Review of Shell's Jackpine Mine Expansion AENV and ERCB SIRs Round 2

Prepared for

Mikisew Cree First Nation GIR

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Prepared by

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Executive Summary

The Mikisew Cree First Nation GIR (Mikisew Cree) has requested that Management and Solutions in Environmental Science (MSES) review Shell's Supplemental Information Request (SIR) Round 2 documents for the Jackpine Mine Expansion Project (JPME). The SIRs include responses to Alberta Environment (AENV) and the Energy Resources Conservation Board (ERCB) information requests. Shell's responses to the SIRs do not contain any answers to questions and requests specifically asked by the Mikisew Cree, as outlined in the report "Review of Shell Canada's Jackpine Mine Expansion & Pierre River Mine Project Application", prepared by MSES for the Mikisew Cree in July 2009.

MSES evaluated the application to determine how and to what extent Shell has addressed the concerns of the Mikisew Cree surrounding environmental stewardship and to provide recommendations to Shell as to how these concerns and issues could be incorporated into the application and environmental management process. Below we have identified the following points as being shortcomings of the Application or points that require further clarification. Associated rationale and additional potential issues of concern are presented in the body of this report.

1) No attempt was made by Shell in the previous JPME Environmental Impact Assessment (EIA) to model contaminant solute transport in groundwater on the regional scale. Shell's proposed monitoring of Basal Aquifer water levels and water quality during the Project is not a valid alternative to conducting a meaningful assessment of the impacts of the Project on local and regional water quality at the environmental impact assessment stage of the Project, and is a poor substitute for such an assessment, particularly as, based on the results of the solute transport model, peak concentrations of several contaminant indicator parameters will occur long after Project closure, when site groundwater monitoring has ceased (Hydrogeology).
2) Although the seepage rates from the McMurray Basal Aquifer to the Athabasca River may be negligible in comparison to Athabasca River flows, as claimed by Shell, the peak contaminant loadings to the river from JPME are unknown, as a result of the limitations of the Project solute transport modeling. As a result, it is not possible to conduct a cumulative effects assessment of groundwater contaminant loadings from all oil sands projects in the region, including the JPME facility, to the Athabasca River, which should be a basic requirement for a properly conducted EIA (Hydrogeology).
3) No mention is made in the SIRs document regarding the provision of long-term (post-closure) operation and maintenance of the well interception network. As the modeling of external tailings disposal area (ETDA) seepage of interception by the well network terminates 100 years after mine closure, it appears there is no knowledge by Shell of how long the well interception system would actually be required to operate to capture all of the contaminant seepage from

the ETDA. Further, there do not appear to be any plans by Shell to maintain the well interception system, including the installation of the necessary replacement wells, over that extended, and currently unknown, time period (Hydrogeology).

4) AENV information requests for holding times, flow rates and water holding capacity of the holding areas was not provided (Hydrology).
5) Site-specific details for responding to the accidental release of hazardous substances must be well prepared and described in principle, before the application should be approved. A general "*action plan*" that states "*spill control and countermeasures would be implemented on a case-by-case basis and implemented in consultation with AENV*" is unacceptable (Hydrology).
6) Shell's commitment to being involved in research and development associated with pit lakes is positive, but stakeholders must ensure that Shell (and all proponents) partake meaningfully and that progress is documented. Research programs aimed at understanding the creation and functioning of end pit lakes must acknowledge the current uncertainties (Surface Water Quality)
7) Shell has demonstrated a poor understanding surrounding the local and regional carrying capacity of potential wildlife habitat in light of future oil sands exploitation scenarios and knowledge of the carrying capacity of the various habitat types for multiple wildlife key indicator resources (KIRs). In addition, AENV has demonstrated no specific wildlife management goals and strategies (e.g., benchmarks, targets) at the local or regional level (Wildlife).
8) When requested to describe their commitment and plans to monitor wildlife abundance in the surrounding area to confirm project predictions, Shell fails to describe their monitoring program plans in any meaningful detail (Wildlife).
9) As stated in previous reviews of SIRs and SIR responses, the plan to use river corridors as a mitigation measure that would act as habitat and movement conduits is flawed. As Figure AENV43-1 demonstrates, any proposed corridor is impinged upon or is bisected by industrial development, and is not apparently connected to any other corridor network or area in the region that is not leased to oil sands companies. Therefore it is not clear how river corridors would be effective mitigation measures to minimize impacts to wildlife movement and habitat loss (Wildlife).
10) In the JPME Project application, Shell claimed that the environmental consequences of the Project on wildlife abundance is predicted to be negligible to low in the local study area (LSA). AENV asked whether or not this assessment was dependent upon the assumption that pre-disturbance habitat capability can be fully reclaimed at closure, to provide evidence for this assumption, and to provide a list of assumptions made in drawing this conclusion. Rather than addressing pre-disturbance habitat capability, Shell discusses equivalent land capability in their answer (Wildlife).
11) When LFH material is direct-placed or placed within one year of salvage onto areas that are similar in moisture and nutrient regime, a significant number of plant species will emerge from the propagule bank within the LFH. If permanent reclamation areas are not available until 2029,

when areas are being salvaged from 2010 through 2019, then the benefit of minimizing the time that salvage material is stockpiled placed onto reclamation areas seems to be lost (Vegetation & Reclamation).

12) Shell indicates that one technique that "*has already been used*" is to farm LFH until final reclamation areas are available. However, they do not provide evidence of how successful the technique has been in final reclamation (Vegetation & Reclamation).
13) Shell's responses to the round 2 SIRs did not provide any more substantive information on monitoring programs. The overarching approach to monitoring remains unchanged by Shell committing to develop further details during the approval stage. This is very discouraging given that Shell has been in operation for many years and has conducted monitoring programs for its current operations in the Oil Sands region (Follow Up & Monitoring).
14) In the round 2 SIRs, Shell still does not appear to adopt any of the input provided by the Mikisew Cree on past monitoring reports (Follow Up & Monitoring).
15) We acknowledge that Shell occasionally refers to results from past monitoring. However, the use of results from past monitoring is not only sporadic, it is also extremely selective. For example, Shell does not mention anywhere the many exceedences that were recorded in the monitoring of water and air quality (Follow Up & Monitoring).

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1.0 Introduction

The Mikisew Cree First Nation GIR (Mikisew Cree) has requested that Management and Solutions in Environmental Science (MSES) review Shell's Supplemental Information Request (SIR) Round 2 documents for the Jackpine Mine Expansion Project (JPME). The SIRs include responses to Alberta Environment (AENV) and the Energy Resources Conservation Board (ERCB) information requests. The responses to the SIRs do not contain any answers to questions and requests specifically asked by the Mikisew Cree, as outlined in the report "Review of Shell Canada's Jackpine Mine Expansion & Pierre River Mine Project Application", prepared by MSES for the Mikisew Cree in July 2009.

The commentaries and questions posed throughout this report address the technical quality and the basis of conclusions reached and predictions made. The technical quality is then related to its usefulness for follow-up programs, thereby addressing the confidence that the Mikisew Cree may have in the environmental management programs during the lifetime of the project. MSES understands that maintaining traditional resource use and cultural activities is important to the Mikisew Cree. We ask how the presented information can be used by the proponent to develop mitigation measures and how the effectiveness of the mitigation can be measured to demonstrate the success of achieving the targets of returning traditional resources to their original state. In its evaluative approach, MSES maintains that it is essential that scientific rigor be employed when considering the potential impacts of oil sands projects, and in determining the potential success of reclaiming the land for future generations.

1.1 Project Description

In 2002, Shell applied for approval of the Jackpine Mine-Phase 1 which was based on a bitumen production level of 200,000 bbl/cd and is expected to start up in 2010. In January, 2009, the ERCB approved Shell's the expansion of the Jackpine Mine-Phase 1 project area to construct and operate a fish compensation lake. At that time, the eastern boundary of the project area was modified due to a land swap with Syncrude Canada Ltd. The expansion of the project in the northeastern corner of the project area has not been approved because potential project impacts associated with the change have not been assessed. Shell is seeking approval as part of the Jackpine Mine Expansion application. The Jackpine Mine Expansion Project will add additional mining area and increase the total mining and processing capacity of the Jackpine Mine to 300,000 bbl/cd.

2.0 Technical Review of the SIRs

2.1 Aquatic Resources

2.1.1 Hydrogeology

2.1.1.1 Comments Regarding Shell Responses to ERCB SIRs:

1) **Reference:** SIR # 28: Shell states "*Travel times in the McMurray Basal Aquifer are predicted to be on the order of hundreds of years and seepage rates are predicted to be negligible compared to Athabasca River flow rates.*" Discuss any other supportive investigations that Shell plans to use to verify predictive results.

Comment: Shell's response to this question is that they will monitor water levels and water quality in the McMurray Basal Aquifer, to estimate groundwater seepage rates in the Basal Aquifer and groundwater travel time from the JPME site to the Athabasca River via the Basal Aquifer.

It is noted that no attempt was made by Shell in the previous JPME Environmental Impact Assessment (EIA) to model contaminant solute transport in groundwater on the regional scale. While groundwater solute transport modeling for the Project was conducted on the local scale, the time domain for this JPME groundwater transport model was limited to 100 years following closure of the mine, at which time peak concentrations of various contaminant indicator parameters at some downgradient groundwater discharge points such as the Muskeg River had not yet occurred. As a result, maximum water quality impacts due to seepage of contaminants via the groundwater pathway from JPME on local and regional surface drainages cannot be determined. Shell's proposed monitoring of Basal Aquifer water levels and water quality during the Project is not a valid alternative to conducting a meaningful assessment of the impacts of the Project on local and regional water quality at the environmental impact assessment stage of the Project, and is a poor substitute for such an assessment, particularly as, based on the results of the solute transport model, peak concentrations of several contaminant indicator parameters will occur long after Project closure, when site groundwater monitoring has ceased.

Finally, although the seepage rates from the McMurray Basal Aquifer to the Athabasca River may be negligible in comparison to Athabasca River flows, as claimed by Shell, the peak contaminant loadings to the river from JPME are unknown, as a result of the limitations of the Project solute transport modeling. As a result, it is not possible to conduct a cumulative effects assessment of groundwater contaminant loadings from all oil sands projects in the region, including the JPME facility, to the Athabasca River, which should be a basic requirement for a properly conducted EIA.

Questions: What plans, if any, has Shell to determine the peak concentrations of all groundwater contaminant indicator parameters resulting from the Project at point of discharge to all major surface water drainages downgradient of the Project? Further, assuming this is done, what plans does Shell have to carry out a cumulative effects assessment of the Project in tandem with other oil sands projects in the region on regional water quality, including the Athabasca River?

2.1.1.2 Comments Regarding Shell Responses to AENV SIRs:

1) **Reference:** SIR #6: *Shell describes details indicating high confidence in the likelihood of successful mitigation of external tailings disposal area (ETDA) seepage water and in quantification of ETDA seepage rates. What were the model parameter inputs used to predict the minimum, average and maximum predicted seepage rates? Further, what is the degree of confidence in these rates?*

Comment : Shell indicates that the estimated average seepage rate from the ETDA facility is 240 L/s, with the minimum and maximum estimated seepage rates from the ETDA facility being 40% less than and 40% greater than the average seepage rate, respectively, with a moderate confidence level in these estimates. Shell further notes that the ETDA will be composed predominantly of tailings sand, overlain by mature fine tailings (MFT), with estimated permeabilities of 2×10^{-6} m/s and 1×10^{-8} m/s, respectively. Shell states that they used a permeability of 1×10^{-8} m/s for the EDTA deposits in the seepage model, which they claim is conservative, leading to the estimation of higher seepage rates from the ETDA. It is unclear how the use of the lower of the two permeabilities associated with the ETDA tailings deposits can be considered conservative with respect to ETDA seepage estimation.

Questions: How is the use of the lower of the two estimated permeabilities for the ETDA tailings deposits conservative, and how does this result in estimation of higher seepage rates from the ETDA facility?

2) **Reference:** SIR # 6b *Shell states that they are aware of publicly-reported information on contaminant seepage releases from ETDA facilities at other projects, but is unable to provide details of the suspected causes of the exceedance events at these facilities or how the seepage interception measures implemented functioned. Describe and discuss the known causes of seepage releases from ETDA facilities, and how the design and construction of the ETDA seepage interception system for the Project will address these issues.*

Comment: Shell states that in the unlikely event that seepage rates from the ETDA exceed the interception system capacity, a possible mitigation measure would involve installation of a well interception system within the Pleistocene Channel Aquifer, and possibly perimeter collection ditches around the ETDA, as well as potentially increasing the pumping rates from existing wells.

While the above-noted potential ETDA seepage interception measures may be effective in limiting ETDA–sourced contaminant releases to the environment over the period of mine operations, some concerns regarding longer-term water quality impacts remain. As noted above, the maximum rate of

degradation of surface water quality from ETDA contaminant releases will occur in several instances beyond the "Far Future" timeline of 100 years after the start of mine closure in 2065, indicating the need for the ETDA seepage interception system to function well beyond the end of the operational period of the mine. Further, the timeline required for capture of the all ETDA seepage has not been determined by Shell, with the contaminant transport model timeline appearing to terminate well before this event. There is also no mention of if or how the seepage interception system will be maintained after mine closure in 2065.

There are also some integrity issues associated with operation of seepage interception wells over time, potentially resulting in ETDA contaminant releases. First, based on experiences at other oil sands facilities, it is noted that after interception wells become operational, with ETDA seepage arriving at the well sites, the wells will begin to bio-foul, reducing their efficiency. As a result, replacement wells will be required periodically, both during the operational period of the mine, and based on contaminant groundwater modeling, for an additional period in excess of 100 years post-mine closure.

No mention is made in the SIRs document, however, regarding the provision of long-term (post-closure) operation and maintenance of the well interception network. As the modeling of ETDA seepage of interception by the well network terminates 100 years after mine closure, it appears there is no knowledge by Shell of how long the well interception system would actually be required to operate to capture all of the contaminant seepage from the ETDA. Further, there do not appear to be any plans by Shell to maintain the well interception system, including the installation of the necessary replacement wells, over that extended, and currently unknown, time period.

Based on the experiences of other oil sands projects, it is very likely that there will be areas of ETDA dyke foundation movement over time. Well screens in particular are susceptible to damage and subsequent siltation in areas where ground displacements occur, rendering them inoperable. As it is generally undesirable to locate these wells sufficiently downgradient of ETDA facilities to avoid this effect, due to poorer containment efficiency, a reasonably high replacement requirement should be accounted for, both during mine operation, as well as for a period in excess of 100 years post-mine closure. However, as in the case above, it is very unlikely Shell has made provision for such a long-term well replacement program, given that, as noted above, the timeline required to ensure capture of all ETDA-sourced groundwater seepage is currently unknown. This suggests the potential for significant groundwater contaminant seepage from the ETDA to downgradient surface water bodies at some point during the post-mine closure period.

Questions: When, and under what reporting format will Shell determine the timeline required for interception of all ETDA groundwater seepage? Further, what assurances can Shell provide, and what contingency plans are in place to ensure that a fully-effective ETDA seepage well interception system will be maintained during the very long post- closure period of the mine, during which releases of ETDA contaminant seepage will continue to occur, to the end point of such ETDA contaminant releases?

2.1.2 Hydrology

2.1.2.1 Comments Regarding Shell Responses to ERCB SIRs

1) **Reference:** SIR # 26a *Provide Shell's plans and timelines for demonstrating the efficacy of EPLs by 2018.*

Comment: As both External Tailings Disposal Area (ETDA) and End Pit Lakes (EPL) are, as yet, unproven technologies, significant adverse long-term environmental impacts are possible. There is considerable doubt that the EPL concept will work as hoped. Both ETDAs and EPLs can lead to significant litigious, liability, regulatory, and reputational risk. Therefore, emerging technologies that have the potential for reducing the environmental footprint and reducing the risk of unknown impacts and associated asset retirement obligations should be embraced.

Question: What are Shell's plans if research carried out at Syncrude's Base Mine Lake finds that EPLs do not function as planned?

2.1.2.2 Comments Regarding Shell Responses to AENV SIRs

1) **Reference:** SIR # 5a "*Since the [polishing] ponds are designed to contain and convey flows for all hydrologic conditions up to the 100 year flood without uncontrolled spillage, provide the emergency response plans for potential spillage in the unlikely event of flows exceeding 100 year flood flows.*"

Questions: Are the elevated levels of total suspended solids (TSS) quoted in the response the result of project operations, or are they 100% natural causes? If the elevated levels of TSS are 100% natural, why are polishing ponds required? If the elevated levels of TSS are not entirely of natural causes, it must be assumed that they are above natural levels, which is in contradiction to Shell's statement that TSS levels during uncontrolled spillage "*would be similar to those in receiving streams*".

With a pond residence time of "*about eight hours*", what percentage of TSS is removed before release into the receiving river?

Shell states that a flood exceeding the 100-year flood event is an "*unlikely event*". This statement is false, as during the lifetime of the project the occurrence of a 100-year flood is a likely event.

2) **Reference:** SIR # 5ci "*What are the anticipated holding times during the time of highest anticipated flows and what are the flows expected?*"

Comment: AENV's request was not answered, as no holding times or flow rates are reported.

3) **Reference:** SIR # 5cii "*Where will the water be held during the extended periods of zero discharge and what in the water holding capacity of the holding area(s)?*"

Comment: AENV's request was not answered, as no water holding capacities are provided.

4) **Reference:** SIR # 5e "*What are the action plans in place for the potential release for each potential parameter of concern?*"

Comment: In light of the 2010 oil catastrophe in the Gulf of Mexico, everyone is reminded of the importance to being prudent and of being well prepared for unexpected events. Therefore, site-specific details for responding to the accidental release of hazardous substances must be well prepared and described in principle, before the application should be approved. A general "*action plan*" that states "*spill control and countermeasures would be implemented on a case-by-case basis and implemented in consultation with AENV*" is unacceptable.

Shell states that "*Site-specific details for responding to the accidental release of hazardous substances will be finalized during the detailed design phase of the project*". **These important plans to protect the environment must be clearly defined before the project should be approved.**

5) **Reference:** SIR # 12a "*Provide further detail regarding the delineation of watershed boundaries to confirm that the boundaries have been confidently determined. In particular, clarify the role of ground-truth data in this exercise.*"

Request: Figure AENV 12-1 shows evidence that the delineated watershed boundary is not based on the 2m and 5m contour lines. The watershed boundary crosses contour lines non-perpendicular and ignores topographic peaks. The watershed boundary is in certain locations much coarser than the contour lines. **Please explain these inconsistencies.**

2.1.3 Surface Water Quality

2.1.3.1 Comments Regarding Shell's Responses to ERCB SIRs

1) **Reference:** SIR # 26 *Provide Shell's plans and timelines for demonstrating the efficacy of EPLs by 2018.*

Comment: EPL's on the closure landscape have implications for surface water quality as they will discharge and, particularly where tailings are incorporated into the design; have the potential to contain various residues from pore- and process-affected waters. Shell provides details of how it plans to participate in research efforts to understand anticipated EPL performance. This includes funding to, and participation with, the Cumulative Environmental Management Association (CEMA), the Canadian Oil Sands Network for Research and Development (CONRAD), and the Oil Sands Tailing Research Facility (OSTRF). Most notable are Shell's plans to participate in Syncrude's Base

Mine Lake as a demonstration project (2012), and to eventually engage in research in an EPL of their own when it comes online.

The tone of the response is confident in that "*Shell believes adequate time exists to progressively apply and incorporate findings from continuing research, modelling pit lake designs, and demonstration lake monitoring into Shell's closure plans.*" **Shell's commitment to being involved in research and development associated with pit lakes is positive, but stakeholders must ensure that Shell (and all proponents) partake meaningfully and that progress is documented**. Aspects of uncertainty and knowledge gaps are documented in CEMA's End Pit Lake Technical Guidance Document, and the response cites a review which focuses on toxicity of napthenic acids, lake modelling, and active management as appreciable technical challenges. Decay in concentration of substances of concern in water is the subject of modelling effort, as are limnological processes such as lake turnover. Research programs aimed at understanding the creation and functioning of end pit lakes must acknowledge the current uncertainties. Even if water quality is acceptable, effort must be made to understand how biological processes will operate against the particular water quality background. There needs to be an understanding of how water quality and biological processes interact as predictions may be complicated by non-linear or mediated effects. Biological processes include establishment of primary producers in pelagic and littoral zones (phytoplankton and macrophytes, respectively) and successive trophic levels with dynamic couplings among them. These mechanisms must be understood at appropriate temporal and spatial scales.

2) **Reference:** SIR # 28 *Shell states, "Travel times are predicted to be on the order of hundreds of years and seepage rates area predicted to be negligible compared to the Athabasca River flow rates". Discuss any other supportive investigation techniques that Shell plans to use to verify the predictions results besides the model simulated results.*

Comment: Shell commits to monitoring groundwater quantity and quality and seepage rates. **This should be included as part of the approvals process to ensure timely detection of any potential migration of substances of concern that might affect surface water quality.**

2.1.3.2 Comments Regarding Shell's Responses to AENV SIRs

1) **Reference:** SIR # 5 …*provide the emergency response plans for potential spillage in the unlikely even of flows exceeding 100 year flood flows.*

Comment: Shell argues that if a rare flood event results in release of water with high concentration of total suspended solids from polishing ponds, then receiving waters outside the development will likely have similar water quality and the result will be no further deterioration

caused by the release. Shell re-iterates that it monitors water quality in polishing ponds, and also appeals to diversion to wetlands to strip total suspended solids from water**. Approval conditions may help enforce these commitments. It may be an overstatement to characterize a 1-in-100 year event as 'unlikely' given the anticipated lifetime of the development; terms such as 'unlikely' are too often interpreted as 'will not happen'.**

2) **Reference:** SIR # 10 *What are the maximum residence times used in the pit lakes modelling? Provide reference citations that the conservation degradation rates used for each organic constituent of concern are applicable for the climatic environmental setting at the JEMA Project site.*

Comment: Shell discusses decay rates used to model concentrations of substances in pit lakes which has implications for surface water quality. Shell's response did refer to use of conservative assumptions in modelling (*i.e.*, use slowest decay rates) but was otherwise detailed and forthcoming and this was helpful.

2.2 Terrestrial Resources

2.2.1 Wildlife

The Wildlife SIRs generated by the ERCB and AENV and the corresponding supplemental information provided by Shell were reviewed in the context of the review work completed earlier on behalf of the Mikisew Cree. The SIR review was completed to determine if any of the SIRs, and corresponding responses supplied by Shell, would be of interest to the Mikisew Cree. Questions and commentaries are posed to either Shell or Government of Alberta representatives (i.e., ERCB, AENV, ASRD) for clarification of potential issues of concern with SIRs or SIR responses.

We would suggest that the questions and comments provided be utilized in conjunction with earlier MSES reviews of JPME and PRM SIRs and SIR responses, where more detailed rationale behind the reviewer's positions are provided.

2.2.1.1 Comments Regarding Overview

1) **Reference:** Sec 1.3, pg 1-11

Comment: Transport Canada informed Shell in February 2010 that they identified two waterways, the Athabasca River and the Muskeg River, that were navigable and applicable to the *Navigable Waters Protection Act* (NWPA). Shell will be required to file application under the NWPA with respect to any works they plan on for the JPME and PRM Projects.

Recommendation: The Mikisew Cree should request to be kept informed of all NWPA applications as they apply to the JPME and PRM projects because of potential negative impacts to Aboriginal and Treaty Rights.

2.2.1.2 Comments Regarding Shell's Responses to ERCB SIRs

1) **Reference:** SIR # 3a-d *Provide an explanation for the increase in waste tonnage from the original application to the updated application.*

Comment: The ERCB requested an explanation for the increased waste (flue gas desulphurization solids, bottom ash and fly ash) tonnage from the original application to the updated application, and how this would affect the EIA. Shell responded that their Class II landfills have been designed to accommodate the additional waste. However, Shell does not appear to have addressed issues surrounding additional emissions from such wastes and potential impacts to wildlife and wildlife habitat through acidification and contamination.

Question: How will the additional wastes affect air quality, acidification or deposition and, in turn, local wildlife and wildlife habitat?

2) **Reference:** SIR # 8 *When would enhanced NST and AFD technologies be ready for incorporation into the tailings plan? Provide the timeline and milestones.*

Comment: In part, the ERCB requested an explanation of when new tailings management technologies will be ready to incorporate into the tailings management plan. Given the mandate of the ERCB, it is not surprising to find that there does not appear to be any evaluation of potential impacts to wildlife and wildlife habitat (current or future). Tests have been, and continue to be, carried out by Shell.

Question: During the pilot scale production of enhanced, non-segregating tailings (NST) slurry in 2008 and 2009, were potential impacts to wildlife and wildlife habitat considered? If not, why not? How will the potential impacts from atmospheric fines drying (AFD) to wildlife and wildlife habitat be evaluated? Have they been evaluated during the summer 2010 technical test program at the Muskeg River Mine? If not, why not? When and how will the Mikisew Cree be informed about Shell's tailings management plans for the JPME and PRM Projects?

3) **Reference:** SIR # 26 *Provide Shell's plans and timelines for demonstrating the efficacy of EPLs by 2018. Elaborate on challenges/difficulties to meet the 2018 deadline and provide solutions to comply with the requirement.*

Comment: It was noted by the ERCB that part of Shell's plans include demonstrating the efficacy of EPLs by 2018. No EPLs currently exist in the Alberta Oil Sands Region, and Shell appears to be betting on the results of research efforts of CEMA, CONRAD and the University of Alberta. It

appears that Shell is not clear whether or not that the success of EPLs can be demonstrated by 2018, and no contingency plans are apparent.

Recommendation: The Mikisew Cree should request that Shell, the ERCB and AENV develop contingency plans to EPLs or explain the next steps if the efficacy of EPLs cannot be demonstrated by 2018, as required. An extension of the 2018 deadline and associated research should not be considered an option.

2.2.1.3 Comments Regarding Shell's Responses to AENV SIRs

1) **Reference:** SIR # 30 *How does this mitigate for the owl nesting period which can begin in early March.*

Comment: AENV expressed concern that nesting owls (and potentially young owls) could be missed if pre-clearing nest sweep surveys were not conducted beginning in March. Current Shell practice is to conduct nest sweeps for migratory and special management bird species between April-August. Given that owls are not specifically protected under the provincial *Wildlife Act* or federally under the *Migratory Birds Convention Act*, it is not clear how, or if, Shell will attempt to mitigate disturbance to owl species who may nest/breed in March.

Question: Please state whether or not Shell will implement any mitigation measures for owl nests or young discovered during pre-construction nest sweep surveys.

2) **Reference:** SIR # 31 *Assess the effects of habitat loss on abundance of all KIRs, and use those assessments to answer the original SIR 423a.*

Comment: In response to being asked for at least the second time by AENV as to why the affects of habitat loss were not assessed with respect to wildlife abundance, shell claims that they understand the link between habitat loss and wildlife abundance but that this relationship is not 'simplistic'. Shell states that the long-term trajectory of wildlife populations depends upon many factors such as carrying capacity of the habitat that is affected and that which remains, and regional wildlife management goals and strategies.

However, Shell has demonstrated a poor understanding surrounding the local and regional carrying capacity of potential wildlife habitat in light of future oil sands exploitation scenarios and knowledge of the carrying capacity of the various habitat types for multiple wildlife Key Indicator Resources (KIRs). In addition, AENV has demonstrated no specific wildlife management goals and strategies (e.g., benchmarks, targets) at the local or regional level. As stated in previous reviews of SIRs and SIR responses, the Mikisew Cree should be concerned about the apparent lack of direction from regulators and lack of understanding by Shell concerning local and regional wildlife population dynamics.

Question/Recommendation: How have additional oil sands developments (leases) been considered in the discussions surrounding local habitat carrying capacity for wildlife? What is the 'carrying capacity' in proximate habitats for moose and other KIRs that Shell is referring to, and how were these estimates measured? What are the specific management goals, plans and objectives for local and regional wildlife populations? The Mikisew Cree should request a meeting with AENV and Shell to discuss how the issues surrounding wildlife and carrying capacity of local and regional habitat types will be resolved.

3) **Reference:** SIR # 33b *Describe Shell's commitment and plans to monitor wildlife abundance in the surrounding environment to confirm project predictions.*

Comment: When requested to describe their commitment and plans to monitor wildlife abundance in the surrounding area to confirm project predictions, Shell fails to describe their monitoring program plans in any meaningful detail. Past experience shows that oil sands monitoring plans are usually not well thought out or planned, and usually only focus on compliance monitoring, not monitoring to test impact predictions. Shell's annual reports for projects such as the Muskeg River Mine demonstrate this apparent lack of any feedback loop to EIA predictions and generally ignore any recommendations made by the Mikisew Cree.

Comment/Question: The response to AENV Question 33b is incomplete. How will Shell involve the Mikisew Cree in the design and implementation of any future monitoring programs, and how will monitoring programs be improved upon from those in the past?

4) **Reference:** SIR # 37a-c …*ASRD is concerned with the risks to birds during the first few years of operation, as other operators in the area have experienced greater than average bird mortality during the initial start-up of operations.*

Comment: AENV stated that other operators in the area of the Shell JPME project have experienced greater than usual avian mortalities during the first 2 years of start –up. They requested that Shell explain what additional deterrents (beyond the BirdAvert system) will be used during the first 2 years of start-up to manage (not avoid) the increased risk of birds landing in new tailings ponds. Shell claims that they were unaware that new start-ups have greater than average avian mortalities during the first 2 years of operation, but they plan on manual hazing of birds in addition to the use of the deterrent system.

Question/Recommendation: The Mikisew Cree should request that (i) AENV explain and provide information surrounding the claim of higher than average bird mortalities during the first 2 years of oil sands (tailings ponds) start-up and (ii) Shell provide statistics and temporal scenarios for tailings pond-related avian mortality for all Shell and Albian Sands oil sand projects.

5) **Reference:** SIRs # 40, 41, 43 and Figure AENV43-1

Comment: Shell was asked to discuss various aspects of the Muskeg River Corridor as depicted in Figure AENV43-1. Questions arose concerning light contamination (Question 40), corridor characteristics and features (Question 42) and corridor width and monitoring (Question 43). Other issues of concern surrounding the proposed wildlife 'corridor' have been raised in previous MSES reviews. For example, remote cameras will be used to monitor this corridor. To reiterate from earlier reviews of SIRs and SIR responses, it appears that photographic bait stations are nothing more than an expensive public relations tool as no quantifiable information related to wildlife distribution and abundance has been produced to date that contributes to EIA predictions or monitoring plans.

As stated in previous reviews of SIRs and SIR responses, the plan to use river corridors as a mitigation measure that would act as habitat and movement conduits is flawed. As Figure AENV43-1 demonstrates, any proposed corridor is impinged upon or is bisected by industrial development, and is not apparently connected to any other corridor network or area in the region that is not leased to oil sands companies. Therefore it is not clear how river corridors would be effective mitigation measures to minimize impacts to wildlife movement and habitat loss. Further, the relative effectiveness of such constrained corridors has not been evaluated, despite claims by Shell and other development proponents in the region (see earlier reviews of SIRs and SIR responses). Shell, other development proponents, and regulators have no apparent short-term or long-term management goals or objectives and have not weighed the importance of regional and local development scenarios.

Shell claims that they will 'research' and 'monitor' the utility of the Muskeg River Corridor. It is disturbing to see that regulators have permitted this approach – allowing supposed mitigation measures to be 'researched' in situ. In addition, there is no specific contingency plan should the corridor fail to meet management goals and objectives (whatever they may be) other than 'adaptive management'.

Question/Recommendation: We recommend that the Mikisew Cree request either a meeting, written explanation, or both with respect to the utility of the proposed wildlife corridors locally (for the Shell JPME project) and regionally. How will the above issues of concern be addressed by Shell and AENV?

6) **Reference:** SIR # 45 *Was this assessment dependent on the assumption that pre-disturbance habitat capability can be fully reclaimed at closure.*

Comment: In the JPME Project application, Shell claimed that the environmental consequences of the Project on wildlife abundance is predicted to be negligible to low in the local study area (LSA).

AENV asked whether or not this assessment was dependent upon the assumption that pre-disturbance habitat capability can be fully reclaimed at closure, to provide evidence for this assumption, and to provide a list of assumptions made in drawing this conclusion. Rather than addressing pre-disturbance habitat capability, Shell discusses equivalent land capability in their answer. Given that reclamation is the primary mitigation measure for wildlife, it is not clear why Shell could not be transparent in the answer provided. It is disturbing to see that Shell validated their assessment approach through the use of linkage diagrams. Although linkage diagrams are a valid tool to be used in the EIA process, they are not the EIA process itself; Shell appears to justify their approach by pointing to invalid linkages in diagrams, not invalid linkages drawn from empirical data. Assumptions behind their conclusions surrounding impacts to wildlife abundance at the LSA scale are unsubstantiated.

Question/Request: Please demonstrate that Shell understands the important difference between the terms 'equivalent land capability' and 'pre-disturbance habitat capability'. The Mikisew Cree and/or AENV should request robust evidence for Shell's assumptions surrounding impacts to wildlife abundance at the LSA scale.

7) **Reference:** SIR # 46 *Shell states that there is no linkage between clearing and mortality for birds. Between which dates will Shell stop all clearing activity each year to increase the chance that this assertion remains true and valid?*

Comment: When asked about their claim that there is no linkage between clearing and mortality for birds, Shell does not provide any evidence or literature to substantiate their statement. The clearing of lands could result in bird mortality through increased access by predators and some species (e.g. owls) nest and raise young outside of the delineated time period of April 1 to August 30. Linkage diagrams are meant to be tools in the EIA process, not act as the assessment process itself.

In addition, Shell states that they are committed to conducting clearing outside of April 1-August 30, but if clearing should be done during this time period that pre-clearing nest surveys will be conducted.

Question: The restricted activity period mitigation may not minimize impacts to all wildlife species, how does that affect Shell's impact predictions? Based on previous projects, how often does the need to conduct clearing within the restricted activity period arise and how does this reflect on the effectiveness of this mitigation measure?

2.2.2 Vegetation & Reclamation

2.2.2.1 Comments Regarding Shell Responses to AENV SIRs

1) **Reference: SIR # 23a** "*Clarify what areas of the development area are expected to be suitable candidates for direct placement and what are the target ecosites phases for these areas?*"

Comment: In their response, Shell indicates that "*ecosite planning does not differentiate between directly placed soils and those coming from stockpiled areas, as care has been taken to minimize the time that reclamation salvage material are stockpiled. Reclamation soil layers will be constructed according to planned ecosite type, regardless of their origin in stockpile or direct placement....*"

When LFH material is direct-placed or placed within one year of salvage onto areas that are similar in moisture and nutrient regime, a significant number of plant species will emerge from the propagule bank within the LFH (MacKenzie 2006 and Mackenzie and Naeth 2007). Therefore, direct-placing salvaged material or placing it onto reclamation areas within one year of salvage is beneficial in terms of the diversity of species that may emerge from the seedbank. If permanent reclamation areas are not available until 2029, when areas are being salvaged from 2010 through 2019, then the benefit of minimizing the time that salvage material is stockpiled placed onto reclamation areas seems to be lost.

Shell indicates that one technique that "*has already been used*" is to farm LFH until final reclamation areas are available. However, they do not provide evidence of how successful the technique has been in final reclamation.

Questions: **How much of the development area will benefit from the direct placement or placement of salvaged mineral soils+LFH within one year of salvage? What evidence can Shell provide of the success of the technique of farming the LFH until permanent reclamation areas are available?**

2.3 Air Quality

2.3.1 Air Quality

No comments at this time.

2.4 Follow Up & Monitoring

Shell's responses to the round 2 SIRs did not provide any more substantive information on monitoring programs. The overarching approach to monitoring remains unchanged by Shell committing to develop further details during the approval stage. This is very discouraging given that Shell has been in operation for many years and has conducted monitoring programs for its current operations in the Oil Sands

region. It is discouraging because Shell does not seem to adopt any of the learning from these programs only assuring the reader that Shell is involved in conducting these programs and that, as a result, Shell will be well positioned to address the concerns raised to date. In the round 2 SIRs, Shell still does not appear to adopt any of the input provided by the Mikisew Cree on past monitoring reports. **Shell should explain why it is apparently not possible to use the concrete information and program structure already developed for the planning of a new project. Specifically to Mikisew Cree concerns, Shell should explain why it did not use information from its past monitoring programs and the input it received from the Mikisew Cree.**

Methodology for monitoring programs should now be clear and concrete, not conceptual. Questions that need to be tested can now be stated concretely, not conceptually. It is surprising to read about Shell's commitments to finalize monitoring programs for either air quality, ground water, or surface water quality with input from regulators and following specifications of approvals. Commitments to developing the details of monitoring programs appear to suggest that the Jackpine Mine is an entirely new project in an entirely new region where Shell still needs to find out what works and what does not. **Please explain why, in proposing monitoring programs, Shell does not appear to accept its own past experience in running monitoring programs in the lower Athabasca River region. In fact, please explain why Shell does not appear to use its own information from an earlier phase of the Jackpine Mine to develop concrete, not conceptual monitoring programs.**

We acknowledge that Shell occasionally refers to results from past monitoring. For example, Shell refers to the results of wildlife corridor monitoring in question, for example question 41b from AENV, in an attempt to demonstrate that wildlife still use areas in proximity of mine development. These are examples of where Shell tries to demonstrate that management actions can be adopted in response to monitoring results. In these examples, Shell appears to look back and use the learning from past programs to support its claims.

However, the use of results from past monitoring is not only sporadic, it is also extremely selective. For example, Shell does not mention anywhere the many exceedences that were recorded in the monitoring of water and air quality. **Please state what can be learned from the monitoring results that show higher than predicted emissions and effluents. Why are exceedences of guidelines stated in approval conditions not used to improve Shell's environmental performance?**

Furthermore, when referring to the wildlife corridor monitoring results, Shell neglects to mention that the same results also showed a significantly reduced use of corridors near the mine than in control corridors. Moreover, Shell neglects to mention that there is no reclaimed land anywhere in the Oil

Sands region where the re-establishment of wildlife habitat use and diversity has been demonstrated. The similarity of species diversity and composition has not been calculated anywhere to show where any given site might be along the trajectory to the re-establishment of pre-disturbance conditions. While we commend initiatives such as the wildlife corridor research and the research surrounding coarse woody debris effects on the distribution of small mammals, we note that results of such research must be interpreted in a comprehensive fashion, not in a selective one, as appears to be done by Shell. Goals and objectives for such research and monitoring must be stated concretely and results must be must be reported so as to show how and when the goals and objectives will be met. This is particularly urgent in light of the input provided by the Mikisew Cree. **Please provide goals and objectives for the re-establishment of traditional resource use. State concretely how the success of achieving the goals and objectives will be measured. Provide a concrete, not conceptual adaptive management plan to prepare for remedial actions that may be necessary if monitoring results show that the intended targets are not reached.**

In responses throughout, Shell commits to comply with regulatory requirements. There are several problems with this commitment:

1. As noted above, guidelines referred to in approvals are often exceeded without any consequences. In a recent workshop with Shell (January 2010), AENV defended the exceedences apparently as being sufficiently close to the guidelines, which, in the view of AENV, are not hard and fast thresholds that must not be exceeded. The problem with the interpretation of guidelines is that the Mikisew Cree are left wondering when AENV would deem an exceedance to be high enough to warrant an investigation of non-compliance.
2. Approval conditions are not prescriptive enough to oblige Shell to measure the success of re-establishing terrestrial ecosystem components and processes.
3. Approval conditions have not, in any fashion, compelled the proponents in the Oil Sands region in the past to re-establish traditional resource use and to measure the success of such re-establishment.

Moreover, in many questions (e.g. 18b (soil), 31a (fish), 35b (species at risk), 58b (groundwater)) Shell refers to various "*conceptual*" monitoring programs and commits to developing a response plan. The Mikisew Cree are well aware of the programs Shell conducted in the past. The Mikisew Cree are also well aware of the approval conditions handed down from AENV. None of these documents have ever satisfied the requirements, concerns, and issues submitted by the Mikisew Cree. Shell has been operating in the Oil Sands for at least ten years, and has decades of prior experience with the Oil Sands region through exploration, feasibility studies and assessments. It is time to be concrete about environmental planning. Rather than committing to complying with regulatory requirements and rather than committing to conceptual programs, **Shell should concretely discuss how it met requirements in the past, how its follow-up programs concretely address the concerns and**

issues of the Mikisew Cree, and how, concretely, follow-up programs need to be improved based on failures of past programs, to better address the concerns and issues of the Mikisew Cree.

3.0 Discussion Points for Follow Up Meetings

This section lists discussion points that may facilitate discussions, workshops, or action plans between the Mikisew Cree and Shell that may assist the Mikisew Cree in advancing towards their vision of resource use. Although the points below highlight the overarching issues, they do not replace comments and questions raised throughout the report and are not, necessarily, mutually exclusive. The Mikisew Cree may wish to engage the discipline experts retained by either party in a technical dialogue to discuss the specifics of the main body of the reviews above.

Hydrogeology:

1. Although the seepage rates from the McMurray Basal Aquifer to the Athabasca River may be negligible in comparison to Athabasca River flows, as claimed by Shell, the peak contaminant loadings to the river from JPME are unknown, as a result of the limitations of the Project solute transport modeling. As a result, it is not possible to conduct a cumulative effects assessment of groundwater contaminant loadings from all oil sands projects in the region, including the JPME facility, to the Athabasca River, which should be a basic requirement for a properly conducted EIA. Please discuss plans to determine the peak concentrations of all groundwater contaminant indicator parameters resulting from the Project at point of discharge to all major surface water drainages downgradient of the Project. Further, assuming this is done, what plans does Shell have to carry out a cumulative effects assessment of the Project in tandem with other oil sands projects in the region on regional water quality, including the Athabasca River?
2. Shell further notes that the ETDA will be composed predominantly of tailings sand, overlain by MFT, with estimated permeabilities of 2×10^{-6} m/s and 1×10^{-8} m/s, respectively. Shell states that they used a permeability of 1×10^{-8} m/s for the EDTA deposits in the seepage model, which they claim is conservative, leading to the estimation of higher seepage rates from the ETDA. Please explain how the use of the lower of the two estimated permeabilities for the ETDA tailings deposits is conservative, and how does this result in estimation of higher seepage rates from the ETDA facility?
3. When, and under what reporting format will Shell determine the timeline required for interception of all ETDA groundwater seepage? Further, what assurances can Shell provide, and what contingency plans are in place to ensure that a fully-effective ETDA seepage well interception system will be maintained during the very long post- closure period of the mine, during which releases of ETDA contaminant seepage will continue to occur, to the end point of such ETDA contaminant releases?

Hydrology

1. What are Shell's plans if research carried out at Syncrude's Base Mine Lake finds that EPLs do no function as planned.
2. Please state what the practical alternatives to pit lakes are that would result in not having to deal with pit lakes as part of the reclaimed landscape.
3. Are the elevated levels of TSS quoted in the response the result of project operations, or are they 100% natural causes? If the elevated levels of TSS are of 100% natural causes, why are polishing ponds required? With a pond residence time of "*about eight hours*", what percentage of TSS is removed before release into the receiving river?

Surface Water Quality

1. Research programs aimed at understanding the creation and functioning of end pit lakes must acknowledge the current uncertainties. There needs to be an understanding of how water quality and biological processes interact as predictions may be complicated by non-linear or mediated effects. Shell's commitment to being involved in research and development associated with pit lakes is positive, but other stakeholders must ensure that Shell (and all proponents) partake meaningfully and that progress is documented.
2. It may be an overstatement to characterize a 1-in-100 year event as 'unlikely' given the anticipated lifetime of the development; terms such as 'unlikely' are too often interpreted as 'will not happen'.

Wildlife

1. The Mikisew Cree should request to be kept informed of all NWPA applications as they apply to the JPME and PRM projects because of potential negative impacts to Aboriginal and Treaty Rights.
2. The Mikisew Cree should request that Shell, the ERCB and AENV develop contingency plans to EPLs or explain the next steps if the efficacy of EPLs cannot be demonstrated by 2018, as required. An extension of the 2018 deadline and associated research should not be considered an option.
3. How have additional oil sands developments (leases) been considered in the discussions surrounding local habitat carrying capacity for wildlife? What is the 'carrying capacity' in proximate habitats for moose and other KIRs that Shell is referring to, and how were these estimates measured? What are the specific management goals, plans and objectives for local and regional wildlife populations? The Mikisew Cree should request a meeting with AENV and

Shell to discuss how the issues surrounding wildlife and carrying capacity of local and regional habitat types will be resolved.

4. The Mikisew Cree should request that (i) AENV explain and provide information surrounding the claim of higher than average bird mortalities during the first 2 years of oil sands (tailings ponds) start-up and (ii) Shell provide statistics and temporal scenarios for tailings pond-related avian mortality for all Shell and Albian Sands oil sand projects.
5. We recommend that the Mikisew Cree request either a meeting, written explanation, or both with respect to the utility of the proposed wildlife corridors locally (for the Shell JPME project) and regionally. How will the issues of concern (see wildlife comment #5 under comments regarding AENV SIRs) be addressed by Shell and AENV?
6. Please demonstrate that Shell understands the important difference between the terms 'equivalent land capability' and 'pre-disturbance habitat capability'. The Mikisew Cree and/or AENV should request robust evidence for Shell's assumptions surrounding impacts to wildlife abundance at the LSA scale.

Vegetation & Reclamation

1. How much of the development area will benefit from the direct placement or placement of salvaged mineral soils+LFH within one year of salvage? What evidence can Shell provide of the success of the technique of farming the LFH until permanent reclamation areas are available?

Follow up & Monitoring

1. Shell should explain why it is apparently not possible to use the concrete information and program structure already developed for the planning of a new project. Specifically to Mikisew Cree concerns, Shell should explain why it did not use information from its past monitoring programs and the input it received from the Mikisew Cree.
2. Please explain why, in proposing monitoring programs, Shell does not appear to accept its own past experience in running monitoring programs in the lower Athabasca River region; in fact, why Shell does not appear to use its own information from an earlier phase of the Jackpine Mine to develop concrete, not conceptual monitoring programs.
3. Please state what can be learned from the monitoring results that show higher than predicted emissions and effluents. Why are exceedences of guidelines stated in approval conditions not used to improve Shell's environmental performance?
4. Please provide goals and objectives for the re-establishment of traditional resource use. State concretely how the success of achieving the goals and objectives will be measured. Provide a concrete, not conceptual adaptive management plan to prepare for remedial actions that may be necessary if monitoring results show that the intended targets are not reached.

5. Shell should concretely discuss how it met requirements in the past, how its follow-up programs concretely address the concerns and issues of the Mikisew Cree, and how, concretely, follow-up programs need to be improved based on failures of past programs, to better address the concerns and issues of the Mikisew Cree.

4.0 Literature Cited

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