrude's ability to continue to manage its inventory of process-affected water on-site and the uncertainty associated with the timing of any future policy direction that would allow for the release of process affected water, the panel requires that Syncrude report annually on the available storage capacity of each tailings pond or structure to ensure sufficient capacity is available to ensure ongoing operations and to protect the environment from accidental releases and to provide an estimate of storage volume requirements for the next five years.

Use of Flue Gas De-Sulphurization Material in Tailings Treatment

Evidence

[1095] To generate composite tailings, Syncrude uses gypsum (calcium sulphate dihydrate) sourced from Suncor's flue gas desulphurization process (FGD). Gypsum reduces fluidity of the mature fine tailings fluids and helps bind the sand grains together. The gypsum is added at a dosage of about 1200 g/m³ of composite tailings. It is the calcium (Ca²⁺) that is important in defining the rheology fluid phase. The sulphate (SO₄²⁻) contributes to the overall dissolved salts in the recycle water.

[1096] Syncrude said that the levels of these components are carefully monitored to control the concentration of dissolved solids in the process water. Syncrude has been evaluating appropriate alternatives to gypsum as part of its continuous improvement efforts. This evaluation demonstrated that Syncrude FGD solids, alum (Al₂(SO₄)₃), and carbon dioxide (CO₂ to create carbonic acid) are promising substitutes. Syncrude FGD contains about 44 per cent calcium sulphite hemihydrate (CaSO₃ 1/2H₂O), 10 per cent calcium sulphate dihydrate (CaSO₄ 2H₂O per cent) and 10 per cent coke.

[1097] Syncrude's centrifuge process also uses gypsum from Suncor. In the centrifuge process calcium (Ca²⁺) is the active ingredient and serves to improve centrifuge performance. Gypsum is added at about 800 grams of calcium sulphate per tonne of fines.

[1098] Syncrude said that to assess and understand potential water quality changes associated with the use of gypsum, Syncrude maintains a comprehensive site-wide process water chemistry monitoring program.

[1099] In 2017, Syncrude conducted a test at the centrifuging plant to compare addition of Syncrude FGD solids with addition of Suncor FGD gypsum in the fluid tailings. Syncrude provided the results of the tests and the feed properties of the fluid tailings as well as the properties of the centrate and centrifuge

cake. The demonstration showed that Suncrude would require higher dosage of Suncrude FGD solids compared to Suncor FGD gypsum.

[1100] In December 2018, Suncrude was planning to test Suncrude FGD solids vs Suncor FGD gypsum in the Mildred Lake site composite tailings plant.

[1101] Based on the test results, Suncrude does not expect any negative impact on the long-term performance of the centrifuge cake deposits. Suncrude FGD results in the reduction of sulphate and total dissolved salts, which may have a small positive effect on reclamation of the cake deposits. Suncrude FGD slightly reduces calcium levels in the water released from the cake, which improves bitumen recovery. Suncrude said that future monitoring and reporting would be the same with either source of FGD solids.

[1102] Suncrude said that the application of Suncrude FGD solids as part of the tailings treatment has a couple of benefits. Currently, Suncrude places FGD solids in a class 2 landfill that has a dedicated area of the site and will remain in the landscape at closure. By using Suncrude FGD as an additive to treated tailings, Suncrude will be able to minimize the size of that landfill for closure. In addition, the use of Suncrude FGD in place of Suncor FGD will save costs and provide economic benefits to Suncrude.

Analysis and Findings

[1103] Based on the information Suncrude provided, we did not identify any significant additional risk to the environment and future landscape resulting from the proposed change in additive from Suncor gypsum FGD to Suncrude FGD solids within the centrifuge tailings treatment process. Based on the information provided, the centrate and cake properties were found to be similar for both additives. We therefore approve the use of Suncrude FGD solids as an additive within the centrifuge tailings treatment process.⁷⁷

[1104] For the composite tailings treatment process, at the time of the hearing Suncrude indicated that the application of Suncrude's FGD solids as an additive to composite tailings is being tested. Suncrude will need to apply for permanent use of Suncrude FGD solids as an additive to composite tailings should the results favour its use. We note that should Suncrude FGD solids be used as an additive in both centrifugation and composite tailings treatment processes, it may reduce the size, maintenance, and liability of the onsite class II FGD landfill that is currently employed for depositing FGD solids.

⁷⁷ EPEA Amendment Approval – Condition 4.3.25

South West Sand Storage

Evidence

[1105] Syncrude proposes to use existing tailings facilities to store fluid tailings generated from the MLX project areas. Therefore, Syncrude requested that the panel remove the existing *EPEA* and *OSCA* approval clauses related to the timing of fluid tailings deposition into and transfer from the South West Sand Storage facility.

[1106] The *OSCA* approval clause currently reads as follows:

Syncrude shall design, construct and operate the Southwest Sand Storage facility as described in Application No. 1595820, Syncrude:

- a) Shall not deposit fluid fine tailings after December 31, 2017 unless otherwise approved by the AER.
- b) Shall commence the transfer of fluid fine tailings no later than December 31, 2017 unless otherwise approved by the AER.
- c) Shall remove all fluid fine tailings by no later than December 31, 2023 unless otherwise approved by the AER.⁷⁸

[1107] The *EPEA* approval clause currently reads as follows:

- 3.3.22 The approval holder shall not deposit fluid tailings into the Southwest Sand Storage Area after December 31, 2015, unless otherwise authorized in writing by the Director.
- 3.3.23 The approval holder shall remove all fluid tailings from the Southwest Sand Storage Area by no later than December 31, 2023, unless otherwise authorized in writing by the Director.

[1108] Syncrude plans to complete transfer of residual fluid tailings from South West Sand Storage by 2038 and reclaim this area to commercial forest and wildlife habitats for closure. Syncrude also states within table AER IRB 2-2 that the South West Sand Storage area will contain tailings centrifuge cake, straight coarse tailings, flotation tailings, and cyclone overflow within the final closure landscape.

[1109] Meanwhile, Syncrude proposes using South West Sand Storage as contingency storage if a water release policy and decision is delayed.

Analysis and Findings

[1110] We accept that the existing *OSCA* and *EPEA* conditions related to the depositing and transferring of fluid tailings into South West Sand Storage should be removed to allow Syncrude to store fluid tailings produced from the MLX project.⁷⁹ However, the provisions around removal of all fluid tailings from South West Sand Storage will be maintained with the timeline extended to 2038 as this is what Syncrude committed to in its application.

⁷⁸ *OSCA* Amendment Approval Condition – 40

⁷⁹ *EPEA* Amendment Approval Condition – 4.3.38

[1111] We are concerned about Syncrude's proposed timing of completing the transfer of residual fluid tailings from South West Sand Storage by 2038, which is two years after the end of mine life for the MLX project. The concern stems from the fact that Syncrude has not provided sufficient information to demonstrate that all residual fluid tailings will be able to be removed from South West Sand Storage within the proposed time frame. In future decisions, the AER should consider any risk from the remaining fluid tailings in South West Sand Storage after end of mine life.

[1112] Another concern is insufficient information about the management of the remainder of fluid tailings and treated tailings that are expected to remain within South West Sand Storage after end of mine life. The tailings to remain in place pose risks to the environment and achieving reclamation outcomes for the South West Sand Storage area. For tailings facilities having dam structures, such as South West Sand Storage, the presence of significant fluid tailings and treated tailings deposits might mean that the dam cannot be decommissioned. We note that Syncrude is in the process of capping and closing East-In-Pit. The experience of managing fluid tailings in East-In-Pit shall be incorporated in the closure of other tailings areas, such as South West Sand Storage.

[1113] Unless Syncrude is approved to use the South West Sand Storage facility beyond the MLX project, the panel expects Syncrude to decommission and reclaim the area accordingly.

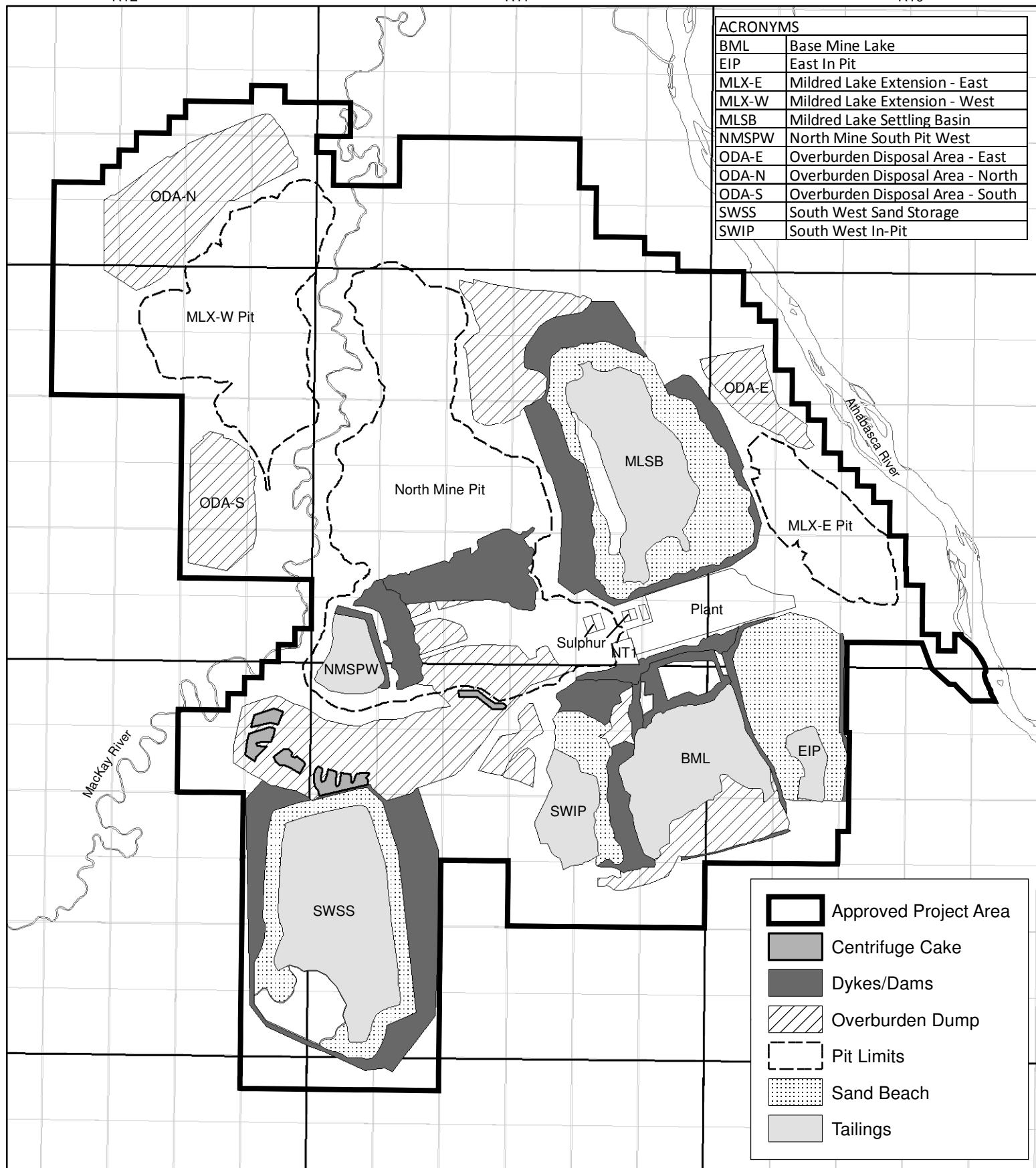
TMP and EPEA Plan Alignment

[1114] *Directive 085* requires that TMPs include sufficient information to demonstrate alignment with existing approvals and plans, including the *EPEA* life of mine closure plan. Where alignment does not occur, the applicant must identify the inconsistencies and describe how alignment will be achieved.

Analysis and Findings

[1115] Currently, Syncrude's *EPEA* life of mine closure plan is under review as part of application 040-00000026. To ensure consistency, the panel recommends that Syncrude demonstrate alignment with approvals and plans as part of its *EPEA* life of mine closure plan and mine reclamation plan. We note that some of the decisions in this report as well as the revised TMP that will be submitted by Syncrude in 2023 may have implications for the Syncrude's *EPEA* life of mine closure plan.

Appendix 1 Map



SYNCRUDE CANADA LIMITED MILDRED LAKE OIL SAND PROJECT

APPENDIX A TO APPROVAL NO. 8573P



0 1 2 4 6 8 Kilometers



The AER does not warrant the accuracy or completeness of the information contained in this map and is not responsible for any errors or omissions in its content and accepts no liability for the use of this information

Base Data Provided by Spatial Data Warehouse Ltd. 2003

Appendix 2 Hearing Participants

Principals and Representatives (abbreviations used in the report)	Witnesses
Syncrude Canada Limited (Syncrude) B.J. Roth, counsel D. Collins, counsel L. Estep, counsel E. Cook, counsel T. Armfield, counsel	B. Campbell P. Eng. D. Fischer P. Phys. K. Flynn E. Hamelin P. Biol. E. Hartman L. Hill C. Legdon R. Lewko P.Eng. J. Lorentz P. Eng. R. Pelletier P.Eng. I. Shelvey A. Sullivan P. Geo. M. Velez P.Eng. B. Vincent
Athabasca Chipewyan First Nation E. Murphy, counsel M. Hulse, counsel C. DiPuma, counsel	C. Candler PhD M. Carver PhD, P.Eng., P.Geo, P.Ag. S. Gutsell PhD. C. Joseph PhD. J. Ladouceur R. Ladouceur L. Laviolette A. Stewart P. Biol. M. Thompson PhD., P.Biol. E. Trippe De Rouché L. Tsessaze
Suncor Energy Inc. (Suncor) C. Chell, counsel J. Heisler	
Alberta Energy Regulator staff M. LaCasse, AER counsel A. Doebele, AER counsel E. Arruda D. Campbell J. Campbell R. Chiarella F. Debela R. Drummond L. Erickson A. Geremew C. Ham	

Principals and Representatives (abbreviations used in the report)	Witnesses
<p>D. Hovsepian</p> <p>E. Kerkhoven</p> <p>A. Ledi</p> <p>E. Mailes</p> <p>K. McCallion</p> <p>Y. Mihiretu</p> <p>D. Naas</p> <p>D. O’Neal</p> <p>W. Qiu</p> <p>E. Smith</p> <p>J. Smith</p> <p>C. Teichreb</p> <p>C. Wang</p> <p>T. Wang</p> <p>T. Wheaton</p> <p>K. Yap</p> <p>E. Zimmerman</p>	

Appendix 3 Motion Decision

Via e-mail only

January 20, 2019

Woodward & Company Lawyers LLP
Attention: Eamon Murphy and
Caily DiPuma

Dentons LLP
Attention: Bernard Roth and
Laura Estep

Alberta Justice and Solicitor General
Attention: Vivienne Ball and
Nicole Hartman

Counsel:

**Re: Proceeding ID 361
Syncrude Canada Ltd.
Mildred Lake Extension Project
Athabasca Chipewyan First Nation Motion**

On January 14, 2019, Athabasca Chipewyan First Nation (ACFN) filed a motion relating to information on conservation offsets filed by Syncrude in this proceeding. On January 15, 2019, Syncrude Canada Ltd. ("Syncrude") filed a response to that motion opposing it. On January 17, 2019, the Government of Alberta (Alberta) filed a submission also opposing the motion. On January 16, 2019, ACFN filed a submission in reply to Syncrude and filed a reply to Alberta's response to the motion on January 18, 2019.

The panel has decided to deny ACFN's motion in its entirety.

Relief Sought by ACFN

ACFN seeks the following orders:

- a) that Syncrude produce the Memorandum of Agreement it relies on to support its alleged offset of the disturbance caused by the proposed MLX Project (Offset Agreement);

- b) that a notice to attend be issued to Alberta Environment and Parks (AEP) requiring:

inquiries 1-855-297-8311
24-hour
emergency 1-800-222-6514

- i) production by AEP of its draft Conservation Offset Policy Framework (draft Policy) referred to in AEP's March 28, 2018 letter to Syncrude; and,
- ii) the attendance of an AEP representative at the hearing to provide evidence with respect to the draft Policy and the conservation offset alleged by Syncrude.

In the alternative, ACFN asks that Syncrude be prohibited from relying on the conservation offset and its submissions relating to the alleged conservation offset be struck from the record of proceeding.

Background

In its Hearing Submission (Ex.44.02) filed on October 4, 2018, Syncrude provided the following evidence related to the creation of the Birch River Wildland Provincial Park:

43. Prior to announcement, on March 28, 2018, Syncrude received a signed Letter of Understanding from the Minister of Alberta Environment and Parks, regarding Syncrude's contribution to the conservation project, as described in the Memorandum of Agreement signed by all parties in the project, and its potential applicability toward recognized offsets for Syncrude industrial activities. The letter states:

"The purpose of this letter of understanding is to acknowledge that the proposal, if implemented as described in the Memorandum of Agreement, meets the criteria for conservation offsets as set out in the draft Conservation Offset Policy Framework and can be used in a regulatory process to support offsetting habitat impacts of industrial activities planned by Syncrude."

44. The agreement does not relieve Syncrude of its responsibilities regarding reclamation of disturbed land as outlined in the company's... Operating License and Mine Financial Security Program (MFSP). Our contribution to the conservation partnership is in addition to all other

legislated reclamation accountabilities and, as a result, will have a net positive land impact in Alberta. A copy of the letter referred to above is included in this package.

inquiries 1-855-297-8311
24-hour
emergency 1-800-222-6514

45. Based on the letter from the Minister, it is Syncrude's intent to rely on this environmental initiative to provide an offset for the proposed industrial disturbance from execution of the MLX Project.

On November 9, 2018, ACFN submitted information requests (IRs) to Syncrude. ACFN did not request the Memorandum of Agreement (Offset Agreement) referred to in Syncrude's Hearing Submission, or the draft Conservation Offset Policy Framework (draft Policy).

In IRs issued to Syncrude on December 5, 2018, the panel posed the following questions:

9. Exhibit 44.02, PDF page 10 - 11 and 60 – 62

In its October 4th submission, paragraph 45, Syncrude indicates its intention to rely on a conservation offset associated with the creation of Birch River Wildland Provincial Park to provide an offset for the proposed industrial disturbance resulting from the MLX project.

- a) Provide a copy of the Memorandum of Agreement regarding the conservation offset, as described in paragraph 43.
- b) Provide a copy of the "draft Conservation Offset Policy Framework" as described in paragraph 43.

In its response to IRs 9 (a) and (b), Syncrude stated:

9(a) Syncrude is not in a position to share the Memorandum of Agreement referred to in the 28 March letter from Alberta Environment and Parks (AEP) to Syncrude; the document is confidential.

9(b) Syncrude does not have a copy of the draft Conservation Offset Policy Framework. Syncrude understands that AEP has designed the Memorandum of Agreement to ensure alignment with the draft Conservation Offset Policy Framework as confirmed in the 28 March 2018 letter from AEP to Syncrude.¹

¹ Exhibit 71.02, PDF p 26

The panel's IR No. 9 also asked for other information regarding the conservation offsets and Syncrude provided additional information in its response.

In a letter dated January 8, 2019, ACFN asked that Syncrude explain the specific reasons why the Offset Agreement is confidential and any harm that might be caused by its disclosure.

In its reply submission filed on January 10, 2019, Syncrude stated:

As Syncrude explained in its response 9(a) to AER Information Request – Package C (Exhibit 71.02), this Memorandum is a confidential document. The ACFN has asked for further detail regarding the confidential nature of the document. Syncrude can advise that during the development of the Memorandum, Syncrude made a commitment not to release a copy of this multi-party agreement outside of the signatories to it. The Memorandum contains confidential commercial and non-commercial information relevant to the other signatories that is outside of the funding and offset provisions specific to Syncrude's participation in the initiative. The Minister of Alberta Environment and Parks directed the letter dated March 28, 2018 (Exhibit 44.02, Attachment 6, PDF pages 59-62) to Syncrude to provide detailed information regarding the offset calculation specific to Syncrude's participation in this agreement for the purposes of regulatory proceedings. This information has been provided as evidence to support statements Syncrude has made regarding the offsets provided. As a Minister of the Crown has provided this information directly to Syncrude, Syncrude submits this information is sufficient evidence for the record in this proceeding, allowing Syncrude to honour its commitment to the Government of Alberta to maintain the Memorandum's confidentiality among the parties.²

Powers of the AER to Compel Information and the Attendance of Witnesses

Section 55 of the *Alberta Energy Regulator Rules of Practice* (Rules of Practice) gives the AER the power to direct parties to file such additional information as it considers necessary to permit a full and satisfactory understanding of an issue in a

² Exhibit 86.01, PDF 1 Syncrude Reply Submission

proceeding. The AER is the master of its own procedure, subject to the rules of procedural fairness, and as such retains discretion to determine what information is necessary to allow the matter to proceed to a fair and efficient hearing of the applications.

Section 20 of the Rules of Practice gives the panel the authority to issue a notice to attend requiring a person to attend an oral hearing as a witness and produce documents specified in the notice.

The test for the AER to compel witnesses requires the regulator to be:
...convinced that the evidence that would be adduced is critical for the Board to understand the issues it is charged to address. Further, it must be clear that there is no other reasonable way to obtain the evidence. Compelling and substantive reasons are needed for the board to take such action....³

This test has been further clarified:

To be necessary, the evidence sought must be relevant. However, relevance alone is not sufficient. The evidence sought must be such that without it, the Panel cannot meet its mandate.⁴

In relation to IRs, Section 12(1) of the Rules of Practice allows a party to request another party to provide information necessary to:

- a) Clarify documentary evidence filed by the other party,
- b) Simplify the issues,
- c) Permit a full and satisfactory understanding of the matters to be considered, or
- d) Expedite the proceeding.

Sections 13 and 14 of the Rules of Practice require the recipient of an IR to provide a full and adequate response to each question or explain why they have not provided such a response. If the recipient of responses is not satisfied with those responses, it may file a motion requesting a better response.

³ *Big Loop Cattle Co. Ltd. v Alberta (Energy Resources Conservation Board)*, 2010 ABCA 328 at paras. 27 and 29

⁴ Letter decision of the Frontier Oil Sands Mine Project Joint Review Panel dated October 12, 2018.

ACFN Submissions in Support of its Motion

In support of its motion to compel Syncrude to produce the Offset Agreement, ACFN referred to the Rules of Practice relating to IR responses and confidential documents, asserting that Syncrude has not provided any explanation of its position that the document is confidential.

ACFN submitted that the only evidence Syncrude has produced in relation to the alleged conservation offset is the March 28, 2018 Letter of Understanding (the Letter) from AEP. Their position is that in light of Syncrude's reliance on the Letter, and in order for the parties and the panel to understand Syncrude's submission on this issue, the draft Policy must be produced, and an AEP representative must testify regarding the draft Policy and the conservation offset alleged by Syncrude.

ACFN notes that Syncrude relies on the alleged conservation offset to support its position that several of ACFN's requested mitigations are unnecessary. ACFN asserts that Syncrude's failure to provide evidence in relation to the offset, including a copy of the Offset Agreement and the draft Policy has a direct impact on its submissions and impairs ACFN's ability to fully and fairly participate in the hearing.

If Syncrude does not provide sufficient evidence to support the offset and if ACFN is unable to test that evidence in a meaningful way, ACFN asks that Syncrude be prohibited from relying on the offset.

Syncrude Submissions Opposing the Motion

Syncrude submitted that ACFN was not entitled to demand further and better responses to IR's that ACFN did not make. If ACFN had questions about the proposed offsets, it should have asked IRs on the topic, but it did not. Additionally, Syncrude submitted that ACFN is not prejudiced by the fact the Offset Agreement and the draft Policy are not on the record in the proceeding. This is because ACFN can pursue issues associated with the conservation offsets claimed by Syncrude through cross-examination of Syncrude's witnesses at the hearing.

Syncrude also noted that an Order-in-Council was issued on May 14, 2018 creating the Birch River Wildland Park and the creation of offsets was the subject of press releases made by Syncrude and Alberta on May 15, 2018. These documents are included in its Hearing Submission.

Alberta Parks and Environment Submissions Opposing the Motion

AEP opposes the request for it to produce the draft Policy and for an AEP representative to attend the hearing to give evidence. It submits that ACFN has not provided a compelling reason why evidence from an AEP representative relating to the draft Policy or the conservation offsets is critical to the issues before the panel. ACFN does not need the draft Policy or further evidence from AEP to be able to make submissions to the panel regarding its views on the impacts of the MLX project.

AEP also noted that section 49 of REDA gives the Crown the option of whether and how it participates in an AER hearing.

ACFN's Reply to Syncrude and Alberta

In response to Syncrude's reply to the motion, ACFN stated that it is not concerned with the adequacy of Syncrude's IR response, but with the fact that Syncrude did not adequately explain why it could not provide the information requested and why the information sought is confidential. Additionally, ACFN indicated that the requested documents are necessary for parties to be able to cross-examine adequately.

In response to Alberta's submission, ACFN stated that Alberta is taking an overly narrow and untenable interpretation of the panel's mandate and the issues. ACFN noted that as Syncrude has raised the offset as a mitigation, the parties are entitled to know the extent to which this will occur. ACFN also submitted that to weigh the Letter, the panel should have the draft Policy since the letter is not legislation, regulation or policy.

Discussion

inquiries 1-855-297-8311
24-hour
emergency 1-800-222-6514

a. Syncrude's IR response

The panel does not consider that the Rules regarding IR responses help ACFN with its motion. It is inappropriate for a participant to demand further and better responses to an IR that was not asked by that participant. ACFN was aware of Syncrude's position regarding the offset and the existence of the Offset Agreement when it posed its IRs to Syncrude. It did not ask for information about the conservation offsets or for the Offset Agreement at that time and it is too late now to pursue issues that it chose not to pursue when it had the opportunity earlier.

ACFN states that Syncrude's response to the panel's IR was inadequate not because it did not provide the Offset Agreement, but because it did not adequately explain why the document should be treated as confidential. The panel disagrees and is satisfied that the evidence on the record adequately explains why the Offset Agreement is confidential.

b. is the information sought necessary

The panel has considered whether the information sought, the Offset Agreement and the draft Policy, is necessary for the participants to have a sufficient understanding of the applications to be able to meaningfully and fairly participate in the hearing.

As noted by the Alberta Court of Appeal in *Inter Pipeline Fund v Alberta (Energy Resources Conservation Board)*, the regulator:

...has the power to determine whether information put forward by an applicant is adequate in the sense that it will enable other parties to make an informed case against an application.⁵

⁵ *Inter Pipeline Fund v Alberta (Energy Resources Conservation Board)*, 2012 ABCA 208 at para. 69.

The panel is satisfied that the information on the record is satisfactory to allow the panel and the participants to understand the issues relating to offsets and mitigations in a way that will allow them to explore and test Syncrude's evidence on that issue, and allow for a fair and efficient hearing. Fairness is the paramount consideration, and the panel has reached its decision with the main goal being fairness of the proceeding for all parties.

The topic of conservation offsets and the Offset Agreement and draft Policy are addressed in the evidence in sufficient detail to allow for the cross-examination of Syncrude's witnesses on this topic. The Offset Agreement and the draft Policy may be relevant to the claimed offset, but they are not necessary pieces of information for ACFN to test Syncrude's evidence regarding environmental impacts and how the conservation offsets relate to mitigations proposed.

The panel notes that use of conservation offsets is not a regulatory requirement. Neither the Offset Agreement nor the draft Policy establishes requirements for Syncrude to meet. The usefulness of the draft Policy is also limited because it is in draft only. It is not legislation, regulation or actual published government policy.

Syncrude has chosen not to produce the Offset Agreement. By making that choice, Syncrude bears the risk that at the conclusion of the hearing the panel may find the evidence regarding the offset to be insufficient to persuade the panel of the characteristics or specific use of the offset as asserted by Syncrude. Such a result could affect the panel's decisions in a way that does not support Syncrude's applications. However, taking that risk is Syncrude's choice. This choice does not mean there is insufficient evidence regarding the offset to allow ACFN to test Syncrude's evidence at the hearing.

The panel is satisfied that there is sufficient evidence on the record, including in relation to environmental impacts, offsets and mitigations, to proceed to the oral portion of this proceeding and that the parties have enough information to make informed cases in respect of the applications.

c. compelling an AEP representative to attend the hearing

Given the conclusions above about the sufficiency of the information on the record regarding the offsets, the attendance of an AEP representative is not necessary.

d. excluding evidence of the offset from the record

The panel sees no justification for excluding evidence of the claimed conservation offset from the proceeding record. As noted above, if Syncrude provides insufficient evidence to support the claimed offset, that evidentiary gap will be to Syncrude's detriment.

Sincerely,



Meighan G. LaCasse
Counsel

cc: A. Doebele and E. Arruda, AER
T. Hafso, R. Kopecky, S. McCarthy, ACO
T. Razzaghi, Boughton Law
M. Gustafson and M. Price, JFK Law Corporation
M. Hulse, Woodward & Company LLP
J Heisler, Suncor Energy Inc.

Appendix 4 *OSCA* Approval

MADE at the City of Fort McMurray, in the
Province of Alberta, on

ALBERTA ENERGY REGULATOR

IN THE MATTER of a Commercial scheme of Syncrude Canada Ltd (hereinafter called “The operator”) for the recovery of oil sands or production of oil sands products from the **Athabasca Wabiskaw-McMurray Oil Sands Deposit in the Mildred Lake Area.**

WHEREAS the operator has applied to the Alberta Energy Regulator (AER) to amend Approval No. 8573 in respect of the Mildred Lake Extension (MLX) project and Tailings Management Plan.

The Alberta Energy Regulator, pursuant to the *Oil Sands Conservation Act*, chapter O-7 of the Revised Statutes of Alberta, 2000, orders as follows:

1) (a) The scheme of the operator for the recovery of oil sands and production of oil sands products, from the area shown on the attached hereto marked Appendix A to this approval as such scheme is described in related applications including

- | | |
|----------------------------|----------------------------------|
| a) Application No. 957, | w) Application No. 950107, |
| b) Application No. 6888, | x) Application No. 960196, |
| c) Application No. 6889, | y) Application No. 980381 |
| d) Application No. 9160, | z) Application No. 1244645 |
| e) Application No. 9775, | aa) Application No. 1284738, |
| f) Application No. 790543, | bb) Application No. 1296639, |
| g) Application No. 820394, | cc) Application No. 1317860, |
| h) Application No. 821217, | dd) Application No. 1309396, |
| i) Application No. 840142, | ee) Application No. 1453988, |
| j) Application No. 840232, | ff) Application No. 1497852, |
| k) Application No. 841228, | gg) Application No. 1507992, |
| l) Application No. 841319, | hh) Application No. 1595820, |
| m) Application No. 851024, | ii) Application No. 1625971, |
| n) Application No. 870593, | jj) Application No. 1662881, |
| o) Application No. 920398, | kk) Application No. 1732572, |
| p) Application No. 920863, | ll) Application No. 1754933, |
| q) Application No. 921321, | mm) Application No. 1826976, |
| r) Application No. 921322, | nn) Application No. 1920103, and |
| s) Application No. 931494, | oo) Application No. 1820856 |
| t) Application No. 940001, | |
| u) Application No. 940146, | |
| v) Application No. 941167, | |

is approved, subject to the *Oil Sands Conservation Rules* and the terms and conditions herein contained.

- (b) Subclause (1) does not preclude alterations in design or equipment provided the AER is satisfied the alterations are compatible with the outline of the scheme, meet the operating criteria in the approval, are made for the better operation of the scheme, and do not result in adverse impacts that are unacceptable to the AER.
- 2) The operator shall provide its additional drilling plans to the AER as part of its annual mine plan submissions.
- 3) If future drilling indicates potential resource underneath the overburden disposal area in MLX East (ODA-E) and significant changes are required to the approved mine plan due to changes in the resource evaluation, the operator shall submit a mine-plan amendment application to the AER indicating any impacts on the approved mine plan and the MLX project.
- 4) This approval applies to the production in each calendar year of 27.5 million cubic metres of marketable hydrocarbons.
- 5) Approval for those facilities described in Application No. 980381 for which construction has not commenced on or before 31 December 2010 shall lapse unless a later date is approved by the AER.
- 6) (a) The operator shall carry out its operations in a manner that, under normal operating conditions, on an annual basis, meet naphtha losses of not greater than 4.3 volumes of naphtha lost per 1000 volumes of bitumen produced to a maximum annual average of 300 cubic metres (1900 barrels) per calendar day.
- (b) The operator is required to recover not less than 99.0% of the sulphur contained in the acid gas produced during each three month period beginning 1 January, 1 April, 1 July, and 1 October up to a maximum sulphur inlet rate of 2000 tonnes/day. When the sulphur inlet rate exceeds 2000 tonnes/day for a quarter, the operator is required to recover not less than 99.5%.
- 7) The operator shall remove all materials from the discard site "NT1" on Appendix A and shall proceed to recover the crude bitumen within this area prior to 31 December 2025, or such other date as the AER may require.
- 8) The operator shall file with the AER on or before 28 February of every year, or such other date or frequency as the AER may stipulate, a report summarizing for the preceding year, efforts to minimize the withdrawal of fresh water from the Athabasca River, efforts to maximize reuse of process affected water, and efforts to minimize the on site storage of process affected water.
- 9) Following installation of the new coker as described in Application No. 980381, The operator shall file with the AER on or before 28 February of every year, or such other date or frequency as the AER may stipulate, a report summarizing for the preceding year, efforts to achieve an annual recovery of the sulphur contained in the acid gas produced of not less than 99.8 per cent.
- 10) The operator shall file with the AER on or before 28 February 2002 and every second year thereafter, or such other date or frequency as the AER may stipulate, a report summarizing:

- (a) Efforts to reduce naphtha losses to the target of 3.6 volumes of naphtha lost per 1000 volumes of bitumen produced.
 - (b) The performance of the Mildred Lake facility, which shall include as a minimum:
 - i) a discussion of the energy efficiency for the previous two calendar years,
 - ii) the results of any studies undertaken to identify opportunities for improved energy efficiency,
 - iii) a description of any modifications made to improve energy efficiency, and
 - iv) a comparison of the energy efficiency with those of similar industrial operations.
- 11) The operator shall conduct an acoustical survey for the MLX-East mine operations during the modeled peak year noise emission of Year 2029 to confirm compliance at the receptor location, Receptor 4 (R4), a critical receptor location that is on the local study area boundary defined in the noise impact assessment report. The operator shall provide the results of the acoustical study report to the AER within 6 months of the survey. In the event that the acoustical study report shows that sound levels do not meet Directive 038 requirements, the operator shall develop and implement a noise mitigation plan, and then conduct a follow-up acoustical survey to confirm compliance within 6 months.
- 12) The operator shall submit detailed geotechnical designs of final pit walls, external and in pit overburden disposal areas and reclamation material stockpiles six months prior to construction.
- 13) The operator shall provide a Devonian geohazard management plan, including a program to evaluate the potential for Devonian karst features; a set of performance criteria for the pit floor such as indicators of stress and pore pressure, seepage quantity and seepage quality; and contingency measures that would be implemented in the event karst features or inflow in Devonian water is encountered. The Devonian geohazard management plan shall be provided to the AER prior to commencing mining at MLX- West or MLX-East. The operator shall report on the results of its Devonian geohazard management plan as part of its annual mine plan submission.
- 14) The operator shall provide to the AER a SAGD-mining impact assessment for the MLX west pit prior to commencing mining in this pit. The assessment needs to be supported by performance or monitoring data from an existing SAGD operation and by an additional monitoring program in the buffer zone before mine operation start-up.
- 15) The operator is required to
- (a) engage with stakeholders and indigenous communities on the activities undertaken in respect of tailings management, including research and monitoring;
 - (b) engage with stakeholders and indigenous communities on its water-capping technology demonstration, including research and monitoring;
 - (c) conduct an annual forum with stakeholders and indigenous communities as part of the engagement activities required under (a) and (b); and
 - (d) report to the AER in the annual fluid tailings management report for Mildred Lake on its engagement efforts undertaken in the reporting period.

- 16) The report in clause 15 shall include the following:
- (a) how the stakeholders and indigenous communities were identified for engagement;
 - (b) a list of stakeholders and indigenous communities identified;
 - (c) objectives for engagement, including gathering input and feedback on tailings management, research and monitoring from stakeholders and indigenous communities ;
 - (d) the type of engagement activity that was undertaken, and the tailings management, research and monitoring information that was provided to each stakeholder and indigenous community;
 - (e) the specific frequency and duration of the engagement with each stakeholder and indigenous community;
 - (f) what specific feedback was provided by each stakeholder and indigenous community;
 - (g) what specific feedback on this report was provided by each stakeholder and indigenous community ;
 - (h) how the operator has included stakeholder and indigenous community feedback in their tailings management, research and monitoring;
 - (i) how the operator has included stakeholder and indigenous community feedback in respect to its water-capping technology demonstration, including research and monitoring;
 - (j) how the operator has shared results from research and monitoring with each stakeholder and indigenous community;
 - (k) how the operator addressed any outstanding concerns of stakeholders and indigenous communities arising from engagement;
 - (l) a discussion of any unresolved concerns identified; and
 - (m) outcomes from the annual forum(s).
- 17) The operator shall provide to the AER, for its approval, an updated Tailings Management Plan by January 31, 2023 or any such other date as the AER may stipulate in writing. This updated Tailings Management Plan shall:
- (a) Demonstrate that fluid treatment capacity for the selected technologies is equal to or greater than the production rate of fluid tailings. Treatment capacity equal to production capacity must be achieved by December 31, 2025.
 - (b) Incorporate learnings from Base Mine Lake demonstration project.
 - (c) Provide an assessment of the results and predictions from Base Mine Lake research.
 - (d) Update the Ready to Reclaim Criteria and Ready to Reclaim Trajectory for each deposit and any of the proposed technologies.
 - (e) Revise profiles for new and legacy fluid tailings that are representative of Mildred Lake Mine and MLX project fluid tailings only.
 - (f) Revise the end of mine life target so that it is no greater than 5 years of fluid tailings production at the Mildred Lake (MLX) mine site.
 - (g) Identify and discuss any implications of changes to the Tailings Management Plan for the closure plans for the affected tailings deposit facilities.
 - (h) Any other information the AER may require.
- 18) The operator is not authorized to place untreated fluid tailings in North Mine Centre Pit unless an approval amendment is granted by the AER.
- 19) The operator is not permitted to cap the North Mine Centre Pit centrifuge cake deposit with water unless an approval amendment is granted by the AER.

- 20) The operator is required to provide an updated design for the North Mine Centre Pit by September 30, 2020, or such other date as the AER may stipulate in writing, for AER to assess. The updated design shall include:
- (a) an assessment of implications for the mine plan; and
 - (b) any other information the AER may require.
- 21) By September 30, 2020, the operator shall provide to the AER a detailed alternative technology plan to treat the 250.5 Mm³ of fluid tailings that is currently planned to be placed in North Mine Centre Pit. The plan shall:
- (a) satisfy the requirements of section 4.6 of *Directive 085*;
 - (b) include any or a combination of the alternative technologies, including but not limited to centrifugation and co-mix;
 - (c) include an evaluation of the potential to scale up the use of co-mix and other technologies to reduce reliance on water capping of fluid tailings;
 - (d) include a detailed implementation timeline and discuss cost, risk, benefit, and any associated assessment of implications for the mine plan, deposit design, capping design, reclamation outcomes, schedule and milestone for treatment, capping and reclamation;
 - (e) if by 2023, water capping has not been demonstrated as viable and approved, be capable of treating all new and legacy tailings at Mildred Lake site within 10 years of the end of mine life as required by the *Tailings Management Framework* and *Directive 8*;
 - (f) be executable in 2023 and if required be implemented no later than 2027 in place of North Mine Centre Pit water-capping; and
 - (g) include any other information the AER may require.
- 22) By September 30 2020, the operator is required to provide to the AER a conceptual alternative technology plan for the treatment of the 173.7Mm³ of fluid tailings currently placed in Base Mine Lake, in the event the Base Mine Lake demonstration doesn't prove viable. The plan shall:
- (a) include any or a combination of alternative technologies;
 - (b) include a detailed implementation timeline and discuss cost, risk, benefit, and any implications for the mine plan and closure plan;
 - (c) if by 2023 water capping has not been demonstrated and approved, be capable of treating fluid tailings within the timelines required by Tailings Management Framework and Directive 85;
 - (d) any other information the AER may require.
- 23) For any water-capped deposits on the Mildred Lake site, the operator is required to submit to the AER an assessment of the applicable Ready to Reclaim criteria and Ready to Reclaim trajectory for fluid tailings in water-capped lake by January 31, 2023, or such other date as stipulated by the AER in writing.
- 24) Subject to clause a), the operator shall achieve the ready to reclaim criteria as set out in Appendix C.
- (a) If, at any time, the operator proposes any new or modified ready to reclaim criteria in Appendix C, the operator shall provide any other information the AER may require;

- i) The operator shall not use any ready to reclaim criteria unless the AER has amended Appendix C to allow the ready to reclaim criteria.
- 25) The operator shall provide to the AER for its approval a detailed centrifuge cake tailings deposit assessment report and research plan by September 30, 2020, or any such other dates as the AER may stipulate in writing,
- 26) The detailed centrifuge cake tailings deposit assessment report and research plan in clause (25) shall include, but not be limited to the following:
 - (a) a plan to define landform and reclamation capping requirements for deep centrifuge tailings deposits based on North Mine South Pit cake deposit operation and research results, including:
 - i) An outline of the plan to resolve uncertainties with centrifuge treatment and capping design capabilities
 - ii) an updated settlement and consolidation model or engineering analysis, along with any required supporting information;
 - iii) an updated flux model, along with implications to groundwater-surface water modelling;
 - (b) an outline of the plan to identify risks and address uncertainties with each type of capping material proposed;
 - (c) an assessment of implications to the development of self-sustaining ecosystems aligned with the Life of Mine Closure Plan required by EPEA;
 - (d) an assessment of:
 - i) deep centrifuge cake tailings deposit designs and operations,
 - ii) Kc clay or suitable overburden material needs, and availability;
 - iii) deep centrifuge cake tailings deposit milestones,
 - iv) fluid tailings profiles;
 - (e) updates to proposed RTR criteria and RTR trajectory for the North Mine South Pit, North Mine Centre Pit and MLX-West deep centrifuge cake deposits;
 - (f) any other information the AER may require.
- 27) The operator shall provide to the AER for its approval a detailed composite tailings deposit assessment report and research plan update by February 28, 2020, or such other dates as the AER may stipulate in writing.
- 28) The detailed composite tailings deposit assessment report and research plan update in clause (27) shall include, but not limited to the following:
 - (a) an updated settlement and consolidation model or engineering analysis, along with any required supporting information;
 - (b) an updated flux model, along with implications to groundwater-surface water modelling;
 - (c) an update to the rationale for defining capping requirements for composite tailings deposits based upon East In Pit operation and any related research results
 - i) an assessment of implications to the development of self-sustaining boreal forest terrestrial or wetland ecosystems aligned with life of mine closure plan;
 - (d) contingency plans for capping material shortages;
 - (e) an assessment of implications to:
 - i) composite tailings deposit milestones,
 - ii) to fluid tailings profiles; and

- (f) any other information the AER may require.
- 29) The operator shall meet the deposit milestone dates as set out in Appendix D, or such other dates as the AER may stipulate.
- 30) The operator shall monitor :
- (a) on a quarterly basis or such other basis as the AER may stipulate in writing, the performance of the centrifuge tailings and composite tailings plant, including the variation of properties of the treated tailings and the released water;
 - (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, and pore water pressure in composite tailings deposit;
 - (c) measurement for froth treatment tailings; and
 - (d) any other parameter specified in writing by the AER.
- 31) The operator shall, in addition to any reporting required by *Directive 085*, provide in the annual fluid tailings management report:
- (a) the available storage capacity of each tailings deposit or pond that contains water or tailings at the end of the reporting period;
 - (b) annual storage capacity and volume requirements for the five years following the end of the reporting period;
 - (c) for each composite tailings deposit, monitoring data including representative cross-sections to illustrate the variation of the following:
 - i) solids and clay content,
 - ii) sand to fines ratio;
 - iii) effective stress;
 - iv) pore water pressure;
 - v) settlement;
 - vi) any other parameter considered relevant by the operator; and
 - vii) any other parameter specified by the AER;
 - (d) monitoring results evaluated on a quarterly basis or such other basis as the AER may stipulate in writing, for the centrifuge tailings and composite tailings plant operation performance, including;
 - i) the variation of properties of the treated tailings and the released water;
 - (e) for each treated fluid tailings deposit, representative cross-sections illustrating deposit consolidation;
 - (f) Kc clay, and suitable overburden material use in tailings treatment or capping over the year, and available for the five years following the end of the reporting period;
 - (g) results from measurement for froth treatment tailings; and
 - (h) any other parameter specified in writing by the AER.
- 32) The operator shall achieve the
- (a) profile specified in Appendix B, Table 1 and Figure 1; and
 - (b) profile specified in Appendix B, Table 2 and Figure 2.
- 33) The operator shall not exceed

- (a) any of the profile deviation trigger, total volume trigger or total volume limit specified in Appendix B, Table 3.
 - (b) the profile deviation trigger specified in Appendix B, Table 4.
- 34) The operator shall not remove fluid tailings from the fluid tailings inventory unless it has achieved the Ready to Reclaim Criteria in Appendix C.
- 35) If any limit or trigger in clause (33) is exceeded, the operator shall comply with the management response or action directed by the AER.
- 36) The operator shall submit to the AER for its approval a detailed plan that identifies the steps the operator will take to reduce site wide Naphtha solvent discharges to the Mildred Lake Settling Basin from the operator's current levels and the timelines in which it will take these steps.
- 37) The Plan in clause (36) shall be submitted by December 31, 2021 and the reduction of Naphtha solvent to commence by start-up of Mildred Lake Extension project in 2023.
- 38) The operator is required to provide the AER its research plan to assess and resolve the risks and uncertainties with reclamation of froth treatment tailings by December 1, 2019, or such other dates as the AER may stipulate in writing. Pending its research results, the operator is permitted to continue placing froth treatment tailings only in the Mildred Lake Settling Basin.
- 39) The operator shall not use the Mildred Lake Settling Basin for tailings management, and MLX west pit for centrifuge cake deposit beyond the ten years after end of mine life for the MLX project and Aurora North Mine, year 2050, unless an approval amendment is granted by the AER.
- 40) The operator shall operate the Southwest Sand Storage facility as described in Application No. 1595820, and as amended in Application No. 1826976. The operator:
- (a) shall remove all fluid tailings from the Southwest Sand Storage facility by no later than December 31, 2038 unless otherwise approved by the AER.
- 41) The operator shall place treated fluid tailings only in the treated fluid tailings placement areas identified in Application No. 1820856, unless written authorization or approval amendment is obtained from the AER.
- 42) With the exception of Base Mine Lake, the operator shall not place any water, which includes industrial wastewater, above treated or untreated tailings for the purpose of creating an aquatic closure landscape, unless an approval amendment is granted by the AER.
- 43) The operator shall
- (a) notify the AER of any proposed on-site fluid tailings pilots, prototypes or demonstrations at least 6 months, or such other time as the AER may stipulate in writing, prior to any proposed construction or implementation; and

(b) not construct or implement any of the proposed on-site fluid tailings pilots, prototypes or demonstrations unless written authorization or approval amendment is obtained from the AER.

- 44) The Operator shall apply for an amendment to this Scheme Approval to align with any applicable government policy, including, but not limited to
- (a) tailings water release;
 - (b) placement of any water above treated or untreated tailings to create a water capped pit lake; and,
 - (c) reclamation criteria.

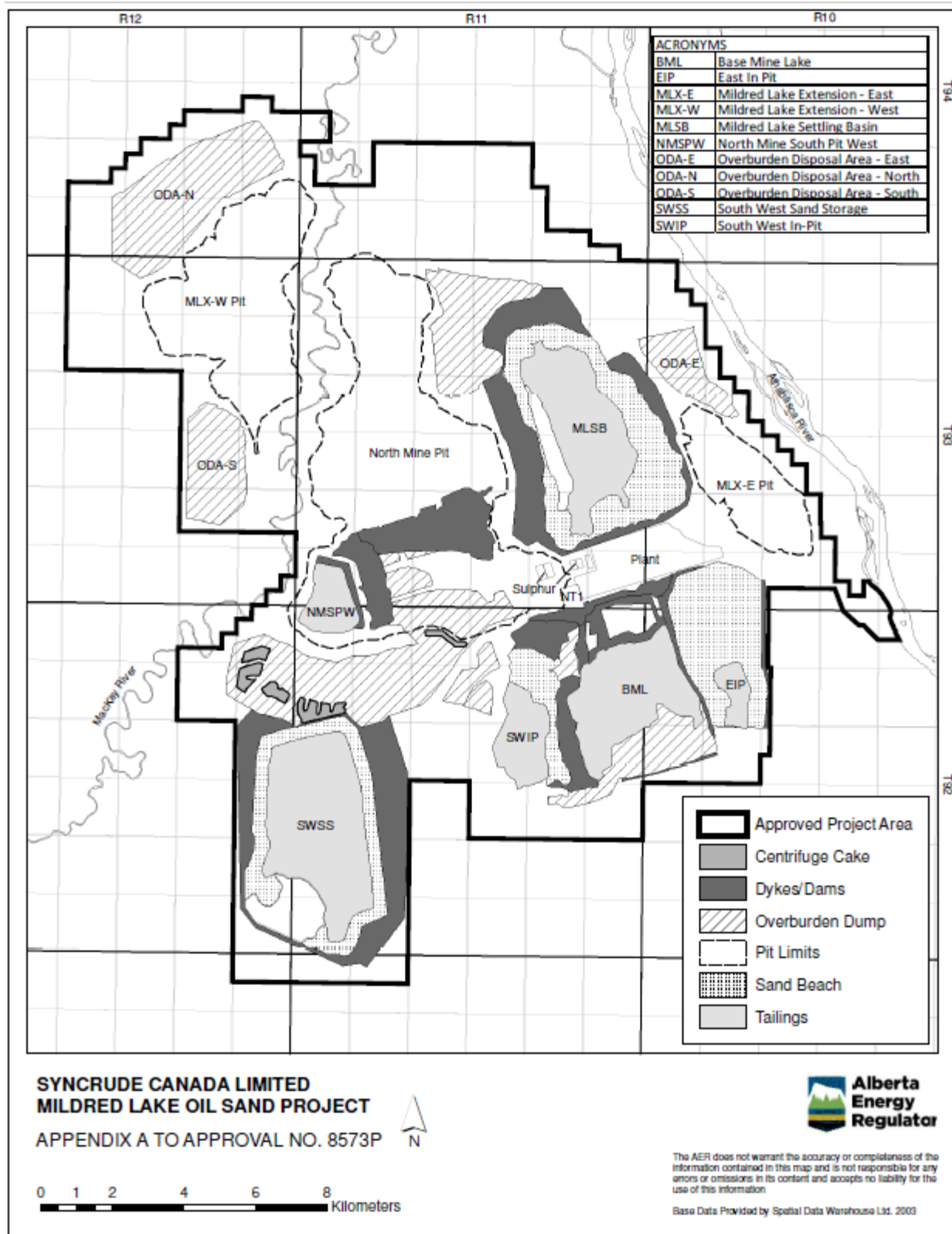
45) The AER may,

- (a) Upon its own motion, or
- (b) Upon the application of an interested person

Rescind or amend this approval at any time if, in the opinion of the AER, circumstances so warrant.

46) Approval No. 8573O is rescinded and replaced with Approval 8573P.

END OF DOCUMENT



SYNCRUDE CANADA LTD. MILDRED LAKE

APPENDIX B TO SCHEME APPROVAL NO. 8573P

Table 1. Profile for New Fluid Tailings

Year	Approved Profile New FT Inventory (million cubic metres)
2014	0
2015	15
2016	31
2017	54
2018	71
2019	94
2020	103
2021	128
2022	141
2023	151

Table 2. Profile for Legacy Fluid Tailings Profile

Year	Approved Profile Legacy FT Inventory (million cubic metres)
2014	470
2015	462
2016	449
2017	433
2018	418
2019	401
2020	386
2021	369
2022	353
2023	165

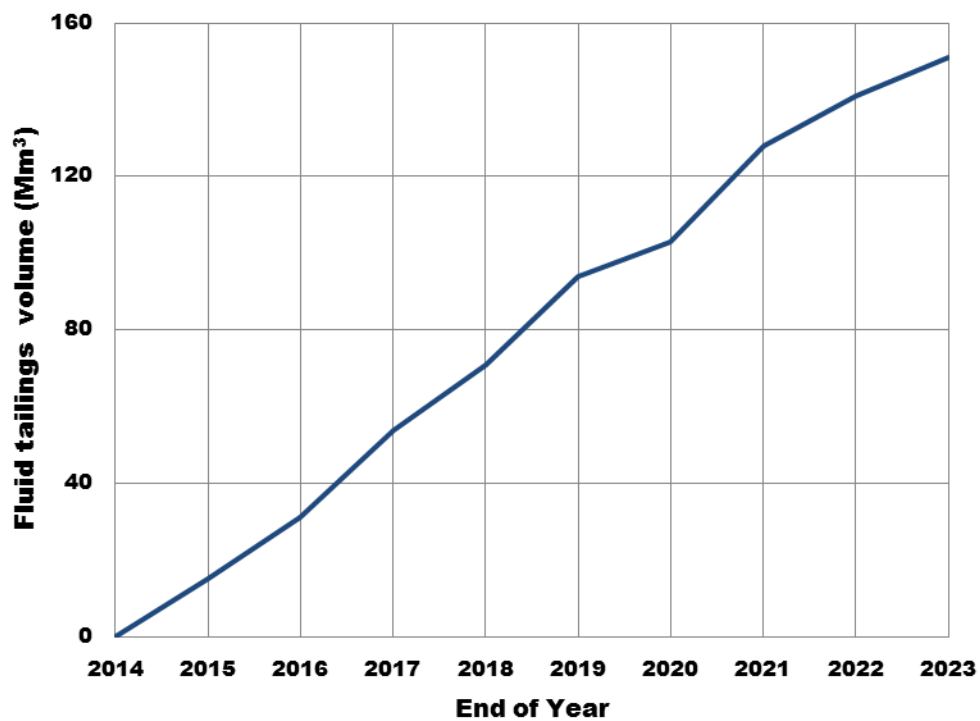


Figure 1. Profile for New Fluid Tailings

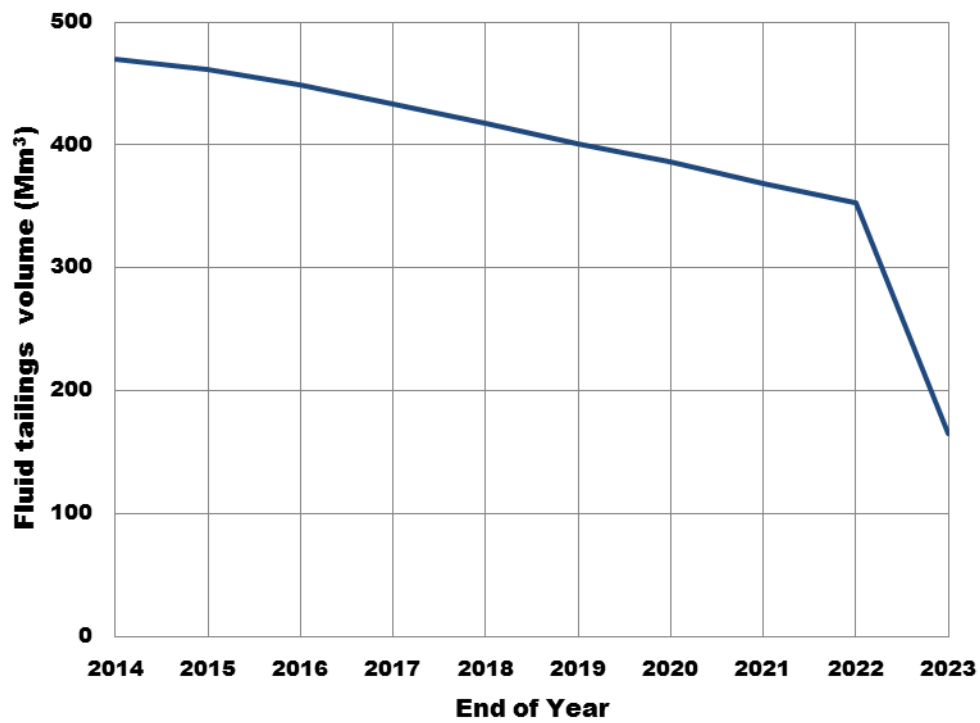


Figure 2. Profile for Legacy Fluid Tailings

Table 3. Thresholds for Profile for New Fluid Tailings

Threshold Type	Trigger or Limit	Calculation Factors
Profile Deviation Trigger	20 per cent	$\text{annual deviation percent}_{year} = \frac{\text{New FT Inventory}_{year} - \text{Approved Profile New FT Inventory}_{year}}{\text{Approved Profile New FT Inventory}_{year}}$ $\text{profile deviation trigger}_{year} = \frac{\sum_{i=year-5}^{year-1} (\text{annual deviation percent}_i)}{\text{Count}(\text{annual deviation percent}_i; \text{annual deviation percent}_{i-5})}$
Total Volume Trigger	151 million cubic metres	n/a
Total Volume Limit	211.4 million cubic metres	n/a

Table 4. Thresholds for Profile for Legacy Fluid Tailings

Threshold Type	Trigger or Limit	Calculation Factors
Profile Deviation Trigger	20 per cent	$\text{annual deviation percent}_{year} = \frac{\text{Legacy FT Inventory}_{year} - \text{Approved Profile Legacy FT Inventory}_{year}}{\text{Approved Profile Legacy FT Inventory}_{year}}$ $\text{profile deviation trigger}_{year} = \frac{\sum_{i=year-5}^{year-1} (\text{annual deviation percent}_i)}{\text{Count}(\text{annual deviation percent}_i; \text{annual deviation percent}_{i-5})}$

SYNCRUDE CANADA LTD. MILDRED LAKE

APPENDIX C TO SCHEME APPROVAL NO. 8573P

Table 1. RTR Criteria for treated tailings deposits

Deposit	Subobjective	RTR criteria
Composite Tailings (CT) Deposits	Subobjective 1	65 per cent solids Content by weight within 1 year of tailings placement, based upon deposit sampling
		75 per cent solids Content by weight within 1 year after sand capping of deposit, based upon deposit sampling
	Subobjective 2	Groundwater is monitored as required by <i>Environmental Protection and Enhancement Act (EPEA)</i> Approval No. 26-02-00, as amended or renewed
Centrifuged Cake Deep Deposits	Subobjective 1	50 per cent solids content by weight within 1 year of tailings placement, based upon deposit sampling ¹
	Subobjective 2	Groundwater is monitored as required by <i>Environmental Protection and Enhancement Act (EPEA)</i> Approval No. 26-02-00, as amended or renewed

¹ The ready to reclaim criteria and ready to reclaim trajectory are to be updated.

SYNCRUDE CANADA LTD. Mildred Lake

APPENDIX D TO SCHEME APPROVAL NO. 8573P (deposit milestones)

Table 1. Deposit Milestones for Syncrude Canada Ltd Mildred Lake Composite Tailings Deposits

Deposit	Tailings Placement		Capping		Reclamation Material Placement Begins	Year at which settlement is expected to be negligible
	Start Year	Completion Year	Start Year	Completion Year		
East In Pit	N/A	N/A	N/A	2019	N/A	2030
South West In Pit	N/A	2022	N/A	2025	2031	2035
North Mine South Pit- Sand	N/A	2031	2029	2036	2030	2043
North Mine North Pit	2024	2031	2032	2036	2039	2046

Appendix 5 *EPEA* Approval

AMENDING APPROVAL

ALBERTA ENERGY REGULATOR

ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT

R.S.A. 2000, c.E-12, as amended.

APPROVAL NO.: 26-02-XX

APPLICATION NO.: 034-00000026

EFFECTIVE DATE:

EXPIRY DATE: June 20, 2020

APPROVAL HOLDER: Syncrude Canada Ltd.

ACTIVITY: Construction, operation and reclamation of the

Mildred Lake Oil Sands Processing Plant and Mine, Aurora North Oil Sands Processing Plant and Mine, and Aurora South Oil Sands Processing Plant and Mine

is subject to the attached terms and conditions.

Approvals Manager, Authorizations Branch
Alberta Energy Regulator

TERMS AND CONDITIONS ATTACHED TO APPROVAL

Environmental Protection and Enhancement Act Approval No. 00000026-02-00, as amended, is hereby further amended as follows:

- Subsection 1.1.2 (kkk) is deleted and replaced with the following:

1.1.2 (kkk) “plant” means all buildings, structures, process and pollution abatement equipment, vessels, storage facilities, material handling facilities, roadways, pipelines, and other installations, associated with the activity that is the subject of this approval and includes the land on or in which these are located as specified in TABLE 1.1-A:

TABLE 1.1-A: PLANT LOCATIONS

Mine	OS Lease	Legal Land Description				Application Number
		Section	TWP	Range	Meridian	
Mildred Lake	17, 22	7, 8, 9, 10	94	11	4	026-00000026
			93	10, 11	4	023-00000026
		3, 4, 5, 8, 9, 10, 16, 17, 18, 19, 20, 29, 30, 31	93	10	4	034-00000026
		7, 18, 19, 25, 30, 31, 36	93	11	4	
		6, 7, 18	94	11	4	
		11, 12, 13, 14, 23, 24, 25, 26, 27, 28, 33, 34, 35, 36	93	12	4	
		1, 2, 3, 4, 9, 10, 11, 12, 13, 14	94	12	4	
Aurora North	10, 12, 34, Parts of 52		96	9, 10, 11	4	036-00000026
		NE and SE 11	96	11	4	
		NE and NW 12	96	11	4	
		NW 19	96	9	4	044-00000026
		NE 24	96	10	4	046-00000026
Aurora South	30, 31, Parts of 13		93, 94, 95	8	4	023-00000026

- The following is added after 1.1.2 (IIII):

1.1.2 (mmmm) “interception run-on” means precipitation that falls on, or traverses undisturbed areas that may otherwise drain as surface flow onto the plant.

- Subsections 3.2.21 to 3.2.27 are deleted.
- Subsections 3.3.22 to 3.3.23 are deleted.
- The following is added after Subsection 3.3.34:

MILDRED LAKE EXTENSION PROJECT

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- 3.3.35 The approval holder shall construct the Mildred Lake Extension Project as described in Application No. 034-00000026, unless otherwise specified within this approval.
- 3.3.36 The approval holder shall design and construct the industrial runoff control system, and at a minimum, all of the following design criteria shall be met:
- (a) adequate pond retention time to remove 15 micron and greater sized particles for all precipitation events up to and including a 1 in 10 years precipitation event occurring over 24 hours; and
 - (b) design to meet the release limits specified in TABLE 4.2-A;
- unless otherwise authorized in writing by the Director.
- 3.3.37 The approval holder shall submit the following to the Director within 30 days following construction completion of all Mildred Lake Extension Project sedimentation ponds and outfall structures:
- (a) as built drawings; and
 - (b) cross-sections of sedimentation ponds and outfalls structures referred to in (a).
- 3.3.38 The approval holder shall submit an EPEA Water Management Plan for the Mildred Lake Extension Project to the Director on or before October 31, 2019, unless otherwise authorized in writing by the Director.
- 3.3.39 The plan referred to in subsection 3.3.38 shall include, at a minimum, the following:
- (a) design basis and water management philosophy for:
 - (i) industrial runoff;
 - (ii) interception run-on; and
 - (iii) industrial wastewater;
 - (b) designs and details of water management areas and systems including:
 - (i) each industrial runoff facilities and associated catchment areas, drainage ditches and outlets;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (ii) each interception run-on facilities and associated catchment areas, drainage ditches and outlets; and
 - (iii) each industrial wastewater facilities and associated catchment areas, inflow sources, drainage ditches or piping routes, and outlets;
 - (c) discussion on potential risks, issues and mitigation measures for the surface water management systems;
 - (d) protocols for surface water maintenance activities;
 - (e) a specific mitigation proposal for clean water releases from the areas surrounding the MacKay River bridge, with triggers for implementation;
 - (f) a specific monitoring proposal for Horseshoe Lake, which shall include methodology and procedures:
 - (i) for collecting water quality data on a seasonal basis for at least three years, prior to constructing the Mildred Lake Extension East site; and
 - (ii) to determine whether project related effects are occurring to Horseshoe Lake;
 - (g) changes to the Aquatic Environmental Effects Monitoring plan referred to in subsection 4.2.3.30 that would adjust project effects monitoring; and
 - (h) any other information as required in writing by the Director.
- 3.3.40 If the plan referred to in subsection 3.3.38 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 3.3.41 The approval holder shall implement the plan referred to in subsection 3.3.38, as authorized in writing by the Director.
- 3.3.42 Any changes to the plan referred to in subsection 3.3.38 shall be authorized in writing by the Director before implementation.
- 3.3.43 The approval holder shall construct the dedicated disposal areas in the Mildred Lake Extension West area as described in Application No. 034-00000026, unless otherwise authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

MILDRED LAKE NORTH MINE NORTH PIT COMPOSITE TAILINGS DEPOSIT

- 3.3.44 The approval holder shall construct the modifications to the North Mine North Pit as a composite tailings deposit as described in Application No. 034-00000026, unless otherwise authorized in writing by the Director.

MILDRED LAKE NORTH MINE CENTRE PIT

- 3.3.45 The approval holder shall construct the North Mine Centre Pit centrifuge cake deep deposit area as described in Application No. 034-00000026, unless otherwise authorized in writing by the Director.
6. The following is added after Subsection 4.1.21 but before Subsection 4.1.22.
- 4.1.21.1 The approval holder shall ensure, by year 2030 for the Mildred Lake Extension project, that the combined mine mobile equipment emission rate of nitrogen oxides expressed as tonnes of nitrogen dioxide equivalent, shall not exceed 12.7 tonnes per day on a 365-day nitrogen dioxide rolling average.
7. The following is added after Subsection 4.1.25 but before Subsection 4.1.26.
- 4.1.25.1 The approval holder shall annually monitor the Mildred Lake Extension project's mine mobile equipment emissions, in accordance with the plan referred to in subsection 4.1.41.1.
8. The following is added after Subsection 4.1.37 but before Subsection 4.1.38:
- 4.1.37.1 The approval holder shall submit a monitoring plan to quantify and characterize the emissions of VOCs and RSC from the Mildred Lake Extension project's fugitive emissions sources, to the Director on or before September 30, 2021, unless otherwise authorized in writing by the Director.
- 4.1.37.2 The plan referred to in subsection 4.1.37.1 shall include:
- (a) detailed methodology to quantify and characterize monitoring of the following sources:
 - (i) exposed oil sands mining areas;
 - (ii) tailings management and storage facilities (including centrifuge cake);
 - (iii) any other significant fugitive or point sources; and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (iv) any other sources identified in writing by the Director;
 - (b) a proposed approach in improving and implementing measurement methodologies for tailings facilities and exposed oil sands mining areas; and
 - (c) any other information as required in writing by the Director.
- 4.1.37.3 If the plan referred to in subsection 4.1.37.1 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 4.1.37.4 The approval holder shall implement the plan referred to in subsection 4.1.37.1, as authorized in writing by the Director.
- 4.1.37.5 Any changes to the plan referred to in subsection 4.1.37.1 shall be authorized in writing by the Director before implementation.
- 4.1.37.6 The approval holder shall submit a report summarizing the results of the implemented plan referred to in subsection 4.1.37.1, to the Director on or before March 31, 2023 for the year 2022 and subsequent reports annually, unless otherwise authorized in writing by the Director.
- 4.1.37.7 The approval holder shall submit an exposed bitumen mine face fugitive emissions minimization plan, to the Director on or before September 30, 2021, unless otherwise authorized in writing by the Director.
- 4.1.37.8 The plan referred to in subsection 4.1.37.7 shall include the following:
 - (a) a detailed approach and methodology on how the approval holder will optimize the Mildred Lake Extension project's mine development to minimize exposed bitumen mine face fugitive emissions;
 - (b) a detailed approach on how the approval holder will track and measure the efficacy of the plan; and
 - (c) any other mine face fugitive emissions minimization approaches identified in writing by the Director.
- 4.1.37.9 If the plan referred to in subsection 4.1.37.7 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 4.1.37.10 The approval holder shall implement the plan referred to in subsection 4.1.37.7, as authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- 4.1.37.11 Any changes to the plan referred to in subsection 4.1.37.7 shall be authorized in writing by the Director before implementation.
9. The following is added after Subsection 4.1.41 but before Subsection 4.1.42:
- 4.1.41.1 The approval holder shall submit a plan to the Director for a program to minimize all nitrogen oxide emissions from the Mildred Lake Extension project's mine mobile equipment to meet the emission limits identified in subsection 4.1.22.1.
- 4.1.41.2 The plan referred to in subsection 4.1.41.1 shall be submitted six months prior to commencement of the Mildred Lake Extension project's operations, unless otherwise authorized in writing by the Director.
- 4.1.41.3 The plan referred to in subsection 4.1.41.1 shall include, at a minimum, all of the following:
- (a) methods that will be used to quantify the oxides of nitrogen and all other emissions from the mobile sources;
 - (b) procedures to annually conduct on-vehicle emission measurements for a representative sample of vehicles;
 - (c) procedures, criteria and schedule that will be implemented to ensure that all new and replacement/refurbished mining vehicles and engines are equipped with effective emission control technology that meets, at a minimum:
 - (i) the latest Canadian Environmental Protection Act Off-Road Compression-Ignition Engine Emission Regulations and/or Guidelines as amended; or
 - (ii) the latest United States Environmental Protection Agency emission standards for off-road heavy-duty vehicles, as amended;
 - (d) mining vehicles to be replaced/refurbished, as identified in (c), and the timeline for implementation;
 - (e) an inventory of mine mobile equipment, including power rating, model year, anticipated replacement date and emission tier;
 - (f) any other procedures that the approval holder proposes to implement to study and minimize emissions from mobile sources; and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (g) any other information or actions as required in writing by the Director;
- unless otherwise authorized in writing by the Director.
- 4.1.41.4 If the plan referred to in subsection 4.1.41.1 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 4.1.41.5 The approval holder shall implement the plan referred to in subsection 4.1.41.1, as authorized in writing by the Director.
- 4.1.41.6 Any changes to the plan referred to in subsection 4.1.41.1 shall be authorized in writing by the Director before implementation.
- 10. Subsection 4.1.52 is deleted and replaced with the following:
 - 4.1.52 The approval holder shall compile an annual air emissions summary and evaluation report which shall contain the following information:
 - (a) a summary of the number of continuous ambient air monitoring readings, for sulphur dioxide, hydrogen sulphide, nitrogen dioxide, and particulates (PM_{2.5}), which were greater than the *Alberta Ambient Air Quality Objectives* and were attributed to the approval holder per month for each continuous ambient monitoring station;
 - (b) a discussion of the likely reasons, and any mitigative measures taken, for ambient air quality readings of sulphur dioxide, hydrogen sulphide, nitrogen dioxide, and particulates (PM_{2.5}), which were greater than the *Alberta Ambient Air Quality Objectives* and that were attributed to the approval holder at all continuous ambient air monitoring stations operated by WBEA and the approval holder, and a comparison with the previous five years on a year-to-year basis;
 - (c) an overview of the operation and performance of air emissions control equipment, and a summary of plant modifications and operational changes that may affect atmospheric emissions;
 - (d) a summary of source monitoring conducted in accordance with TABLE 4.1-C and TABLE 4.1-D;
 - (e) a summary of the results of manual stack surveys;
 - (f) a summary of any readings from source emission monitoring (manual stack surveys and continuous emission monitoring) that

TERMS AND CONDITIONS ATTACHED TO APPROVAL

exceeded approval limits and a discussion of the causes and remedial actions taken;

- (g) a summary and discussion of the amount of total sulphur compounds emitted into the atmosphere from the flare stacks and the CO boiler diverter stacks during the year;
- (h) an inventory of sulphur dioxide emissions from all significant release points, including cogeneration units using refinery fuel gas as a fuel source;
- (i) an inventory of nitrogen dioxide emissions from all significant release points;
- (j) an inventory of THC/VOC emissions including the results of fugitive VOC emissions monitoring;
- (k) a summary of the performance of the NRUs in reducing naphtha losses to, and therefore VOC emissions from, the Mildred Lake Settling Basin;
- (l) a summary of the approval holder's effort and performance in managing greenhouse gases on both an intensity and an absolute basis;
- (m) a summary of the approval holder's efforts to minimize and reduce all atmospheric emissions, and in addition for sulphur compounds (expressed as tonnes of sulphur dioxide equivalent), if the total sulphur compound emissions during the year were higher than the average of emissions for the previous three years:
 - (i) a summary of the events and circumstances that lead to the combined sulphur emissions being higher than the average of the preceding three years; and
 - (ii) an outline of steps or procedures which have been taken or will be taken to minimize future emissions;
- (n) the status and results of the environmental effects monitoring (biomonitoring) required by subsection 4.1.30, including:
 - (i) a summary of the data and the results of monitoring conducted during the previous year;
 - (ii) a description of the monitoring program planned for the present year; and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (iii) a description of the approval holder's plans for consultation with other stakeholders during the present year regarding the design and results of the biomonitoring program;
- (o) a summary of the status and the results of any special ambient air quality studies, environmental effects studies (e.g., biomonitoring), and related health studies that the approval holder either participated in or conducted independently;
- (p) a summary of the status and the results of any non-confidential atmospheric emissions reduction reports and studies that the approval holder either participated in or conducted independently;
- (q) a summary of the approval holder's notifications to the community of Fort McKay as per the Syncrude Stakeholder Notification Protocol;
- (r) a digital file containing concentrations of all monitored parameters unless otherwise authorized in writing by the Director;
- (s) the status of any sulphur block activity;
- (t) a summary of comparison of actual G3 and G5 cogeneration and heat recovery steam generation unit NO_x emissions to the performance target referred to in TABLE 4.1-E;
- (u) a summary of the following information, if the NO_x performance target referred to in TABLE 4.1-E is not achieved:
 - (i) an explanation why the performance target was not met; and
 - (ii) the proposed steps and measures that will be implemented to meet the NO_x performance target;
- (v) an emissions monitoring summary of the Mildred Lake Extension project's program to minimize all nitrogen oxide emissions from mine mobile equipment;
- (w) a summary of the approval holder's effort to minimize and reduce the Mildred Lake Extension project's mine mobile equipment emissions to meet the 2030 emissions' limit referenced in subsection 4.1.22.1;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (x) a summary of the changes to the Mildred Lake Extension project's mine mobile equipment inventory, including power rating, model year, anticipated replacement date and emission tier; and
- (y) any other information requested in writing by the Director.

11. The following is added after Subsection 4.1.57:

DUST MANAGEMENT

- 4.1.58 The approval holder shall submit a Dust Management and Mitigation Plan for the Mildred Lake Extension project, to the Director on or before September 30, 2021, unless otherwise authorized in writing by the Director.
- 4.1.59 The plan referred to in subsection 4.1.58 shall include, at a minimum, all of the following:
- (a) a discussion on proposed dust control practices and their effectiveness;
 - (b) a list of all dust exposure areas or locations of concern;
 - (c) a list of all dust generation activities of concern;
 - (d) a list of all dust suppressants or any other chemicals proposed for application;
 - (e) measures to control and mitigate dust from the locations identified in (b);
 - (f) measures to control and mitigate dust from the activities identified in (c);
 - (g) quantitative criteria and thresholds to trigger control/mitigative measures identified in (e) and (f);
 - (h) dust monitoring;
 - (i) contingency plans to respond to dust issues from operations; and
 - (j) any other dust management specified in writing by the Director;
- unless otherwise authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- 4.1.60 If the plan referred to in subsection 4.1.58 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 4.1.61 The approval holder shall implement the plan referred to in subsection 4.1.58, as authorized in writing by the Director.
- 4.1.62 Any changes to the plan referred to in subsection 4.1.58 shall be authorized in writing by the Director before implementation.
- 4.1.63 The approval holder shall not apply dust suppressant or any other chemicals for the purpose of dust management on the roads or lands, unless otherwise authorized in writing by the Director.

REGIONAL INITIATIVES

- 4.1.64 The approval holder shall participate in any regional odour and air quality management initiatives, to the satisfaction of the Director, when requested in writing by the Director.
12. Subsection 4.2.1.2 is deleted and replaced with the following:
- 4.2.1.2 The approval holder shall direct all industrial wastewater from the plant operations, and expressed tailings water from tailings treatment operations and all placement locations, to the Industrial Wastewater Control System.
13. Subsections 4.2.1.4 and 4.2.1.5 are deleted and replaced with the following:
- 4.2.1.4 The approval holder may discharge runoff from undisturbed areas of the plant to the surrounding watershed.
 - 4.2.1.5 Except for the Mildred Lake Extension Project, the approval holder may discharge runoff from overburden storage areas in such a manner as to preclude excessive erosion of the storage area and siltation into natural water bodies.
14. The following is added after Subsection 4.2.1.6 but before Subsection 4.2.1.7:
- 4.2.1.6.1 For the Mildred Lake Extension Project, drainage from muskeg dewatering, overburden dewatering, and industrial runoff from reclamation material storage areas and undeveloped areas, shall be directed to sedimentation ponds, or the industrial wastewater control system for use as recycle water.
15. The following is added after Subsection 4.2.1.10 but before Subsection 4.2.1.11:

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- 4.2.1.10.1 For the Mildred Lake Extension Project, drainage and industrial runoff identified by subsection 4.2.1.6.1 shall be only discharged from the following locations:
- (a) release to MacKay River (Unnamed Sedimentation Pond east of ODA-N);
 - (b) release to an unnamed tributary of MacKay River (Sedimentation Pond 1);
 - (c) overland release towards MacKay River (Sedimentation Pond 2);
 - (d) overland release towards Stream C (Sedimentation Pond 3);
 - (e) release to Beaver River (Unnamed Sedimentation Pond north of Mildred Lake Extension East reclamation material stockpile); and
 - (f) release to Horseshoe Lake (Unnamed Sedimentation Pond south of the Mildred Lake Extension East mine pit).

- 4.2.1.10.2 For the Mildred Lake Extension Project, interception run-on shall be only discharged from the following locations:

- (a) release to MacKay River (NE clean water ditch);
- (b) release to MacKay River (NW clean water ditch);
- (c) release to MacKay River (SE clean water ditch);
- (d) release to MacKay River (SW clean water ditch);
- (e) release to Stream C and Stream D (unnamed creek re-alignment ditch west of ODA-N);
- (f) release to Stream C (unnamed creek re-alignment ditch west of ODA-S); and
- (g) overland release towards MacKay River (NW channel ditch).

16. The following is added after Subsection 4.2.2.1 but before Subsection 4.2.2.2:

- 4.2.2.1.1 Releases from the Mildred Lake Extension Project shall not exceed the limits specified in TABLE 4.2-A.

TABLE 4.2-A: MILDRED LAKE AND AURORA NORTH PLANT DEWATERING ACTIVITY DISCHARGE AND SEDIMENTATION POND LIMITS (INCLUDING EAST

TERMS AND CONDITIONS ATTACHED TO APPROVAL

MINE CURTAIN WATER DIVERSION AND THE MILDRED LAKE EXTENSION PROJECT)

PARAMETER	LIMITS	
	Maximum Daily Average (except DO and pH)	Monthly or Weekly Average
Total Suspended Solids	50 mg/L	---
5-Day Biochemical Oxygen Demand	7.0 mg/L	---
Dissolved Oxygen – Minimum Levels for October 1 to March 31	5.0 mg/L	Weekly Average 6.5 mg/L
Ammonia-Nitrogen (total)	2.5 mg/L	Monthly Average 1.0 mg/L
Acute Lethality Testing Using Rainbow Trout (<i>Oncorhynchus mykiss</i>)	100% Survival in 100% Discharge Sample	---
pH	6.0 – 9.5 pH Units	---
Floating Solids	Not Present Except in Trace Amounts	---
Visible Foam	Not Present Except in Trace Amounts	---
Oil or Other Substances	Not Present in Amounts Sufficient to Create a Visible Film or Iridescent Sheen	---

17. Subsections 4.2.3.5 and 4.2.3.7 are deleted and replaced with the following:

4.2.3.5 The approval holder shall monitor the Mildred Lake (including the Mildred Lake Extension Project) and Aurora North Plant dewatering activities as required in TABLE 4.2-D.

4.2.3.7 For the purpose of TABLE 4.2-D:

- (a) sampling location A is defined as the discharge point of the sedimentation pond, prior to mixing with the Muskeg River;
- (b) sampling location B is defined as the Muskeg River Upstream sampling location, upstream of the plant seepages and discharges;
- (c) sampling location C is defined as the Muskeg River Downstream sampling location, downstream of the plant seepages and discharges;
- (d) sampling location D is defined as upstream location on Stanley Creek;
- (e) sampling location E is defined as the East Mine Curtain Water Diversion Discharge, prior to entering Stanley Creek;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (f) sampling location F is defined as the discharge point of the sedimentation pond prior to mixing with the Bridge Creek; and
- (g) sampling location G is defined as the discharge point of the APCWDS' sedimentation pond prior to mixing with the Athabasca River;
- (h) sampling location H is defined as the discharge point of the locations specified by subsection 4.2.1.10.1, prior to mixing with the receiving stream; and
- (i) sampling location I is defined as the discharge point for the location specified by subsection 4.2.1.10.2 (g), prior to mixing with the receiving stream;

unless otherwise authorized in writing by the Director.

TABLE 4.2-D: MILDRED LAKE (INCLUDING THE MILDRED LAKE EXTENSION PROJECT) AND AURORA NORTH PLANTS' DISCHARGE MONITORING AND REPORTING

MONITORING				REPORTING		REPORT TO
Parameter, Test, or Reporting Requirement	Frequency	Sample Type	Sampling Location	Monthly	Annually	
Flow (in cubic metres/day)	Daily, during release	Calculated or estimated	A, E, F, G, H, I	Yes (as required by subsection 4.2.5.1)	Yes (as required by subsection 4.2.6.2)	Director
pH and temperature	Daily, Monday to Friday during release, except statutory holidays	Grab	A, E, F, H			
	Monthly		C, D			
	Every two months		B			
	Weekly, during release		G			
Total Suspended Solids (in mg/L)	Daily, Monday to Friday during release, except statutory holidays		A, E, F, H, I			
	Monthly		C, D			
	Every two months		B			
	Weekly, during release		G			
Nutrients, major cations and anions, DOC, DIC, TDS, hardness, alkalinity, electric conductivity	Weekly, during release		A, E, F, G, H			
	Monthly		C, D			
	Every two months		B			
5 Day Biochemical Oxygen Demand	Weekly, during release		A, E, F, G, H			
Total recoverable and dissolved metals, and ultra-trace mercury	Monthly, during release		A, E, F, G, H			
Total and methyl mercury at DL < 0.1 ng/L	Monthly, during release		H			
CCME F1, F2, F3 hydrocarbons (Characterize Naphthenic Acids and PAHs if detected in F1-F3) Report Uncorrected, BTEX	Monthly, during release		A, E, F, H			
	Weekly, during release		G			
Ammonia-Nitrogen (in mg/L)	Weekly, during release		A, E, F, G, H			

TERMS AND CONDITIONS ATTACHED TO APPROVAL

MONITORING				REPORTING		REPORT TO
Parameter, Test, or Reporting Requirement	Frequency	Sample Type	Sampling Location	Monthly	Annually	
Dissolved Oxygen (in mg/L)	Weekly, during release (October – March)		A, E, F, G, H			
	Three times, Weekly (October – March)		D			
Chronic toxicity test using Ceriodaphnia and fathead minnows (including Microtox IC metric)	Every two months		A, B, C, E, F, G, H			
96-Hour Multiple Concentration Acute Lethality Test Using Rainbow Trout	Monthly		A, E, F, G, H			
Oil and Grease			G			
Naphthenic Acids	Monthly, during release		G			
48-hour static acute lethality testing using Daphnia magna	Every two months		G			
Sampling location A, B, C, D, E, F, G, H & I defined in subsection 4.2.3.7.						

18. The following is added after Subsection 4.2.3.29 but before Subsection 4.2.4.1:

4.2.3.30 The approval holder shall submit an Aquatic Environmental Effects Monitoring Plan for the Mildred Lake Extension Project, on or before March 31, 2020, unless otherwise authorized in writing by the Director.

4.2.3.31 The plan referred to in subsection 4.2.3.30 shall:

- (a) conduct ongoing aquatic environmental effects monitoring for potential effects from the operation of the plant, including atmospheric emissions, on:
 - (i) water, snow and sediment quality;
 - (ii) resident aquatic biota, including, but not limited to, all of the following:
 - (A) fisheries;
 - (B) benthos; and
 - (C) aquatic habitat;
- (b) include downstream monitoring of the following locations:
 - (i) MacKay River; and
 - (ii) Athabasca River;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (c) include a proposal on a course of action for any mitigation and/or adaptive management approaches that would be required as a result of project related effects if observed in (a) or (b); and
 - (d) any other information as required in writing by the Director.
- 4.2.3.32 The approval holder shall ensure that the monitoring program referred to in subsection 4.2.3.30, is designed (including but not limited to monitoring frequency, timing, spatial coverage, endpoints) to sufficiently detect potential impacts in the receiving environment, to the satisfaction of the Director.
- 4.2.3.33 If the plan referred to in subsection 4.2.3.30 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 4.2.3.34 The approval holder shall implement the plan referred to in subsection 4.2.3.30, as authorized in writing by the Director.
- 4.2.3.35 The plan required in subsection 4.2.3.30 shall be conducted by the approval holder, or alternatively another program authorized in writing by the Director.
- 4.2.3.36 Any changes to the plan referred to in subsection 4.2.3.30 shall be authorized in writing by the Director before implementation.
- 19. The following is added after Subsection 4.2.4.1 but before Subsection 4.2.5.1:
 - 4.2.4.2 The approval holder shall participate in any regional initiatives as a result of management actions from the *Lower Athabasca Region Surface Water Quality Management Framework for the Lower Athabasca River*, Government of Alberta, 2012, as amended, to the satisfaction of the Director, when requested in writing by the Director.
 - 4.2.4.3 The approval holder shall participate and provide funding support to regional monitoring initiatives in a manner satisfactory to the Director.
- 20. Subsection 4.2.6.1 is deleted and replaced with the following:
 - 4.2.6.1 In addition to the annual reporting in TABLE 4.2-C, TABLE 4.2-D and TABLE 4.2-E, the annual Industrial Wastewater and Industrial Runoff Report shall include, at a minimum, all of the following information:
 - (a) a general statement on the performance of the wastewater and surface runoff management program during the previous year and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

a comment on any planned alterations or extensions in the coming year;

- (b) all data collected in accordance with TABLE 4.2-C, TABLE 4.2-D and TABLE 4.2-E, and a trend analysis, using appropriate charts/graphs to demonstrate historical performance of each parameter, and an interpretation of the results of the monitoring;
- (c) a record of the quantity of substances which have been added to or consumed in the plant's industrial process and which may have an effect on the quality of the industrial wastewater generated. The National Pollutant Release Inventory regulation shall be used as a guide on which substances to record and report;
- (d) the volume of liquid (including solids fraction) discharged to the Aurora North Plant tailings settling basin and the MLSB during each calendar month;
- (e) the volume of liquid discharged from the effluent pond to the MLSB during each calendar month;
- (f) the volume of liquid recycled to the Aurora North and Mildred Lake Plants from the tailings settling basin during each calendar month;
- (g) the free water level in the Aurora North Plant and Mildred Lake Plant tailings settling basins at the end of each calendar month;
- (h) the submission of all water monitoring data in electronic format unless otherwise authorized in writing by the Director;
- (i) results and status of any industrial wastewater characterization and review conducted over the previous year;
- (j) an estimate of the annual and monthly total chloride loads to the Athabasca and Muskeg rivers based on estimates from each sediment pond of the annual and monthly volumes released and mean chloride concentrations;
- (k) a cumulative effects analysis for the Muskeg and Athabasca rivers, by comparing changes in loadings to the rivers over the previous five years using data placed in the public domain;
- (l) with respect to the Mildred Lake Extension Project's sedimentation pond releases:
 - (i) a description of all sedimentation ponds and outfalls;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (ii) a table including pond size (m³), latitude and longitude coordinates, catchment areas, types of discharge, discharge routes, discharge frequency and volumes, pond status, and decommissioning schedule;
- (iii) a drainage map indicating all sedimentation ponds, catchment area boundaries, outfalls, drainage routes, flow direction, ultimate discharge locations and receiving streams;
- (iv) a description of quality assurance and quality control measures that were implemented and the data related to the implementation of those measures; and
- (v) the results of toxicity testing and water quality monitoring including:
 - (A) for applicable parameters in TABLE 4.2-D, a summary of the annual average and monthly average mass release rates to the receiving stream in kg per day, including a description of the calculation or measurement methods that were used to quantify the mass release rate;
 - (B) a summary of each water quality parameter listed in TABLE 4.2-D, including the minimum and maximum annual values, the mean annual value, the median annual value, the standard deviation, the standard error, and a comparison with relevant guidelines and approval limits;
 - (C) a trend analysis of annual values (median and mean annual values) for water quality parameters that exceed approval contraventions or relevant guidelines; and
 - (D) appropriate charts and graphs to describe the data, demonstrate historical performances of applicable parameter and a comparison with relevant guidelines;
- (m) with respect to the Mildred Lake Extension Project's interception channel releases:
 - (i) a description of all interception channels and outfalls to receiving streams;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (ii) a table including interception channel locations, catchment areas, types of discharge, discharge routes, discharge frequency and volumes, interception channel status, and decommissioning schedule;
- (iii) a drainage map indicating all interception channels, catchment area boundaries, discharge locations, drainage routes, flow direction, ultimate discharge locations and receiving streams; and
- (iv) a description of quality assurance and quality control measures that were implemented and the data related to the implementation of those measures;
- (n) the aquatic environmental effects monitoring data collected in accordance with subsection 4.2.3.30 and associated summaries on water quality;
- (o) notification of mitigation plans implemented from subsections 3.3.39(c) and 3.3.39(e)
- (p) the results and associated discussions of the results from the plan referred to in subsection 3.3.39(f);
- (q) a summary of any approval contraventions; and
- (r) any other information as required in writing by the Director.

21. The following is added after Subsection 4.3.18:

TAILINGS MANAGEMENT

- 4.3.19 The Director may amend this approval to add additional limits, targets or other requirements for managing tailings disposal, if further regulatory direction is provided in accordance with the following requirements:
- (a) the *Lower Athabasca Region Tailings Management Framework for the Mineable Athabasca Oil Sands*, 2015, Alberta Government, as amended; and
 - (b) *AER Directive 085: Fluid Tailings Management for Oil Sands Mining Projects*, 2016, as amended.
- 4.3.20 The approval holder shall apply for an amendment to this approval to align with any applicable government policy, including, but not limited to:

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (a) tailings water release;
 - (b) placement of any water above treated or untreated tailings to create pit lakes; and
 - (c) reclamation criteria.
- 4.3.21 The approval holder shall ensure the measurement system plan developed as required by *Directive 085: Fluid Tailings Management for Oil Sands Mining Projects*, as amended, aligns with the authorized Groundwater Monitoring Program under this approval.
- 4.3.22 The approval holder shall submit an updated Tailings Management Plan to the Director by January 31, 2023, unless otherwise directed in writing by the Director.
- 4.3.23 The plan referred to in subsection 4.3.22 shall not be implemented unless an approval amendment or written authorization is obtained by the Director.
- 4.3.24 If the plan referred to in subsection 4.3.22 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 4.3.25 The approval holder may use Syncrude's flue gas desulphurization waste (i.e. FGD solids) in the centrifuge tailings treatment process.
- 4.3.26 The approval holder shall submit the design of preventative features for in-pit tailings deposits to the Director at least one year prior to placing the tailings deposits in their final landscape position, unless otherwise authorized in writing by the Director.
- 4.3.27 The submission referred to in subsection 4.3.26 shall include, but is not limited to, all of the following:
- (a) the in-pit design feature and any associated mitigating design features;
 - (b) an assessment and drawings of the design to prevent contaminant seepage to groundwater aquifers;
 - (c) the factors considered in determining when the features identified in (a) will be required;
 - (d) an assessment and drawings of the capping design; and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (e) any other information as required in writing by the Director.
- 4.3.28 If the submission referred to in subsection 4.3.26 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 4.3.29 The submission referred to in subsection 4.3.26 shall not be implemented unless an approval amendment or written authorization is obtained by the Director.
- 4.3.30 Any changes to the submission referred to in subsection 4.3.26 shall be authorized in writing by the Director before implementation.
- 4.3.31 The approval holder shall place treated fluid tailings only in the treated fluid tailings placement areas identified in Application No. 034-00000026, unless written authorization or an approval amendment is obtained from the Director.
- 4.3.32 The approval holder shall place centrifuge cake in the North Mine Centre Pit as described in Application No. 034-00000026.
- 4.3.33 The approval holder shall not cap the centrifuge cake referred to in subsection 4.3.32 with any water, unless an approval amendment is obtained from the Director.
- 4.3.34 The approval holder shall not place untreated fluid tailings in the North Mine Centre Pit, unless an approval amendment is obtained from the Director.
- 4.3.35 The approval holder shall submit a report which updates the closure design of the proposed North Mine Centre Pit as described in Application No. 034-00000026, by September 30, 2020, unless otherwise directed in writing by the Director.
- 4.3.36 The report referred to in subsection 4.3.35 shall include, but is not limited to, all of the following:
 - (a) assessments to evaluate:
 - (i) hydrologic sustainability of the lake, including the submission of modeling results;
 - (ii) water quality within the lake, including the submission of modeling results;
 - (iii) capability of the lake to support various end land uses; and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (iv) conformance to *Directive 085: Fluid Tailings Management for Oil Sands Mining Projects*, as amended;
 - (b) implementation timelines of the chosen design;
 - (c) identification of changes to the most recent Life of Mine Closure Plan as a result of the chosen design;
 - (d) if applicable, for any alternative technology to a water-capped deposit, provide all information identified in (b) and (c);
 - (e) identification of changes to any approved plans under EPEA Approval No. 26-02-00, as amended, as a result of the chosen design; and
 - (f) any other information as required in writing by the Director.
 - 4.3.37 If the report referred to in subsection 4.3.35 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
 - 4.3.38 The approval holder shall remove all fluid tailings from the Southwest Sand Storage area by no later than December 31, 2038, unless an approval amendment is obtained from the Director.
 - 4.3.39 With the exception of Base Mine Lake, the approval holder shall not place any water, which includes industrial wastewater, above treated or untreated tailings for the purpose of creating an aquatic closure landscape, unless an approval amendment is obtained from the Director.
 - 4.3.40 The approval holder shall:
 - (a) notify the Director of any proposed on-site fluid tailings pilots, prototypes or demonstrations at least six months, or such other time as authorized in writing, prior to any proposed construction or implementation; and
 - (b) not construct and implement any of the proposed on-site fluid tailings pilots, prototypes or demonstrations unless written authorization, or approval amendment is obtained from the Director.
22. The following is added after Subsection 4.6.1 but before Subsection 4.6.2:
- 4.6.1.1 The approval holder shall submit a proposal to include the Mildred Lake Extension Project into the existing Mildred Lake Plant's Groundwater

TERMS AND CONDITIONS ATTACHED TO APPROVAL

Monitoring Program, which shall include, at a minimum, all of the following:

- (a) a plan to gather additional information and to report on the hydrogeology, including but not limited to hydraulic properties, groundwater levels and baseline groundwater quality of the:
 - (i) Quaternary Channels in the southern portion of the Mildred Lake Extension West area;
 - (ii) Basal McMurray Aquifer; and
 - (iii) Upper Devonian unit;
- (b) a map and description of surface water drainage patterns;
- (c) a lithologic description and map(s), including cross-section(s), of the surficial and the upper bedrock geologic materials;
- (d) map(s) and cross-section(s) showing depth to water table or potentiometric surface, patterns of groundwater movement and hydraulic gradients;
- (e) the hydraulic conductivity of all surficial and bedrock materials;
- (f) lithologs of all boreholes drilled for groundwater investigation purposes;
- (g) construction and completion details of existing groundwater monitoring wells;
- (h) a site map showing the location and type of current and historical potential sources of groundwater contamination;
- (i) a map showing the location of existing and additional proposed groundwater monitoring wells;
- (j) a rationale for proposed groundwater monitoring well locations and completion depths, which includes consideration of potential sources of groundwater contamination, migration pathways and receptors including domestic use aquifers, springs and surface water bodies;
- (k) a description of groundwater monitoring well development protocols;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (l) a list of parameters to be monitored and the monitoring frequency for each groundwater monitoring well or group of groundwater monitoring wells;
- (m) a description of the groundwater sampling and analytical QA/QC procedures;
- (n) details of a groundwater response plan specifying actions to be taken should contaminants be identified through the Groundwater Monitoring Program;
- (o) details of the management and monitoring of the seepage from external and in-pit tailings areas, including but not limited to:
 - (i) a plan to provide periodic updates to seepage modelling results for construction, operation and post closure phases of the project, based on additional geological information, aquifer test results, and monitoring; and
 - (ii) updated contingency mitigation measures to limit the effects of seepage from external and in-pit tailings areas;
- (p) a Basal Water Sands aquifer depressurization monitoring plan, including but not limited to:
 - (i) aquifer test results and interpretations for the Basal Water Sands;
 - (ii) a plan to monitor water levels, pressures, and record depressurization water volumes and hydrochemistry;
 - (iii) a plan to provide periodic updates to hydrogeological numerical model based on additional geological information, aquifer test results and monitoring; and
 - (iv) a set of performance criteria for monitoring during depressurization to indicate hydraulic connection to the deep Devonian aquifers;
- (q) any other information relevant to groundwater quality at the project site; and
- (r) any other information as required in writing by the Director.

4.6.1.2

The proposal referred to in subsection 4.6.1.1 shall be submitted to the Director, at least 12 months prior to commencement of mining of the

TERMS AND CONDITIONS ATTACHED TO APPROVAL

Mildred Lake Extension Project, unless otherwise authorized in writing by the Director.

- 4.6.1.3 If the proposal referred to in subsection 4.6.1.1 is found deficient by the Director, the approval holder shall correct all deficiencies as outlined in writing by the Director within 120 days of the deficiency letter.
- 4.6.1.4 The approval holder shall implement the proposal referred to in subsection 4.6.1.1, as authorized in writing by the Director.
- 23. The following is added after Subsection 4.6.5 but before Subsection 4.6.6:
 - 4.6.5.1 The approval holder shall carry out remediation of the groundwater in accordance with the following:
 - (a) *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*, Alberta Government, 2019, as amended; and
 - (b) *Alberta Tier 2 Soil and Groundwater Remediation Guidelines*, Alberta Government, 2019, as amended.
- 24. Subsection 4.6.7 is deleted and replaced with the following:
 - 4.6.7 The approval holder shall compile an Annual Groundwater Monitoring Program Summary Report, which shall include, at a minimum, all of the following information:
 - (a) a completed Record of Site Condition form, Alberta Energy Regulator, March 2019;
 - (b) a legal description of the plant and a map illustrating the plant boundaries;
 - (c) a topographic map of the plant;
 - (d) a description of the industrial activity and processes;
 - (e) a map showing the location of all surface and groundwater users, and a listing describing surface water and water well use details, within at least a three kilometre radius of the plant;
 - (f) a general hydrogeological characterization of the region within a five kilometre radius of the plant;
 - (g) a detailed hydrogeological characterization of the plant;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (h) a geological cross-section(s) of the plant;
- (i) a map of surface drainage patterns located within the plant;
- (j) a map of groundwater monitor well locations and a description of the existing groundwater monitoring program for the plant;
- (k) a summary of any changes to the groundwater monitoring program made since the last groundwater monitoring report;
- (l) analytical data recorded as required in subsections 4.6.1 and 4.6.5;
- (m) a summary of fluid elevations recorded as required in 4.6.5 (b) and an interpretation of changes in fluid elevations;
- (n) an interpretation of groundwater flow patterns;
- (o) an interpretation of the analytical results including the following:
 - (i) diagrams indicating the location of any contamination identified;
 - (ii) probable sources of contamination;
 - (iii) the extent of contamination identified; and
 - (iv) comparison of contamination to relevant guidelines;
- (p) a summary and interpretation of the data collected since the groundwater monitoring program began including:
 - (i) control charts which indicate trends in contaminant concentrations; and
 - (ii) the migration of contaminants;
- (q) a description of the following:
 - (i) contaminated groundwater remediation techniques employed;
 - (ii) source elimination measures employed;
 - (iii) risk assessment studies undertaken; and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (iv) risk management studies undertaken;
- (r) a sampling schedule for the following year;
- (s) recommendations, as follows:
 - (i) for changes to the groundwater monitoring program to make it more effective; and
 - (ii) for remediation, risk assessment or risk management of contamination identified;
- (t) a summary of participation undertaken in accordance with subsection 4.6.6;
- (u) borehole logs and completion details for groundwater monitoring wells;
- (v) a map showing locations of all known buried channels within at least five kilometres of the plant;
- (w) an interpretation of QA/QC program results;
- (x) an update on additional hydrogeologic investigations of the Quaternary Channel, Basal McMurray (Basal Water Sands Aquifer) and Devonian Formations;
- (y) details of the seepage management and monitoring program for the external tailings areas, including but not limited to:
 - (i) map(s) and table(s) showing locations and completion details of seepage interception structures including wells, ditches and barriers;
 - (ii) table(s) of measurements recorded as part of the seepage control system performance assessment program, including measurements of pumping rates, groundwater levels and groundwater quality;
 - (iii) a summary and interpretation of seepage control system performance assessment; and
 - (iv) recommendations for changes to the seepage management and monitoring program to make it more effective;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (z) details from the Basal Water Sands Aquifer depressurization monitoring program, including as a minimum:
 - (i) a map displaying locations of Basal Aquifer depressurization wells;
 - (ii) a summary of Basal Aquifer depressurization pumping rates and volumes;
 - (iii) table(s) of historical groundwater quality measured from each Basal Aquifer depressurization well; and
 - (iv) a summary of and interpretation of how Basal Aquifer depressurization may affect results reported from groundwater monitoring wells;
 - (aa) an update on groundwater flow and solute transport model; and
 - (bb) any other information as required in writing by the Director.
- 25. The following is added after Subsection 4.6.7 but before Subsection 4.6.8:
 - 4.6.7.1 The approval holder shall implement any proposals or changes outlined in the Annual Groundwater Monitoring Program Summary Report as authorized in writing by the Director.
- 26. Subsections 6.1.10 to 6.1.17 are deleted and replaced with the following:
 - 6.1.10 The approval holder shall submit a Mine Reclamation Plan to the Director according to the following schedule:
 - (a) on or before December 31, 2019;
 - (b) on or before September 30, 2022;
 - (c) on or before September 30, 2025; and
 - (d) on or before September 30, 2028;unless otherwise authorized in writing by the Director.
 - 6.1.11 The approval holder shall prepare each Mine Reclamation Plan referred to in subsection 6.1.10 in accordance with *Specified Enactment Direction 003: Direction for Conservation and Reclamation Submissions under an Environmental Protection and Enhancement Act Approval for Mineable*

TERMS AND CONDITIONS ATTACHED TO APPROVAL

Oil Sands Sites, December 2018, as amended, unless otherwise directed in writing by the Director.

- 6.1.12 If the Mine Reclamation Plan is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 6.1.13 The approval holder shall implement the Mine Reclamation Plan referred to in subsection 6.1.10, as authorized in writing by the Director.
- 6.1.14 The approval holder shall submit an update to the Life of Mine Closure Plan reflecting the changes to the approved Life of Mine Closure Plan introduced by the Tailings Management Plan referred to in subsection 4.3.22, to the Director on or before January 31, 2023, unless otherwise authorized in writing by the Director.
- 6.1.15 The approval holder shall prepare the Life of Mine Closure Plan referred to in subsection 6.1.14 in accordance with *Specified Enactment Direction 003: Direction for Conservation and Reclamation Submissions under an Environmental Protection and Enhancement Act Approval for Mineable Oil Sands Sites*, December 2018, as amended, unless otherwise directed in writing by the Director.
- 6.1.16 In addition to the requirements specified in subsection 6.1.15, the Life of Mine Closure Plan referred to in subsection 6.1.14 shall include, at a minimum, all of the following:
 - (a) for forest resource information:
 - (i) strategies to minimize and mitigate any impacts to the Annual Allowable Cut by the plant; and
 - (ii) a description of the following, related to the Growth and Yield Program referred to in subsection 6.1.18.2(c):
 - (A) the schedule for establishment of relevant permanent and temporary sample plots,
 - (B) a description of how these plots meet the objectives of monitoring forest yield and forest ecosystem development, and of providing trend information on silvicultural strategies and treatments, and reclamation success, and
 - (C) a description of the sampling protocols for varying types of plots,

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(b) updated water quality models for the Mildred Lake Extension site, including the Mildred Lake Extension West's end pit lake; and

(c) any other information as required in writing by the Director;

unless otherwise directed in writing by the Director.

6.1.17 If the Life of Mine Closure Plan is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

27. The following is added after Subsection 6.1.17 but before Subsection 6.1.18:

6.1.17.1 The approval holder shall implement the Life of Mine Closure Plan referred to in subsection 6.1.14 as authorized in writing by the Director or as set out in an approval amendment obtained from the Director.

28. The following is added after Subsection 6.1.18 but before Subsection 6.1.19:

6.1.18.1 Regarding harvesting, clearing and reforestation, the information provided in the Life of Mine Closure Plan referred to in subsection 6.1.14 and the Mine Reclamation Plan referred to in subsection 6.1.10 regarding harvesting, clearing and reforestation, shall be suitable for integration into the applicable Forest Management Plan, unless otherwise directed in writing by the Director.

6.1.18.2 The approval holder shall:

(a) complete and submit vegetation surveys on all reclaimed areas using survey systems in compliance with the *Alberta Regeneration Standards for the Mineable Oil Sands*, Alberta Environment and Sustainable Resource Development, 2013, as amended, and any other applicable standards approved by the Government of Alberta for use at oil sands mines;

(b) submit records of activity and performance, in a format and following protocols acceptable to the Government of Alberta, related to the revegetation of reclaimed lands;

(c) establish a Growth and Yield Program as approved by the Government of Alberta for reclaimed lands, consistent with the requirements of the *Alberta Forest Management Planning Standard*, Alberta Sustainable Resource Development, 2006, as amended;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (d) comply with the requirements of the *Alberta Forest Genetic Resource Management and Conservation Standards*, Alberta Agriculture and Forestry, December 2016, as amended; and
- (e) comply with any Government of Alberta policy related to the deployment of propagules for use in reclamation;

unless otherwise authorized in writing by the Director.

6.1.18.3 The Mine Reclamation Plan referred to in subsection 6.1.10 and the Life of Mine Closure Plan referred to in subsection 6.1.14 shall each:

- (a) be consistent with the values and objectives in the *Fort McMurray-Athabasca Oil Sands Subregional Integrated Resource Plan*, Alberta Sustainable Resource Development, 2002, as amended;
- (b) be consistent with the *Lower Athabasca Regional Plan (2012-2022)*, Alberta Government, 2012, as amended, under the *Land Use Framework*, Alberta Government, 2008, as amended;
- (c) be consistent with completed sub-regional plans associated with the *Lower Athabasca Regional Plan (2012-2022)*, Alberta Government, 2012, as amended, under the *Land Use Framework*, Alberta Government, 2008, as amended;
- (d) be consistent with the *Lower Athabasca Region Tailings Management Framework for the Mineable Athabasca Oil Sands*, Government of Alberta, 2015, as amended, and *Directive 085 Fluid Tailings Management for Oil Sands Mining Projects*, AER, 2016, as amended; and
- (e) ensure that reclaimed features have natural appearances characteristic of the region;

unless otherwise authorized in writing by the Director.

29. Subsection 6.1.34 is deleted and replaced with the following:

6.1.34 Prior to placement of reclamation material as per subsections 6.1.27 through to 6.1.33, the approval holder shall provide rooting-zone protection by capping the following materials and locations with a minimum average depth of 1.0 m of suitable overburden or tailings sand which meets the chemical criteria for suitable overburden:

- (a) impervious material such as rock;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (b) lean oil sands;
- (c) reject from oil sands processing;
- (d) the following types of tailings as described in the application:
 - (i) composite tailings; and
 - (ii) treated tailings from centrifugation (i.e. centrifuge cake);
and
- (e) plant developed area;

unless otherwise authorized in writing by the Director.

30. The following is added after Subsection 6.1.34.10 but before Subsection 6.1.35:

6.1.34.11 The approval holder shall cap petroleum coke with a minimum average depth of 0.8 m of suitable overburden prior to placement of coversoil and subsoil as per subsections 6.1.27 through 6.1.31, unless otherwise authorized in writing by the Director.

6.1.34.12 The approval holder shall not place petroleum coke in the Mildred Lake Extension East pit, unless an approval amendment is obtained from the Director.

31. Subsections 6.1.36 to 6.1.45 are deleted.

32. Subsections 6.1.48 to 6.1.54 are deleted.

33. The following is added after Subsection 6.1.87 but before Subsection 6.1.88:

6.1.87.1 Until the updated Wildlife Mitigation and Monitoring Program referred to in subsection 6.1.87.3 is authorized in writing by the Director and implemented, the approval holder shall continue to implement the existing approved Wildlife Mitigation and Monitoring Program (previously approved Fish and Wildlife Habitat Enhancement Plan, Waterfowl Protection Plan).

6.1.87.2 In addition to any other requirements specified in this approval, the approval holder shall conduct wildlife mitigation in accordance with the *Master Schedule of Standards and Conditions (MSSC)*, Alberta Energy Regulator and Government of Alberta, November 22, 2018, as amended, unless otherwise authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- 6.1.87.3 The approval holder shall submit a Wildlife Mitigation and Monitoring Program proposal to the Director by December 31, 2019 unless otherwise authorized in writing by the Director.
- 6.1.87.4 The Wildlife Mitigation and Monitoring Program proposal referred to in subsection 6.1.87.3 shall include, at a minimum, all of the following:
- (a) a description of the strategies that will be implemented to meet the desired outcomes as stated in the MSSC, as amended;
 - (b) strategies for identifying wildlife features to meet MSSC requirements;
 - (c) a description of how the achievement of desired outcomes will be measured, and demonstrated;
 - (d) a description of the strategies and actions that will be implemented, considering the mitigation hierarchy, to mitigate project and site-specific effects on fish and wildlife species at risk and of cultural significance throughout the life of the project that may occur through:
 - (i) direct habitat loss;
 - (ii) indirect habitat loss;
 - (iii) habitat fragmentation and effects on fish and wildlife movement; and
 - (iv) mortality;
 - (e) detailed descriptions of mitigation measures to minimize project-induced impacts to fisheries and aquatic habitat at a Hydrologic Unit Class 8 scale;
 - (f) a description of the adaptive management approach that will be used to assess and improve the effectiveness of mitigations;
 - (g) a description of how the wildlife monitoring will align with and support regional monitoring, consistent with provincially recognized priorities;
 - (h) a description of methods that will be implemented to prevent habituation of nuisance wildlife, consistent with Alberta Bear Smart Guidelines, 2011, as amended;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (i) methods to prevent bird collisions with project infrastructure, including towers and transmission lines;
- (j) measures to maintain and facilitate habitat connectivity throughout the life of the project, within the project area, and between the project area and adjacent lands;
- (k) avoidance of wildlife species at risk habitat and migrating bird nests and application of appropriate setbacks to key wildlife habitat features and nests;
- (l) identification of areas of potential risks for wildlife;
- (m) measures to prevent wildlife from coming into contact with areas of risk for wildlife as identified in 6.1.87.4 (l) including, but not limited to, disturbed areas that may contain process affected waters or bitumen;
- (n) a plan and schedule to conduct research and monitoring to address at minimum, the following:
 - (i) the presence, general abundance and distribution of wildlife in the local study area;
 - (ii) early successional wildlife establishment including habitat; and
 - (iii) the specific habitat requirements of species at risk for the purposes of reclamation planning;
- (o) progress in achieving the wildlife habitat levels as outlined in Application No. 034-00000026;
- (p) wildlife habitat use on the reclaimed land;
- (q) a description of the methods and techniques that will be implemented to monitor and assess the effectiveness of wildlife use and passage along the MacKay River corridor, including the MacKay River bridge crossing; and
- (r) any other information as required in writing by the Director.

6.1.87.5

If the Wildlife Mitigation and Monitoring Program proposal referred to in subsection 6.1.87.3 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- 6.1.87.6 The approval holder shall implement the Wildlife Mitigation and Monitoring Program proposal referred to in subsection 6.1.87.3, as authorized in writing by the Director.
- 6.1.87.7 The approval holder shall submit a Comprehensive Wildlife Report to the Director according to the following schedule:
- (a) for the first Comprehensive Wildlife Report, on or before July 15, 2022;
 - (b) for the second Comprehensive Wildlife Report, on or before July 15, 2025; and
 - (c) for the third Comprehensive Wildlife Report , on or before July 15, 2028;
- unless otherwise authorized in writing by the Director.
- 6.1.87.8 The Comprehensive Wildlife Report referred to in subsection 6.1.87.7 shall include, at a minimum, all of the following:
- (a) the methods and results of the monitoring conducted in the Wildlife Mitigation and Monitoring Program;
 - (b) the mitigations implemented in the Wildlife Mitigation and Monitoring Program;
 - (c) a discussion of the effectiveness of the mitigation implemented in the Wildlife Mitigation and Monitoring Program relative to measureable outcomes as identified in the approved Wildlife Mitigation and Monitoring Program;
 - (d) adaptive management measures taken or planned;
 - (e) changes in habitat availability and habitat conditions for species at risk and of cultural significance, which have been identified in the application, stakeholder consultation, and Wildlife Sensitivity Maps, as amended;
 - (f) changes proposed to the Wildlife Mitigation and Monitoring Program;
 - (g) a summary of methods used and results obtained through the regional wildlife monitoring initiatives below:
 - (i) Oil Sands Bird Contact Monitoring Program; and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (ii) any other regional wildlife monitoring initiative the approval holder participates in;
 - (h) a summary of methods used and results obtained for project specific monitoring conducted pursuant to the Bird Protection Plan;
 - (i) proposed changes to any of the regional or project specific initiatives described in (g) and **Error! Reference source not found.**;
 - (j) a summary of discussions with Athabasca Chipewyan First Nation's traditional land users on the implementation, monitoring and adaptive management measures, including any concerns raised and how or if these concerns were addressed;
 - (k) a summary of the effectiveness and trajectory of the Mildred Lake Extension Offset Plan in subsection 6.1.87.11; and
 - (l) any other information as required in writing by the Director.
- 6.1.87.9 The approval holder shall implement the proposed changes to the mitigation and monitoring programs outlined in the Comprehensive Wildlife Report referred to in subsection 6.1.87.7 as authorized in writing by the Director.
- 6.1.87.10 The approval holder shall have mitigation measures in place and shall take necessary steps to prevent wildlife from coming into contact with industrial wastewater.
- 6.1.87.11 The approval holder shall submit a Mildred Lake Extension Offset Plan to the Director by June 30, 2020, unless otherwise authorized in writing by the Director.
- 6.1.87.12 The approval holder shall:
- (a) establish a 100 metre setback distance for the Mildred Lake Extension West lease boundary from the top of the escarpment of the MacKay River, if the Mildred Lake Extension Offset Plan referred to in subsection 6.1.87.11 is submitted by June 30, 2020; or
 - (b) establish a 200 metre setback distance for the Mildred Lake Extension West lease boundary from the top of the escarpment of the MacKay River, if the Mildred Lake Extension Offset Plan

TERMS AND CONDITIONS ATTACHED TO APPROVAL

referred to in subsection 6.1.87.11 is not submitted by June 30, 2020.

- 6.1.87.13 With the exception of the construction of the MacKay River bridge crossing, no clearing or construction activity is permitted within the 200 metre setback distance until the Mildred Lake Extension Offset Plan referred to in subsection 6.1.87.11 is authorized in writing by the Director.
- 6.1.87.14 The plan referred to in subsection 6.1.87.11 shall:
- (a) result in restoration of 434.4 ha of self-sustaining, locally common boreal forest wildlife habitat;
 - (b) result in the restoration of wildlife habitat identified in (a) that could be used in a culturally meaningful way by Athabasca Chipewyan First Nation for traditional use activities, such as hunting and harvesting;
 - (c) provide opportunities for Athabasca Chipewyan First Nation traditional use for the restored areas until such time when the Mildred Lake Extension Project is reclaimed and reclamation certified;
 - (d) identify the chosen restoration locations, by including descriptions and maps of the locations;
 - (e) include specific restoration plans for areas identified in (d);
 - (f) include quantitative and qualitative assessments of:
 - (i) the total area of wildlife habitat that will be restored; and
 - (ii) how the restoration locations are equivalent to the 434.4 ha identified in (a);
 - (g) include a schedule for when the offset measures will be implemented and anticipated to be completed;
 - (h) include a monitoring plan to quantitatively and qualitatively measure the effectiveness and trajectory of restoration;
 - (i) include an adaptive management plan that details steps to be taken due to ineffective restoration or trajectory; and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (j) provide a summary of the engagement and collaboration efforts with the Athabasca Chipewyan First Nation on the plan, which shall include:
 - (i) input received;
 - (ii) how the input was incorporated into the plan; and
 - (iii) identification of any areas of disagreement.
- 6.1.87.15 If the plan referred to in subsection 6.1.87.11 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 6.1.87.16 The approval holder shall implement the plan referred to in subsection 6.1.87.11 as authorized in writing by the Director.
- 6.1.87.17 Any changes to the plan referred to in subsection 6.1.87.11 shall be authorized in writing by the Director before implementation.
- 6.1.87.18 The approval holder shall submit all monitoring reports and results of the:
 - (a) Owl River offset project; and
 - (b) any other offset projects established to mitigate impacts on fish and fish habitat from the Mildred Lake Extension project;to the Director, by March 31 of the year following the year in which the report was completed.

RECLAMATION MONITORING

- 6.1.87.19 The approval holder shall submit a Reclamation Monitoring Program proposal to the Director, when notified in writing by the Director.
- 6.1.87.20 The approval holder shall prepare the Reclamation Monitoring Program proposal referred to in subsection 6.1.87.19 as directed in writing by the Director.
- 6.1.87.21 If the Reclamation Monitoring Program proposal is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.
- 6.1.87.22 The approval holder shall implement the Reclamation Monitoring Program referred to in subsection 6.1.87.19 as authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

34. Subsections 6.1.89 and 6.1.90 are deleted and replaced with the following:

- 6.1.89 The approval holder shall prepare and submit the Annual Report, in accordance with *Specified Enactment Direction 003: Direction for Conservation and Reclamation Submissions under an Environmental Protection and Enhancement Act Approval for Mineable Oil Sands Sites*, December 2018, as amended, unless otherwise directed in writing by the Director.
- 6.1.90 As part of the Annual Report referred to in subsection 6.1.89, the approval holder shall submit to the Director a summary on its reclamation engagement focus group activities according to the following schedule:
- (a) for the first report, on or before April 15, 2020; and
 - (b) every five years thereafter.

Approvals Manager, Authorizations Branch
Alberta Energy Regulator

Appendix 6 *Water Act* Approval

Approval Amendment
Pursuant to the Provisions of the
Water Act



Approval No. 00263298-00-00

Amendment No. 00263298-00-05

Application No. 005-00263298

File No. 27558

Syncrude Canada Ltd
P.O. Bag 4009
Fort McMurray, Alberta T9H 3L1

The approval is amended as follows:

1. Revise condition 1 of the approval to read as follows:

1. The approval is appurtenant to:

- (i) the lands set out in the plan noted in condition 3 as No. 27558-P011;
- (ii) the lands within Range 11, Meridian W4, Township 94, Section 8, 9 and 10, as well as LSD 1 of Section 7; and
- (iii) the lands enclosed by coordinate locations 1 through 30 and the existing fenceline boundary as set out in Plan No. 27558-P014;

hereafter called the "Fenceline Plan", excluding the following structures as set out in the Plan No. 27558-P012: Mildred Lake Settling Basin (MLSB), East Mine In-Pit (EIP), West Mine In-Pit (WIP), and South West Sand Storage (SWSS).

2. Include the following plans and reports filed in the AER's records as:

AER NUMBER	TITLE
27558-P014	"Mildred Lake Water Act Approval Fenceline Amendment, FigSIR2 WA 1-1 Fenceline Amndmnt 17-05-15", dated November 2016, Provided by Syncrude
27558-P015	"Permanent Drainage Plan, Figure AER IRA PLA 6-3, 18-11-02", dated November 2018, submitted by Syncrude Canada Ltd.
27558-R018	"Appendix AER IRC A, Rev3 Volume 1, Section 8.0: Environmental Management", dated December 2018, submitted by Syncrude Canada Limited

AMENDMENT

27558-R019 “Appendix SIR2 Follow-up Water Act Addendum
B, MLX-W Clean Water Return Conceptual
Details”, submitted by Syncrude Canada Ltd.
within Supplemental Information Request 2
Follow-Up Water Act Addendum, dated May 2017

3. Revise condition 12 of the approval to read as follows:
 12. Notwithstanding condition 10, the Approval Holder shall submit to the Director at least 180 days, or another deadline specified in writing by the Director, before the beginning of construction, all required plans and supporting information for review and receive a written authorization or approval amendment for all proposed dams and/or canals under the provisions of the Water Act.
4. Add the following conditions:
 - 12.1 The Approval Holder shall follow the *Water (Ministerial) Regulation*, Part 6, “Dam and Canal Safety”, and the associated *Alberta Dam and Canal Safety Directive* requirements for any authorization to construct, undertake a major repair, decommission, close, cease long term operations, or operate in a limited way a dam or canal.
 - 12.2 The Approval Holder shall not begin any activities associated with dam or canal construction, major repair, decommissioning, closure, long-term cessation, or limited operation unless written authorization or approval amendment for the plan is granted by the AER.
 - 12.3 For new dam or canal design and construction, the Approval Holder shall submit to the Director for written authorization or approval amendment at least 180 days before the beginning of construction, or by another deadline specified in writing by the Director, all required plans and supporting information for the proposed dam or canal under the provisions of the Water Act.
 - 12.4 For changes to previously authorized dam or canal designs or to consequence classification, the Approval Holder shall submit to the Director for written authorization or approval amendment at least 90 days before the beginning of construction or before the proposed change to consequence classification, or by another deadline specified in writing by the Director, all required plans and supporting information for the changes under the provisions of the Water Act.

AMENDMENT

- 12.5 The Approval Holder shall provide a dam decommissioning plan to the AER for written authorization or approval amendment:
- (a) at least 12 months before performing any decommissioning activity;
 - (b) at least 12 months before beginning capping activities at any tailings pond or deposit; or
 - (c) when required by the Director.
19. The Approval Holder shall submit to the Director for authorization, a monitoring program which shall include the following:
- (a) the measurement of Horseshoe Lake water levels for at least 3 years prior to constructing the Mildred Lake Extension East site; and
 - (b) the identification of conditions under which Horseshoe Lake needs to be supplemented with additional clean water to maintain mean annual, open water, and winter baseline conditions.
20. The Approval Holder shall submit the monitoring program in condition 19 by October 31, 2019, unless otherwise authorized in writing by the Director.
21. The Approval Holder shall submit a *Wetland Assessment and Impact Report* to the Director in accordance with the *Alberta Wetland Assessment and Impact Report Directive* (AEP, 2016 as amended) for the MLX-W Clean Water Return Area, as delineated in *Appendix SIR 2 Follow-up Water Act Addendum B MLX-W Clean Water Return Conceptual Details* within Report No. 27558-R019.
22. If the *Wetland Assessment and Impact Report* in condition 21 is found deficient by the Director, the Approval Holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

AMENDMENT

23. The Approval Holder shall submit the *Wetland Assessment and Impact Report* in condition 21 as an amendment application to the approval, at least 6 months prior to the beginning of construction activities within the MLX-W Clean Water Return Area.

Manager, Authorizations Branch
Alberta Energy Regulator

Date

Appendix 7 *Water Act* Licence

**LICENCE TO DIVERT WATER
ALBERTA ENERGY REGULATOR
WATER ACT, R.S.A. 2000, c.W-3, as amended**

LICENCE NO.: 00363203-00-00

APPLICATION NO.: 001-00363203

FILE NO.: 27558

PRIORITY NO.: 2015-01-19-002

EFFECTIVE DATE: _____

EXPIRY DATE: _____

SOURCE OF WATER: Surface Runoff contributing to the MacKay River watershed

POINT OF DIVERSION: All points where water is diverted from sources within the boundaries
set out in Plan No. 00363203-P001 for the Mildred Lake Extension
West Project

LICENSEE: Syncrude Canada Ltd.

Pursuant to the *Water Act*, R.S.A. 2000, c.W-3, as amended, a licence is issued to the Licensee to:

operate a works and to divert up to 6,490,000 cubic metres of water annually from the
source of water for the purpose of Industrial

subject to the attached terms and conditions.

Manager, Authorizations Branch
Alberta Energy Regulator

Date

DEFINITIONS

- 1.0 All definitions from the Act and the Regulations apply except where expressly defined in this licence.
- 1.1 In all parts of this licence:
- (a) "Act" means the Water Act, RSA 2000, c. W-3, as amended;
 - (b) "Application" means the written submissions to the Director in respect of application number 001-00363203 and any subsequent applications for amendments of Licence No. 00363203-00-00;
 - (c) "Director" means an authorized employee of the Alberta Energy Regulator;
 - (d) "Fenceline" means the lands set out in the plan noted as No. 27558-P014, hereafter called the Fenceline Plan;
 - (e) "Point(s) of diversion" means the location(s) where water is diverted from the source of water;
 - (f) "Point of use" means the locations in which the diverted water is used by the Licensee for the licenced purpose;
 - (g) "Regulations" means the regulations, as amended, enacted under the authority of the Act; and
 - (h) "Water Use Reporting System" means the secure internet website provided by Alberta Environment at <https://www.alberta.ca/water-use-reporting-system.aspx> for submitting measuring and monitoring results electronically to the Director.

GENERAL

- 2.0 The Licensee shall immediately report to the Director by telephone any contravention of the terms and conditions of this licence at 1-780-422-4505.
- 2.1 The terms and conditions of this licence are severable. If any term or condition of this licence is held invalid, the application of such term or condition to other circumstances and the remainder of this licence shall not be affected thereby.
- 2.2 The Licensee shall not deposit or cause to be deposited any substance in, on or around the source of water that has or may have the potential to adversely affect the source of water outside the Fenceline.
- 2.3 The licensee shall comply with the terms and conditions of the "Water Use Reporting System User Consent".

DIVERSION OF WATER

- 3.0 This licence is appurtenant to the lands set out in the plan noted in condition 3.1 as No. 27558-P014, which includes the area noted as existing fenceline boundary and the area defined by coordinate locations 1 thru 30, hereafter called the Fenceline Plan.
- 3.1 The Licensee shall undertake the water diversion in accordance with the plans and reports filed in the following AER records:

TITLE	AER Number
"MLX-W New Water Act Licence Fenceline, FigATT6-1 (Rev 4) 17-05-12", dated May 2017, provided by Syncrude	00363203-P001
"Mildred Lake Water Act Approval Fenceline Amendment, FigSIR2 WA 1-1 Fenceline Amndmnt 17-05-15", dated November 2016, provided by Syncrude	27558-P014
"Syncrude MLX SIR1 Water Act #1 and SIR2 # 64 Estimation of Annual Surface Water Diversion Volume", memo dated August 23, 2016, provided by Amec Foster Wheeler,	00363203-R001
"Appendix AER IRC A, Rev3 Volume 1, Section 8.0: Environmental Management", dated December 2018, submitted by Syncrude Canada Limited	27558-R018
"Table ATT6-3 (Rev3): MLX-W Proposed Fenceline Coordinates", dated May 2017, submitted by Syncrude Canada Ltd.	00363203-R002

- 3.2 The Licensee shall divert water only for the purpose specified in this licence.
- 3.3 The Licensee shall divert water only from the source of water specified in this licence.
- 3.4 The Licensee shall divert water only from the following points of diversion:
- (a) all points where water is diverted from surface runoff within the boundaries defined by coordinate locations 1 through 218 as set out in Plan No. 00363203-P001 for the Mildred Lake Extension West Project.

- 3.5 The Licensee shall divert the water only to the following points of use:
- (a) the lands as set out in Plan No. 27558-P014, which includes the area noted as existing fenceline boundary and the area defined by coordinate locations 1 thru 30.
- 3.6 The Licensee shall not divert more than 6,490,000 cubic metres of water per calendar year for the purposes of industrial.
- 3.7 The Licensee shall establish a method of determining:
- (a) the volume of water diverted from each source on a monthly basis; and
 - (b) the volume of water released to water bodies outside of the boundaries defined by coordinate locations 1 through 218 as set out in Plan No. 00363203-P001, on a monthly basis.
- 3.8 The Director reserves the right to establish instream flow needs or other water conservation objectives governing the:
- (a) rate of diversion; and,
 - (b) timing of diversions
- from the Athabasca River downstream of Fort McMurray in accordance with the *Lower Athabasca Region Surface Water Quantity Management Framework for the Lower Athabasca River*, as amended, effective upon written notice to the Licensee.
- 3.9 To protect the aquatic environment, the Licensee shall reduce the maximum rate of water diversion or cease diverting water when ordered in writing by the Director.
- 3.10 This licence is based on knowledge available at the time of issue, and therefore the Director reserves the right to amend this licence to:
- (a) establish water conservation objectives;
 - (b) reduce the quantity of water diversion;
 - (c) establish a maximum rate of water diversion;
 - (d) require the Licensee to modify monitoring systems and the annual water monitoring information; and
 - (e) require the Licensee to evaluate additional offstream storage or alternative sources of water supply;

if, in the Director's opinion, an adverse effect has occurred, is occurring or may occur due to the operation of the diversion of water under this licence on:

- (f) the Athabasca River;

- (g) MacKay River;
- (h) other water users;
- (i) instream flow needs; or
- (j) the aquatic environment.

MONITORING AND REPORTING

- 4.0 Unless otherwise authorized in writing by the Director, the Licensee shall:
- (a) monitor the monthly precipitation, including snow, within the boundaries defined by coordinate locations 1 through 218 as set out in Plan No. 00363203-P001;
 - (b) monitor the monthly quantity of water diverted or surface runoff intercepted within the boundaries defined by coordinate locations 1 through 218 as set out in Plan No. 00363203-P001, using the methods specified in condition 3.7; and
 - (c) monitor the total number of cubic metres of water returned to each water body outside the boundaries defined by coordinate locations 1 through 218 as set out in Plan No. 00363203-P001, using the methods specified in condition 3.7.
- 4.1 The Licensee shall record and retain all of the following information for a minimum of 5 years after being collected:
- (a) the place, date and time of all monitoring and measuring;
 - (b) the results obtained pursuant to 4.0; and
 - (c) the name of the individual who conducted the monitoring, measuring and sampling stipulated in (a) and (b).
- 4.2 The Licensee shall report to the Director the results of the measuring and monitoring required in 4.0 (b) using the "Water Use Reporting System" on or before the end of the month following the month in which the information is based upon was collected.
- 4.2 The Licensee shall compile an Annual Water Use Report on or before February 28th of each year following the calendar year in which the information on which the report is based was collected.
- 4.3 The Licensee shall retain each Annual Water Use Report for a minimum of 5 years.
- 4.4 The Licensee shall submit an Annual Water Use Report to the Director:
- (a) on or before February 28th of each year following the calendar year in which the information on which the report is based was collected; or

- (b) within a time period specified in writing by the Director.
- 4.5 The Annual Water Use Report shall include, at a minimum, the following information collected during the previous calendar year:
- (a) the results obtained pursuant to 4.0;
 - (b) a site plan showing the closed circuit drainage area within Plan No. 00363203-P001 for the previous calendar year, and a site plan showing the proposed closed circuit drainage area within Plan No. 00363203-P001 that is anticipated for the following calendar year; and
 - (c) any other information required in writing by the Director.

COMPLAINT INVESTIGATION

- 5.0 The Licensee shall:
- (a) investigate all written complaints accepted by the Director relating to allegations of surface water and groundwater interference as a result of the diversion of the water or operation of the works; and
 - (b) provide a written report to the Director, within a time specified in writing by the Director, detailing the results of the investigation relating to the complaint accepted by the Director in 5.0(a).
- 5.1 The Licensee shall satisfy the Director that the report submitted pursuant to 5.0(b) has identified remedial and/or mitigative measures relating to the alleged interference.

Manager, Authorizations Branch
Alberta Energy Regulator

Date

Appendix 8 Mineral Surface Lease

Mineral Surface Lease MSL352

July 12, 2019

By e-mail only

Syncrude Canada Ltd.
525 3 Ave SW Floor 7
Calgary, AB T2P 0G4

E-mail: george.jocelyne@syncrude.com

RE: Notice of Decision: Formal Disposition Issued

Dear Sir/Madam:

Based on the review of your formal disposition application dated **June 30, 2017**, the Alberta Energy Regulator has completed its review of your request.

Pursuant to section 20 of the *Public Lands Act*, the Alberta Energy Regulator is granting authority to enter upon those portions of vacant or other public lands for which you have obtained the occupant's consent, for the purpose of a **Mine - Oilsands**, subject to the conditions in Schedule A, attached.

The *Responsible Energy Development Act* permits the filing of a request for a regulatory appeal by an eligible person in regards to an appealable decision as defined in section 36 of the *Responsible Energy Development Act*.

If you are eligible to file a request for a regulatory appeal and you wish to do so, you must submit your request in the form and manner and within the timeframe required by the Alberta Energy Regulator. Filing requirements are set out in section 30 of the Alberta Energy Regulator Rules of Practice available on the AER website, www.aer.ca under Acts, Regulations and Rules. Regulatory appeal requests should be emailed to the Regulatory Appeal inbox at: RegulatoryAppeal@aer.ca.

Edmonton (Twin Atria)
2nd Floor, Twin Atria Building
4999 - 98 Avenue
Edmonton, Alberta T6B 2X3
Canada

tel 780-638-4491
fax 780-442-1459

www.aer.ca

Should you have any questions regarding the above decision, please contact the undersigned at AERSurfaceActivityApplication@aer.ca, quoting the disposition number.

Sincerely,

Charles MacDonald

Manager, Oil Sands West

Alberta Energy Regulator

cc: kneil@lornel.com

SCHEDULE “A”

ADMINISTRATIVE CONDITIONS

Definitions

1. 001 All definitions in the Public Lands Act, RSA 2000, c P-40 and regulations apply except where expressly defined in this Disposition. Where a definition is not provided for in the Public Lands Act, RSA 2000, c P-40 and regulations or this Disposition, the definition contained in the *Alberta Public Lands Glossary of Terms* shall apply.

In this Disposition,

“**Act**” means the Public Lands Act, RSA 2000, c P-40, as amended;

“**Activity**” means the construction, operation, use and reclamation associated with the purpose for which this disposition has been granted.

“**Director**” means the “director” duly designated under the Act;

“**Disposition**” means this disposition, granted pursuant to the Act, which includes this document in its entirety, including all recitals, indices and Schedules;

“**Effective Date**” means the date referred to as such on the first page of this Disposition;

“**Expiry Date**” means the date referred to as such on the first page of this Disposition;

“**Lands**” means those lands as identified in the approved Plan which forms part of this Disposition;

“**Personal Information**” has the meaning as set out in the Freedom of Information and Protection of Privacy Act, RSA 2000, c F-25, as amended;

“**Regulatory body**” means the Department of Environment and Parks or the Alberta Energy Regulator which has the authority under the Responsible Energy Development Act and its regulations to grant dispositions under the Act and Regulation;

“**Regulation**” means all regulations, as amended, under the Act;

“**Term**” has the meaning set forth in section 5 of this Disposition.

Grant of Disposition

2. 002 The Regulatory body issues this Disposition to the Disposition Holder, in accordance with the Act/Regulation subject to the terms and conditions contained in this Disposition.
3. 003 The Disposition Holder shall only use the Lands for the purpose/activity as referred to as such on the first page of this Disposition.
4. 004 Notwithstanding any references in this Disposition, the Act, or the Regulation, this Disposition is not intended to be, nor shall it be interpreted as or deemed to be a lease of real property at common law.

Term

5. 005 The term of this Disposition means the period of time commencing on the Effective Date and ending on the Expiry Date, unless otherwise changed in accordance with this Disposition (the “Term”).

Disposition Fees and Other Financial Obligations

6. 006 The Disposition Holder shall pay all fees, rents, charges, security and other amounts payable in accordance with Act and Regulations.
7. 007 The Disposition Holder shall be responsible for the payment of, and shall pay promptly and regularly as they become due and payable, any tax, rate or assessment that is duly assessed and charged against the Disposition Holder, including but not limited to property taxes and local improvement charges with respect to the municipality in which the Lands are located.

Notwithstanding that this Disposition has expired, the Disposition Holder remains liable for the amount of the property taxes and local improvement charges.

Notwithstanding that this Disposition has been cancelled, the Disposition Holder remains liable for the amount of the property taxes and local improvement charges, as calculated on a pro-rated basis from January 1st of the last year of the Term to the date of cancellation of the Disposition.

8. 008 The Disposition Holder shall be responsible for the payment of all costs to the appropriate service provider or to the Regulatory body charges with respect to the supply and consumption of any utility services and the disposal of garbage.

Compliance

9. 009 The Disposition Holder shall enter on and occupy the Lands only for the Activity authorized under this Disposition.
10. 010 The Disposition Holder shall obtain federal, provincial, municipal, and other permits and approvals, as applicable, with respect to activities that may take place on the Lands.

Condition of the Lands

11. 011 The Disposition Holder accepts the Lands on an “as is” basis.

Improvements to the Lands

12. 012 The Lands and buildings, structures and equipment erected thereon shall be used by the Disposition Holder solely for the purposes permitted by this disposition, the Act, and the Regulations.

Impact on Other Disposition Holders

13. 013 The Disposition Holder shall be responsible for damage to improvements or to the Lands in which prior rights have been issued, including damage to traps, snares or other improvements.

Province's Use of the Lands

14. 014 The Province may reconstruct, expand or alter its facilities on the Lands in any manner. The Disposition Holder shall, if directed by the Province, relocate the Disposition Holder's improvements at the Disposition Holder's expense in order to facilitate reconstruction, expansion or alteration of the Province's facilities.
15. 015 The Disposition Holder acknowledges that:

- a) the regulatory body may issue additional dispositions to any person authorizing that person to enter onto, use and occupy the Lands for various purposes including, but not limited to, the extraction and removal of merchantable resources, or to conduct development, including, but not limited to mineral resource development;
- b) the regulatory body may retain revenues from such additional dispositions; and
- c) the Disposition Holder is not entitled to any reduction in its fees, rents, charges or other amounts payable on the basis that additional dispositions relating to the Lands have been issued.

Assignment, Subletting and Encumbrances

16. 016 The Disposition Holder shall not:
- a) Permit any builder's liens or other liens for labour or material relating to work to remain filed against the Lands; or
 - b) Register, cause or allow to be registered, or permit to remain registered any caveat or encumbrance against the title to the Lands, without first obtaining the prior written consent of the regulatory body, which may be arbitrarily withheld.
17. 017 The Regulatory body may, upon written notice to the Disposition Holder of not less than 60 days, cancel this Disposition or withdraw any part of the Lands from this Disposition as the Province considers necessary to construct banks, drains, dams, ditches, canals, turnouts, weirs, spillways, roads or other structures necessary or incidental to those works.

Reclamation

18. 018 On or before the expiry or termination of this disposition, the Regulatory body, in its sole discretion, may order the Disposition Holder to:
- a) Remove all equipment, personal property, fixtures, structures, buildings or improvements of any sort that the Disposition Holder constructed, erected, placed, or brought onto the Lands or that the Disposition Holder caused or allowed to be constructed, placed, or brought onto the Lands (the "Holder's Items"), failing which the Holder's Items shall become the property of the Province;

- b) Vacate the Lands and any of the Holder's Items not removed free from any encumbrance;
- c) Reclaim the Lands to an equivalent land capability, as defined in the Regulation; and
- d) Vacate the Lands

Indemnification and Limitation of Liability

19. 019 The Disposition Holder shall indemnify and hold harmless the Province and/or the regulatory body, its employees, and agents against and from all actions, claims, demands, or costs (including legal costs on a solicitor-client basis) to the extent arising from:
- a) the Disposition Holder's breach of this Disposition, or
 - b) any actions or omissions, negligence, other tortious act, or wilful misconduct of the Disposition Holder, or of those for whom the Disposition Holder is legally responsible, in relation to the exercise of the rights, powers, privileges or duties under this Disposition.
20. 020 The Disposition Holder shall not be entitled to any damages, costs, losses, disbursements, or compensation whatsoever from the Province or the Regulatory body, regardless of the cause or reason therefore, on account of:
- a) partial or total failure of, damage caused by, lessening of the supply of, or stoppage of utility services or any other service;
 - b) the relocation of facilities or any loss or damage resulting from flooding or water management activities;
 - c) the relocation of facilities or any loss or damage resulting from wildfire or wildfire management activities;
 - d) any damage or annoyance arising from any acts, omissions, or negligence of owners, occupants, or tenants of adjacent or contiguous property; or
 - e) the making of alterations, repairs, improvements or structural changes to the utility services, if any, anywhere on or about the Lands, provided the same shall be made with reasonable expedition.

Insurance

21. 021 The Disposition Holder shall at all times during the Term, at its own expense and without limiting the Disposition Holder's liabilities therein, maintain the following insurance coverage in compliance with the Insurance Act, RSA 2000, c I-3, with carriers, on forms, and with coverage and endorsements satisfactory to the regulatory body in its sole discretion:
- i. General or commercial liability insurance in an amount not less than \$2,000,000 inclusive per occurrence, insuring against bodily injury, personal injury, and property damage including loss of use thereof. That includes employees and members as additional insureds, products and completed operations liability if applicable; sudden and accidental pollution coverage if applicable; and watercraft liability if applicable;
 - ii. Automobile liability insurance on all vehicles owned, operated or licensed in the name of the Disposition Holder and used on or taken onto the Lands or used in carrying out the obligations under this Disposition in an amount not less than \$2,000,000;
 - iii. "All risk" property insurance insuring the Disposition Holder's personal property on the Lands against accidental loss or damage; and
 - iv. Such additional insurance policies and coverage as the Province reasonably requires from time to time, including, but not limited to, wildfire fights expense coverage in an amount not less than \$250,000.
22. 022 The Disposition Holder shall, on request of the regulatory body, provide the regulatory body with acceptable evidence of insurance, in the form of a detailed certificate of insurance, prior to using or occupying the Lands and at any other time upon request of the Province. On request the Disposition Holder shall promptly provide the regulatory body with a certified true copy of each policy.
23. 023 Any insurance called for under this Disposition shall be endorsed to provide the Regulatory body with at least 30 days advance written notice of cancellation or material change.

Notices

24. 024 The Disposition Holder shall maintain current contact information with the Regulatory body.

Interpretation

25. 025 The headings used throughout this Disposition are inserted for convenience of reference only and do not form part of the Disposition.
26. 026 A reference to any federal or provincial law or regulation or to any municipal bylaw shall be deemed to be a reference to the law, regulation or bylaw as may be amended, revised, repealed and replaced, or substituted from time to time.

General

27. 027 For greater certainty, the Disposition Holder shall comply with the terms of the attached indices, supplements, addendums and schedules, including:
- a) Administrative Conditions
 - b) Landscape Analysis Tool Report
 - c) Supplements
 - d) Condition Addendum
 - e) Plan
 - f) Or otherwise identified by the regulatory body.
28. 028 Should any term of the disposition be invalid or not enforceable, it shall be severed from the Disposition and the remaining terms of the disposition shall remain in full force and effect.
29. 029 The Disposition Holder shall:
- a) generate and receive an Entry Confirmation Number through the Electronic Disposition System (EDS) within 72 hours of commencing the activity; and
 - b) provide other notifications in relation to the status of the activity as directed in writing by the regulatory body.
30. 030 The disposition holder shall comply with the direction as provided within the Pre-Application Requirements for Formal Dispositions document as amended and in effect on the date of issuance of this formal disposition.

31. 031 The disposition holder is required to contact the registered trapper(s) identified on an Activity Standing Search Report by registered mail at least ten (10) days prior to commencing any activity.

CONDITION ADDENDUM

Land Management

- 1011-AS Incidental Activities as referenced on the associated supplement that fall within the sizing parameters, as defined within the PLAR Approvals and Authorizations Administrative Procedure's as amended, identified at the time of application are subject to the conditions of the associated disposition and shall be available for use for a term of four years from date of disposition approval.
- 1013-AS Where an Integrated Resource Plan or a Reservation/Protective Notation identifies a greater set back, the greater set back shall prevail.
- 1014-AS Additional applications for access will not be permitted if access under disposition already exists.
- 1015-AS Where a Higher Level Plan exists, the direction provided within that plan shall be followed.
- 1017-AS For activities that fall within any Protective Notation (PNT) lands with a purpose code 400 Series encompassing a section of land (259 hectares) or less, located in the Provincial White Area (i.e., Provincial settled lands), all construction activities shall be built and occur within lands developed as range improvement. Where no range improvement exists, activities shall occur within 100 meters of the perimeter (i.e., outside boundary), with the following exceptions:
- pipeline construction activities
- 1022 The disposition holder shall close inactive portion(s) of the access that lead to non-producing wells to highway vehicle traffic within 1 year of well non-production. Method and location of access control features shall be provided to the issuing regulatory body office in writing.
- 1023 The disposition holder shall repair or replace any identified improvements (e.g., fences, water control structures, and signage) that were damaged as a result of industry activities on the land to pre-existing condition within 30 days of entry or immediately if occupied by livestock.

- 1024 The disposition holder shall maintain all activities for proper drainage of surface water.
- 1026 For activities that occur on Canadian Forces Bases, the disposition holder shall coordinate all activities through Energy Industry Control at (780) 842-5850 for activity on Canadian Forces Base/Area Support Unit, Wainwright, and (780) 573-7206 for activity on Canadian Forces Base/Area Support Unit, Cold Lake.
- 1028 The disposition holder shall comply with all requirements and direction as defined within the Pre-Application Requirements for Formal Dispositions as amended.
- 1030 The disposition holder shall not cause surface disturbance in coulees or through river benchland areas-excluding access, pipelines and linear easements crossing the watercourse feature.
- 1032 In addition to complying with Federal, provincial and local laws and regulations respecting the environment, including release of substances, the disposition holder shall, to the regulatory body's satisfaction, take necessary precautions to prevent contamination of land, water bodies and the air with particulate and gaseous matter, which, in the opinion of the regulatory body in its sole discretion, is or may be harmful.
- 1033 The disposition holder shall remove all garbage and waste material from this site to the satisfaction of the regulatory body, in its sole discretion.
- 1037 Entry is not allowed within the boundaries of any research or sample plot.
- 1038 When planned activities cross designated or recreation trail(s) or when operations encroach on those trail(s), the disposition holder shall ensure that:
- Lines crossing trail(s) are constructed in a manner that will not remove snow from the trail(s), produce ruts in the trail(s), or otherwise adversely affect travel.
 - No mechanical equipment is permitted to travel along the trail(s), unless approved in writing by an officer of the regulatory body.
 - Warning signs are posted along trail(s) during construction and reclamation activities advising trail users of the upcoming crossing location.
 - Any recording devices or equipment laid along the trail(s) are placed off of the travel portion so that the geophones do not interfere with travel.

- 1034 The disposition holder shall ensure any garbage remaining on site overnight is placed in secure bear resistant containers. The disposition holder shall ensure that these containers are emptied on a regular basis to avoid excess garbage being present on the land or when the disposition holder will be off the land for more than two days.
- 1046 Where a Wildfire Prevention Plan and/or FireSmart Plan is required for review and approval by the Wildfire Management Branch, the disposition holder shall ensure any proposed clearing on public land has been agreed to by the regulatory body.
- 1057 For oil sands mine sites and in situ dispositions that are larger than 100 acres and full disturbance fees are not being billed, the disposition holder shall provide to the regulatory body within 60 days after March 31st of each year, a plan illustrating and describing,
- a) the areas cleared and/or utilized for development and operations incidental thereto, indicating the acreage thereof, during the preceding year ending on March 31.
 - b) the areas reclaimed, also indicating the acreage thereof, during this year.

In addition to any other charges specified in this authority, the disposition holder shall pay a sum of money for each acre of land identified on the plan as having been cleared and/or utilized. The charge applied will be the zonal rate in effect on March 31st for first year's charges on mineral surface leases. The disposition holder shall also pay a charge as assessed by the regulatory body for forest growth destroyed on those area cleared and/or utilized.

Vegetation

- 1101 Manage all weeds as per the Weed Control Act.
- 1105 Chemical application for the purpose of vegetation control shall occur in accordance with the Pesticide Regulation and Environmental Code of Practice for Pesticides.
- 1106 The disposition holder shall salvage all merchantable timber and haul to the location of end use unless a request for waiver is approved under the Forests Act.
- 1107 The disposition holder shall salvage timber according to the utilization standards for the overlapping timber disposition(s) (i.e., FMA, CTL, DTL) or, where no overlapping timber disposition exists, as per the approved forest management plan.

- 1108 The disposition holder must slash, limb and buck flat to the ground all woody debris and leaning trees created by the activity. The length of slashed woody debris shall not exceed 2.4 meters.
- 1109 On forested lands, the disposition holder shall dispose of excess coarse woody debris remaining after rollback or stockpiling for interim/final reclamation.
- 1110 The disposition holder shall dispose of coarse woody debris within FireSmart Community Zones by burning unless a Debris Management Plan has been approved under the Forest and Prairie Protection Act.
- 1112 The disposition holder shall not allow timber storage piles or windrows to encroach into standing timber.

Soil

- 1130-AS Permafrost degradation is not permitted. Onsite permafrost depth must be maintained to the same depth as offsite control.
- 1131-AS In permafrost areas, surface stripping shall not occur.
- 1133 The Disposition holder shall suspend all activities during adverse ground conditions.
- 1134 The disposition holder shall prevent and control erosion (surface and subsurface) and sedimentation on all disturbed lands.
- 1135 The disposition holder must install and maintain erosion control measures (e.g., silt fences, matting, gravel, and check dams).
- 1136 The disposition holder shall not remove soil from the disposition unless authorized. This includes all soil horizons and all soil types (e.g. leaf litter, organic soils such as muskeg, and clay fill material are all included).
- 1137 The Disposition holder must not bury topsoil.
- 1138 Where soil disturbance occurs from site construction or linear trenching of a minimum of 12 inches or greater, the disposition holder must salvage all topsoil if present (topsoil includes the leaf litter layer (LFH) and the A horizon) as follows;
- Where two-lift stripping occurs, topsoil and part or all of the upper subsoil (B horizon) must be stripped and stored separately.

- Where topsoil is less than 15 centimeters, conservation shall include the topsoil plus part of the upper subsoil (B horizon) up to a total depth of 15 centimeters (unless the B horizon is considered chemically unsuitable as outlined in the May 2001 Salt Contamination Assessment Guidelines, as amended).
- 1139 The disposition holder shall store reclamation materials separately (topsoil, subsoil,) on the disposition, such that it can be distributed evenly over the disturbed area for progressive (interim) and/or final reclamation. LFH and coarse woody debris are suitable for storage with topsoil. Reclamation materials must not be buried.
- 1140 Wood chips shall not be mixed with forest floor and/or surface soil. It cannot be spread to a depth greater than 5 cm as defined in the directive ID 2009-01 Management of Wood Chips on Public Land.
- 1141 Storage piles/windrows of reclamation material shall not encroach into standing timber.
- 1142 Soil sterilants are prohibited.
- 1143 All spoil material excavated from the pipeline trench shall be returned to the trench in a manner that there is no pooling of water or erosion occurring on the surface. The maximum height of crown (roach) shall not exceed 60 cm on frozen soils and 30 cm on dry or non-frozen soils. Breaks in pipeline roaches shall occur as to not impede water drainage and allow for passage of water.
- 1144 In permafrost areas, the disposition holder shall utilize snow (natural or man-made) to establish a level surface

Watercourse/Waterbody

- 1171-AS The disposition holder shall not interrupt natural drainage (including ephemeral and fens), block water flow or alter the water table.
- 1173-AS The disposition holder shall construct activities outside the appropriate watercourse setbacks, except for vehicle or pipeline crossings:
- a) Intermittent watercourses and springs shall have a setback of at least 45 meters from the top of the break.
 - b) Small Permanent watercourses shall have a setback of at least 45 meters from the top of the break.

- c) Large Permanent watercourses shall have a setback of at least 100 meters from the top of the break.
- 1174-AS The disposition holder shall maintain the following waterbody setbacks from the disposition edge for all site activities, or paralleling linear dispositions, or pipeline bore site:
- a) A minimum setback of 45 meters of undisturbed vegetation shall be maintained from non-permanent seasonal wetlands.
 - b) A minimum setback of 100 meters from the bed and shore of semi-permanent and permanent ponds/wetlands, shallow open water ponds, lakes and watercourses.
- 1176-AS The disposition holder shall ensure all crossings maintain fish passage. Crossings shall be compliant with the departments Code of Practice under the Water Act, Water (Ministerial) Regulation.
- 1179 The disposition holder shall not deposit or place debris, soil or other deleterious materials into or through any watercourse and/or waterbody, or on the ice of any watercourse and/or waterbody.
- 1180 The disposition holder shall maintain the access (e.g. crossing structures, ditches, etc.) to ensure proper drainage.
- 1182 The disposition holder shall not strip the organic soil layer and lesser vegetation from portions of the disposition not needed for the road grade on approaches to watercourse crossings.
- 1183 Where crossings have been removed, the disposition holder shall immediately stabilize the bank or shoreline of all affected watercourses and/or waterbodies and/or make alterations or modifications to the bank or shoreline to restored to native vegetative species found in the adjacent area.
- 1184 Access (off-disposition) for water withdrawal requires an Approval or Authorization from the regulatory body.
- 1186 Where surface disturbance will occur and a risk of surface erosion exists, the disposition holder shall install and maintain sediment control structures to dissipate the flow of water and capture sediment prior to it entering a watercourse or waterbody.

- 1187 During watercourse structure maintenance, the disposition holder must install sediment and erosion control measures.
- 1194 The disposition holder shall not remove or use water from dugouts, surface ponds, springs, or water wells within the grazing disposition unless an approval is issued from the Environment and Parks (GoA) agrologist.
- 1196 All licences, authorizations and approvals issued under the Alberta Environmental Protection and Enhancement Act, Water Act or Public Lands Act should not be taken to mean the proponent (applicant) has complied with federal legislation. Proponents should contact Habitat Management, Fisheries and Oceans in relation to the application of federal laws relating to the Fisheries Act (Canada).

Fisheries Protection Program, Fisheries and Oceans Canada

867 Lakeshore Road, Burlington, Ontario, L7R 4A6

Telephone: 1-855-852-8320

Email: Fisheriesprotection@dfo-mpo.gc.ca

Web address: www.dfo-mpo.gc.ca

Proponents should also contact the Navigation Protection Program, Canadian Coast Guard, 4253-97 Street, Edmonton, Alberta, T6E 5Y7, phone: (780) 495-4220, relating to the Navigation Protection Act.

Reclamation

- 1200 The disposition holder shall conduct progressive reclamation and interim clean-up for constructed activities and all associated disturbances (log decks, remote sumps, campsites, borrow sites, etc.) of that disposition as per External Directive SD 2010-02 Progressive Reclamation and Interim Clean up as amended.
- 1202 The disposition holder shall utilize natural recovery, on all native landscapes (forested, wetlands, riparian, and peatlands) for all areas of the site, not required for operations or padded with clay. Natural recovery is to be implemented within 1 growing season of completions (post-drill) or for sites that are not drilled within 1 growing season of

construction. Assisted natural recovery is allowed on high erosion sites, sites prone to weeds, agronomic invasion, or padded sites (forested and peatland).

- a) During assisted natural recovery when reseeding with herbaceous seed native to the Natural Subregion or agronomic annuals and seed mixes as approved by the regulatory body, shall be free of the species listed in the Weed Control Act. A seed certificate (under the rules and regulation of the Canada Seeds Act) for each species shall be provided to the regulatory body upon request.
- b) Assisted natural recovery can be used for planting woody species for the purpose of accelerated reclamation. The woody species must be native to the Natural Subregion and follow the Alberta Forest Genetic Resource Management and Conservation Standards as amended.

1203 The disposition holder shall when seeding pasture or cultivated lands, use agronomic or forage seed that meets or exceeds Certified #1 as outlined in the Canada Seeds Act and Seeds Regulations. Seed mixes are to be free of species listed in the Weed Control Act. A seed certificate (under the rules and regulation of the Canada Seeds Act) for each species shall be provided to the regulatory body upon request.

1204 Revegetation with trees or shrubs within the Green Area shall be consistent with the Alberta Forest Genetic Resource Management and Conservation Standards document.

1205 Where materials are available, the disposition holder shall utilize rollback as follows;

- a) Place rollback across the entire width for a distance of at least 200 meters from all points of intersection with roads and permanent watercourses.
- b) Place rollback across the entire width on all slopes greater than or equal to 10%.
- c) Ensure that rollback does not exceed 50% ground coverage on linear disturbances. Spread rollback in a manner that does not create a vertical fire hazard by increasing ladder fuels. Rollback must remain flat and on the ground in contact with soil.
- d) Rollback on lands under agricultural disposition (grazing lease, farm development lease) will only be applied after obtaining consent from the disposition holder.
- e) In substitution of a proportion of rollback, use dog-legs, directional drilling, or other techniques to retain at least 50 meters of forest cover (where it exists) to block line-of-

sight and vehicle access at all points of intersection with all permanent watercourses and roads.

- f) No rollback shall occur on wildfire control breaks, containment lines or other designated debris free locations identified within a Wildfire Management Plan or FireSmart Plan.

1206 Coarse woody debris that is stored for final reclamation for greater than 12 months must be mixed with the top soil (LFH/Ae).

1207 Slash and rollback accumulations are not permitted within 5 meters of the perimeter of the disposition boundary greater than what is already occurring on the surrounding undisturbed forest floor.

1210 Upon cancellation and abandonment, the disposition holder shall contour the disturbed land to an acceptable land form using chemically suitable overburden and/or subsoil. The disposition holder shall replace topsoil and restore the natural drainage by removing any culverts and fills.

1211 Upon abandonment or as directed by the regulatory body, the holder shall reclaim the disposition to the pre-disturbance land use (forested, grassland, cultivated, mineral wetland and peatlands) unless a change in land use is approved in writing by the regulatory body.

Wildlife

1280 The disposition holder is required to conduct a wildlife sweep of the immediate area (site plus 100 meters) prior to entry and construction to identify wildlife features. All observations must be reported to the regional AEP Wildlife Biologist, the issuing regulatory body, and entered into the Fisheries and Wildlife Management Information System (FWMIS).

1281-AS Where the presence of an important wildlife feature including; mineral licks, raptor nests, active den sites, and hibernacula, is known or identified through a Wildlife Sweep, the disposition holder shall leave a buffer zone of a minimum width of 100m undisturbed vegetation, where an established buffer does not already exist (e.g. Species at Risk).

If species are identified during the wildlife sweep, the disposition holder must produce the Wildlife Sweep to the regulatory body for review before continuing with the approved activity. Results from Wildlife Sweeps must be provided to the regulatory body upon request.

- 1282 The disposition holder shall follow the industrial practices in the Bear-Human Conflict Management Plan for Camps as amended for all industrial camps operating on public land.
- 1286 All licences, authorizations and approvals issued under the Alberta Environmental Protection and Enhancement Act, Water Act or Public Lands Act should not be taken to mean the proponent (applicant) has complied with federal legislation. Proponents should contact Environment Canada, Canadian Wildlife Service in relation to the application of federal laws relating to the Migratory Birds Convention Act (protection of eggs and nests) and the Species at Risk Act.

Environmental Stewardship Branch | Prairie & Northern Region

Environment Canada

Eastgate Offices, 9250 49th Street

Edmonton, Alberta T6B 1K5

Telephone: 1-780-951-8600

Email: Enviroinfo@ec.gc.ca

Web address: <http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=AB36A082-1>

Web address: <http://www.sararegistry.gc.ca/>

- 1287 The disposition holder must facilitate wildlife movement on all above ground pipelines as per the Above Ground Pipeline Wildlife Crossing Directive 2014-07 as amended.

Key Wildlife and Biodiversity Areas

- 1471-AS The disposition holder shall not conduct any activities within a 100 meter buffer to the edge of valley breaks excluding access, pipelines and linear easements activities crossing the watercourse feature. In the absence of well-defined watercourse valley breaks, a 100 meter buffer from the permanent watercourse bank applies.
- 1478 No legumes are to be seeded for any re-vegetation.
- 1479 The disposition holder shall re-vegetate activities, associated facilities and clearings to species compatible and consistent with the adjacent vegetation type (i.e., when the features are reseeded, reclaimed or partially restored).

Additional Conditions

32. The holder upon request of the Regulatory body, to the Regulatory body's satisfaction, in its sole discretion, shall provide a security deposit when requested in a form and time required by the Regulatory body for any disturbance/operations occurring on the lands in accordance with the provisions of the holder's disposition.
33. The holder shall maintain the land in a neat and clean condition acceptable to a departmental officer.
34. The holder shall maintain any buildings or other improvements erected or placed on the land in good and substantial repair and condition, normal wear and tear excepted.
35. The holder shall comply with all provision and requirement set out in the approval issued on these lands in accordance with Division 2, Part 2, of the Alberta Environmental Protection and Enhancement Act, which forms part of this authority: EPEA Approval 26-02-00, as amended
36. The holder shall provide the departmental officer with a Timber Salvage Plan minimum 30 days prior to the activity.
37. The holder shall notify a departmental officer not less than 48 hours prior to the proposed application of a pesticide. A written report of the pesticides uses, dates of treatment, methods of application, total area treated and target vegetation shall be forwarded to the departmental officer within one month of the treatment date.
38. The holder shall submit an Industrial Wildfire Control Plan to Alberta Agriculture and Forestry by March 1st annually. Contact the departmental officer for further information.
39. The holder shall provide an Aggregate Management Plan for the lease area identifying the location, quality and quantity of all gravel resources to the departmental officer for approval. The inventory shall be based on all available data and shall include a detailed report of every log or survey taken on any exploration hole or test pit in which gravel deposits have been encountered. The plan shall include the location of all exploration holes or test pits along with a report and map identifying the types and depths of all gravel material encountered.
40. The holder shall provide annual updates (April 15th) to the operational component of the Aggregate Management Plan to the departmental officer. The update shall account for all gravel used, extracted, stockpiled and any exploration activities planned for the year to come, relative to mine development. The report shall also identify all exploration conducted for gravel,

overburden, oil sand and provide an evaluation of the testing information (location, type, depth, quality, quantity).

41. The holder shall ensure that sterilization of recoverable sand and gravel reserves does not occur. Sand and gravel resources discovered during mining activity and not used for ancillary/construction purposes during the course of mining activity must be stockpiled.
42. The holder shall provide a waste management plan to prevent wildlife problems. The waste management plan shall be submitted to the Land Manager for approval as part of the annual plan.
43. Provided that the holder establishes to the satisfaction of the Regulatory body that the surface materials removed under this authority were supplied free of charge and used by the Government of Alberta or used in the construction or maintenance of a public work owned by the province or a municipality in Alberta, no royalty is payable. To qualify for royalty exemption, it is the responsibility of the holder to provide documented proof that the surface materials were used for construction and maintenance of a public work.
44. The holder shall contact and advise the officer of the Regulatory body of its intentions:
 - prior to entry upon the lands,
 - prior to any additional construction during the term of this authority,
 - at the completion of operations, and
 - upon abandonment of this activity.

AERAuth.Mining@aer.ca

45. Soil rutting shall not occur on minimal disturbance sites.
46. Watercourse structures shall be maintained to prevent sedimentation and erosion.
47. The holder shall remove all garbage and waste material from this site to the satisfaction of the Regulatory body, in its sole discretion.
48. The holder shall provide to the department within 60 days after March 31st each year a plan illustrating and describing,

- a) the areas cleared and/or utilized for mining and operations incidental thereto, indicating the acreage thereof, during the preceding year ending on March 31st.
- b) the areas reclaimed, also indicating the acreage thereof, during this year.

In addition to any other charges specified in this authority, the holder shall pay a sum of money for each acre of land identified on the plan as having been disturbed and/or utilized. The charge applied will be the zonal rate in effect on March 31st for first year's charges on mineral surface leases. The holder shall also pay a charge as assessed by the department for forest growth destroyed on those area disturbed and/or utilized.

- 49. Decks of merchantable timber, prior to transfer to the salvage recipient, shall be legibly and permanently marked with a disposition number.
- 50. The holder shall ensure that all gravel resources remain recoverable through the course of mine development. Gravel resources discovered during mine development and not used for ancillary/construction purposes must be stockpiled, as directed by a departmental officer.
- 51. The holder shall salvage and stockpile, as directed by a departmental officer, all gravel resources found that are greater than 1000 m³ in size and greater than 1 metre in depth, that are free of oil sand contamination, and being within the mineral surface lease boundary unless otherwise authorized by a departmental officer.
- 52. The holder shall not,
 - a) sell, remove or carry away sand and gravel that is found in situ and is free of bitumen, oil or other petroleum substances, or
 - b) use any such sand and gravel in connection with any construction work on the lands, except under the authority of the Minister under the Public Lands Act, Part 7 — Disposition and Fees Regulation (AR 54/2000).

The holder shall not be liable for any royalties for any sand and gravel that is stockpiled in the course of mining activity, unless that sand and gravel is used by the holder at a later date.

- 53. The disposition holder shall submit to the Director, at least 60 days before beginning of construction, or another deadline specified in writing by the Director, all detailed engineering plans for the permanent MacKay River Bridge.

54. The disposition holder shall submit to the Director, at least 60 days before beginning of construction, or another deadline specified in writing by the Director, all detailed engineering plans for the temporary MacKay River Bridge.
55. The disposition holder shall, in addition to other requirements under this approval, construct the bridge crossings referred to in condition 53 and 54 in accordance with the plans as authorized in writing by the Director.