Review of Shell's Supplemental Information Round 2 for the Pierre River Mine Project to AENV and ERCB

Prepared for

Mikisew Cree First Nation GIR

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Prepared by

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Executive Summary

The Mikisew Cree First Nation IRC (Mikisew Cree) has requested that Management and Solutions in Environmental Science (MSES) review Shell's Supplemental Information Round 2 (SIR) documents for the Pierre River Mine Project (PRM). The SIRs include responses to Alberta Environment (AENV) and the Energy Resources Conservation Board (ERCB) information requests. The SIR does not contain any answers requests 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 IRC 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 supplemental information provided by Shell or points that require further clarification. Associated rationale and additional potential issues of concern are presented in the body of this report.

- Shell has yet to respond to Mikisew Cree comments and concerns presented in a technical review of the Environmental Impact Assessment (EIA) submitted in July 2009.
- There appears to be a number of weaknesses particularly in the assessment of cumulative effects on surface water quality (Hydrogeology).
- Groundwater quality monitoring is proposed to be done semi-annually to annually, but with this monitoring timeline there is concern that a significant amount of External Tailings Disposal Area (ETDA)-sourced contamination could migrate beyond the interception well network before the subsequent round of groundwater quality monitoring occurs (Hydrogeology).
- Groundwater solute transport modeling of the ETDA-sourced contaminant seepage was not carried out over a sufficient time scale to determine peak concentrations. We recommend that the long term contaminant loadings be quantified and assessed in terms of cumulative impacts from all oil sands projects operating and planned within the Athabasca basin over the next 100 years and beyond (Hydrogeology).
- Shell acknowledges that other oil sands facilities have experienced ETDA-sourced contaminant releases to the environment, after also apparently having applied best environmental management practices for ETDA seepage interception, but it is not clear whether Shell's seepage interception system design is an improvement from these systems that have failed (Hydrogeology).

- Use of hydrological modelling approach for calculating actual evapotranspiration is contradictory to accepted hydrological science. Clarification is needed on hydrological approach and results (Hydrology).
- No *site-specific adaptive management strategies*" are provided if the wetland monitoring results indicate that the groundwater drawdown has significant and negative effects on wetlands (Hydrology).
- Monitoring of adjacent wetlands, and, in fact, of any ecological constituent was not used to inform the assessment and management of impacts of the Pierre River Mine (Hydrology).
- Shell re-iterates their confidence that end pit lakes will function as planned but there is no indication that progress is being made that provides evidence that supports this claim (Water Quality).
- The SIR asks about Shell's planned response if groundwater contamination is found beyond the interception wells in the Athabasca River (*i.e.*, surface water is affected) but the response does not address detection of contamination in surface waters (Water Quality).
- It is not apparent whether Shell considered the width of the effective wildlife corridor relative to sensory disturbance from adjacent oil sands developments. Shell does not provide any substantive rationale for predicting that effective corridor width will not be affected by the project (Wildlife).
- When asked to provide the criteria that they used to determine whether an environmental or social consequence rating was 'acceptable' or 'unacceptable', Shell did not provide any information but rather posed that they would *"provide evidence regarding the acceptability of environmental impacts"* (supposedly at a later date). As such, they have not answered the question (Wildlife).
- Shell has no contingency plan should their proposed large-scale reclamation efforts fail, and there are no targets associated with wildlife species recolonization of disturbed land or specific habitat requirements of wildlife (Wildlife).
- A lack of commitment to setting objective targets and measuring success in the re-establishment of pre-disturbance vegetation communities is still evident in Shell's responses (Vegetation & Reclamation).
- Shell has not studied the areas associated with diversion channels C6 and C11. If these areas will be directly affected by the Project, it is important that the resources being affected are well understood prior to development. For vegetation, this means that we need to know how much of the area is within different ecosite phases and wetland types and how much of each vegetation community will be directly affected (Vegetation & Reclamation).
- It is acknowledged by Shell that there may be exceedances of the Alberta Ambient Air Quality Objectives (AAAQO) for benzene in areas where the Mikisew Cree pursue traditional activities (Air Quality).

- We recommend that the Mikisew Cree request Shell provide a commitment to improving energy efficiency. It was pointed out that the use of asphaltene increases CO_2 emissions which cannot be considered as continuous improvement (Air Quality).
- Shell will not commit to purchasing of Tier 4 compliant equipment which may help reduce mine fleet emissions unless the products are made available in both the US and Canada (Air Quality).
- Shell does not use information from its past monitoring programs or input they have received from the Mikisew Cree in designing concrete follow up and monitoring programs for the PRM project (Follow Up & Monitoring).
- Shell does not discuss how they have improved their environmental performance considering that results from other Shell projects have shown exceedences of water and air quality parameters (Follow Up & Monitoring).

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1.0 Introduction

The Mikisew Cree First Nation IRC (Mikisew Cree) has requested that Management and Solutions in Environmental Science (MSES) review Shell's Supplemental Information Round 2 (SIR) documents for the Pierre River Mine Project (PRM). The SIRs include responses to Alberta Environment (AENV) and the Energy Resources Conservation Board (ERCB) information requests. The SIR does not contain any answers requests 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 IRC 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

The Pierre River Mine will be located on the west side of the Athabasca River approximately 100 km north of Fort McMurray and 500 km northeast of Edmonton. Access to the new mining area will be via a new road to be constructed north from the existing Fort Chipewyan winter access road. In addition, a new bridge will be constructed over the Athabasca River to allow for movement of goods and services from the Albian Aerodrome at the Jackpine Mine. The estimated production of oil from this project is 200,000 bbl/cd.

1.2 Review Approach

Given the Treaty rights of the FNs in Northern Alberta, the questions posed to environmental mangers and policy makers are unequivocal: **how much will the deprivation of Treaty rights grow in the future and how and when will this deprivation be mitigated?** The questions seem simple, but the devil lies in the detail. In order to fully answer this question, measurements are needed to provide

quantifiable information on how much of the original traditional resource is available to date, and how much will be left once planned developments go ahead from construction to operation and decommissioning. These measurements must be the foundation of testable questions, much like in the process of environmental monitoring described by Burns and Wiersma (2004). In that process, testable questions are developed, seeking measurable parameters that are subjected to rigorous statistical analyses.

2.0 General Observations

This section highlights some overarching issues or concerns noted during the review of the SIRS:

- There are a number of weaknesses particularly in the assessment of cumulative effects on surface water quality.
- There is concern that Shell, along with other oil sand companies, rely on unproven technologies to substantiate their claims of negligible to low impacts on the environment. Reviewers of water related disciplines (hydrogeology, hydrology and water quality) noted that uncertainty still surrounds biodegradation, end pit lakes (EPL) and external tailings disposal areas (ETDA) seepage interception. We recommend that the Mikisew Cree request Shell provide some evidence that these technologies are meeting the predictions outlined in the EIA application and SIRs rather than just assuming that they will.
- Shell acknowledges that other oil sands facilities have experienced ETDA-sourced contaminant releases to the environment, after also apparently having applied best environmental management practices for ETDA seepage interception, but it is not clear whether Shell's seepage interception system design is an improvement from these systems that have failed. It appears that ETDA seepage is still a major and unresolved problem.
- There is concern with the accuracy of the assessment of project impacts on surface water. Watershed water balance calculations are inconsistent because evapotranspiration is not taken into account adequately. It is also not clear how the removal of nearly 50% of wetlands in the study area could be considered insignificant (see hydrology and wildlife comments).
- Monitoring of adjacent wetlands, and, in fact, of any ecological constituent was not used to inform the assessment and management of impacts of the Pierre River Mine.
- A lack of commitment to setting objective targets and measuring success in the re-establishment of pre-disturbance vegetation communities are still evident in Shell's responses.
- Shell's reclamation approach is still using undefined terms such as "*self-sustaining ecosystem*" and "*equivalent land capability*" which do not have anything to do with creating the naturally occurring species rich ecosites and wetlands found in the boreal forest.

- The potential for off lease adverse impacts from air emissions on Mikisew Cree members still exists, even after Shell's relatively thorough responses to the SIRS. The potential for exceedences of guidelines are acknowledged and have been measured in existing Shell operations. Therefore, it appears that the project is designed with the assumption that exceedences are acceptable.
- Shell continues to disregard the information that would be available from its past monitoring programs. It is not clear why Shell does not present this information because it is critical for the improvement of future environmental management decision.

3.0 Technical Review of the SIRs

3.1 Aquatic Resources

3.1.1 Hydrogeology

3.1.1.1 Comments Regarding ERCB SIRS

1) **Reference:** Response to SIR # 55: Provide the groundwater quality discharge criteria that Shell will use to assess acceptability of released groundwater.

Concern: Shell responds that the actual percentage of ETDA-sourced seepage captured by the proposed groundwater interception wells will depend on the results of the groundwater monitoring program implemented, with the water quality results compared to pre-mining (background) water quality values, and against acceptable water quality criteria set out in applicable regulatory guidelines. However, Shell does not specify which water quality guidelines will apply, mentioning each of Canadian Drinking Water Quality Guidelines (CDWQG), Canadian Council of Ministers of Environment (CCME) guidelines or ecological risk assessment guidelines as possible criteria to trigger interception of ETDA-sourced groundwater seepage.

In addition, groundwater quality monitoring is proposed to be done semi-annually to annually, and thus a significant amount of ETDA-sourced contamination could migrate beyond the interception well network before the subsequent round of groundwater quality monitoring occurs.

Question: How can Shell have any confidence of intercepting effectively 100% of the ETDA-sourced contaminant releases in groundwater, given the significant time spans between groundwater quality monitoring events, and given that ETDA seepage interception is only triggered on the basis of the groundwater quality sampling results?

2) **Reference:** Response to SIR # 57C: Shell assumes there is a downward hydraulic gradient beneath the local study area (LSA) towards the McMurray basal aquifer. What is the fate of groundwater seepage from the Project Area migrating to the basal aquifer?

Concern: Shell states that the Athabasca River is the point of regional groundwater discharge for the McMurray basal aquifer, and that the results of the assessment done on impacts of groundwater seepage from the Project Area on the Athabasca River were negligible with regard to effects on aquatic, human and wildlife health. However, a review of the Shell EIA for the Project indicates that peak concentrations of several Project contaminant indicator parameters were not determined at several solute transport model nodes representing points of groundwater discharge to surface water in the Project Area, as they occurred beyond the temporal model boundary of 100 years beyond Project closure (Far Future Case) used by Shell. In addition, no regional solute transport modeling was carried out. As a result, the basis for Shell's assessment of negligible effects of Project-based groundwater seepage on the Athabasca River with respect to human and ecological health is unclear.

During a previous workshop in Calgary with Shell and their consultants regarding the Jackpine Mine Expansion Project, the question was asked why solute transport modeling was not carried out over a sufficient time span to identify peak concentrations and peak groundwater mass loadings to the Athabasca River and other surface water systems. The response was that contaminant loadings from surface runoff due to mine activities over the operating life of the mine were far greater than loadings from groundwater and, therefore, it was unnecessary to determine groundwater peak loadings that would occur after mine closure.

Irrespective of the above, it is our opinion that groundwater solute transport modeling of the ETDA-sourced contaminant seepage should be carried out over a sufficient time scale to determine peak concentrations, and that the long term contaminant loadings be quantified and assessed in terms of cumulative impacts from all oil sands projects operating and planned within the Athabasca basin over the next 100 years and beyond. Without such information, it is not possible to accurately determine the long term cumulative impacts of groundwater contaminant loadings to the Athabasca basin. It is also considered not good scientific practice to leave peak groundwater concentrations of Project contaminants undetermined.

Questions: Why were the peak concentrations of degraded groundwater quality not determined by Shell in the solute transport modeling carried out at a number of points of discharge to surface water? What are the estimated peak concentrations of all contaminant indicator parameters for the Project at these points of discharge to surface water, and based on the above, what are the expected impacts from these contaminant peak concentrations on the water quality of local tributaries such as Big

Creek, as well as for the Athabasca River, with respect to human and ecological health?

3) **Reference:** Response to SIR # 79: Discuss the chemical behaviour pattern for non-conservative constituents (naphthenic acids and PAHs) in groundwater with respect to adsorption, fractionation, organic carbon partitioning and redox processes.

Concern: Shell indicates that anaerobic decay rates were applied to each PAH group as well as naphthenic acids. The decay rates applied, however, are very likely based on laboratory-derived decay (biodegradation) values, as opposed to site-specific field-based values. Lab-based values can be unreliable predictors of PAH degradation rates in the field (King et al, 1999). Due to the complex nature of the PAH plumes, the extent of natural attenuation cannot be easily predicted. The study found that naphthalene in particular underwent only marginal rates of biodegradation during the multi-year field study (King et al, 1999). As a result, in order to use natural biodegradation as a remedial strategy, field biodegradation must be first proven, then quantified.

Questions: Given that the PAH biodegradation source data used in the solute transport modeling for the Project is likely laboratory-derived, what plans, if any, has the proponent to conduct field-based studies of natural biodegradation rates for PAH compounds? If no field-based PAH biodegradation rates are to be determined for the Project, what is the basis for Shell's confidence in the modeled PAH contaminant solute transport results?

3.1.1.2 Comments Regarding AENV SIRS:

1) **Reference:** Response to SIR # 17C: Shell indicates they are aware of publicly-reported information on contaminant seepage from ETDA facilities at other oil sands projects in the area, but are unable to provide details of suspected causes of contaminant exceedance events. Describe known causes of seepage that are being considered for design and construction of the seepage interception system, and contingency plans in the event of ETDA-sourced contaminant exceedances.

Concern: Shell indicates that the seepage of concern from the ETDA facility is that which will occur through the base of the ETDA into the underlying aquifer, and that potential contingency measures to be implemented in the case of contaminant exceedances include increasing the pumping rates from various groundwater interception wells and /or the installation of new ETDA seepage interception wells.

However, given that other oil sands facilities still experienced ETDA-sourced contaminant releases to the environment, after also apparently having applied best environmental management practices

for ETDA seepage interception, the potential for contaminant releases from the Project ETDA facility appears significant, or even probable.

Questions: What assurances can Shell provide that no contaminant releases will occur from the ETDA facility, and what is the basis for those assurances? Further, given the experience of other oil sands facilities with respect to EDTA-sourced contaminant releases to groundwater, in what way, if any, is the proposed Project ETDA seepage interception system superior to the above-noted ETDA interception systems which have not operated as intended and have resulted in ETDA-sourced contaminant releases to the environment? Finally, if the proposed Project seepage interception measures are essentially equivalent to the seepage interception systems used at other ETDA sites that have experienced contaminant releases, why is Shell not proposing a more environmentally-rigorous seepage containment system, such as a double-liner and leachate collection system, to ensure effectively 100% ETDA seepage containment?

3.1.2 Hydrology

3.1.2.1 Comments Regarding ERCB SIRS

1) **Reference:** Response to SIR # 46

Concern: 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: As reviewers of CEMA's End Pit Lake Technical Guidance Document "*expressed opinions that oil sands pit lakes would require some level of active treatment*", what is the scientific basis of Shell's statement that "*Shell is confident that pit lakes will function as planned*", which means only passive treatment.

2) **Reference:** Response to SIR #46b

Concern: The response to SIR 312b in the May 2009 Pierre River Mine, Supplemental Information, Volume 1, Section 13, states "*Pit lakes are inevitable because voids (pits) are left at the end of mining that will fill with water.*" Although Shell states that "*alternative options to pit lakes are being currently examined*", these alternatives, even if one is actually implemented as a true alternative, do not

resolve the problem of the pits becoming pit lakes, which will "*contain diminishing levels of reclamation waters for several decades*".

Question: Is it true that there are currently no practical alternatives to pit lakes that would result in not having to deal with pit lakes as part of the reclaimed landscape?

3) **Reference:** Response to SIR # 50b

Question: As all ETDAs are known to leak, can slurry walls or grouting to provide a barrier of ETDA seepage water to groundwater flow be installed retroactively?
Should these not be installed during the construction of ETDA in a pro-active manner?

3.1.2.2 Comments Regarding AENV SIRS

1) **Reference:** Response to SIR # 15a-1

Concern: Shell states that "*polishing ponds are primarily required for mitigating elevated levels of total suspended solids (TSS) in runoff during high flow events*." Shell further states that during events of uncontrolled spillage of polishing ponds during a (very likely) flow event exceeding the 100-year flood that "*levels of TSS discharging from the pond would be high, but would be similar to those in receiving streams*".

Question: Are the "*elevated levels of TSS*" quoted above 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?

2) **Reference:** Response to SIR #15a-2

Comment: 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*".

3) **Reference:** Response to SIR # 15b

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

4) **Reference:** Response to SIR #15e

Concern: In light of the oil catastrophe currently occurring in the Gulf of Mexico, everyone is reminded of the importance to being prudent and of being well prepared for unexpected events. As oil spills occur regularly in Alberta's oil sands industry, events "*that hydrocarbon-containing waters are accidentally released to the environment*" are not, as stated by Shell, unlikely, but rather inevitable.

Recommendation: The Mikisew Cree should request that "*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.

5) **Reference:** Response to SIR # 17c-1
Question: What is the confidence interval for the ETDA seepage rate of 240 L/s, as the vertical hydraulic conductivity of the ETDA deposits could be much larger than the 1 x 10^{-8} m/s reported?

6) **Reference:** Response to SIR #17c-2
Question: With regard to estimating the ETDA seepage rate, were the formation of cracks and preferential pathways considered?

7) **Reference:** Response to SIR # 20a
Question: Based on the statement "*The change in flows in the Athabasca River due to closed-circuit operations and reclaimed areas resulting from the Pierre River Mine is considered negligible* (EIA, Volume 4, Section 6.4.7.3)", are the cumulative effects of the oil sands operations on streamflow, particularly low flow conditions, in the Athabasca River also negligible?

8) **Reference:** Response to SIR # 22c-1
Question: Please explain how the Hydrologic Simulation Program Fortran (HSPF) can determine actual evapotranspiration (AET) based on the variables of interception, upper zone, lower zone, baseflow, and groundwater, when none of these variables, other than interception, is a plant specific variable.

9) **Reference:** Response to SIR # 22c-2
Question: Applying HSPF, do different plant communities result in different AET values, and how does HSPF accomplish this?

10) **Reference:** Response to SIR # 22c-3
Concern: Actual evapotranspiration is a very important hydrological variable, which determines how much water is left in the watershed for streamflow. Shell uses the areal actual evapotranspiration estimations using the Morton equation, which results in an average, regional estimate. Rather, Shell should estimate actual evapotranspiration occurring within a specific watershed and for each land segment. However, actual evapotranspiration is not estimated based on climate, soil conditions, and land cover, but calculated as the difference between precipitation and streamflow. In hydrological modelling, it should be the other way around, where streamflow for

altered watershed conditions, be it a change in climate, terrain, or land cover, is calculated as the difference between precipitation and actual evapotranspiration.

Question: Why does Shell follow an approach in hydrological modelling that is contradictory to accepted hydrological science?

11) **Reference:** Response to SIR # 22c-4

Concern: If the watershed hydrology is based on estimates of average, regional actual evapotranspiration, the consequence is that every mm of precipitation falling in the Pierre River Mine area more than falling on the Jackpine Mine Expansion area must run off, producing streamflow. This is not following the principles of physical hydrology.

Request: Please explain this controversy.

12) **Reference:** Table AENV 23-1

Request: Please explain the difference between potential and actual lake evaporation.

13) **Reference:** Response to SIR # 25b-1

Concern: Shell states: "*Hydrologic characteristics of wetlands … include considerable storage of precipitation runoff, considerable evapotranspiration and low runoff yield. In addition, these features attenuate large floods that extend to the flood plains*." Shell further states: " *...the removal of wetland features … will result in reduced flows (i.e. water yield), including flood flows…*". The conclusion stated in the second quotation does not follow the logic of the first statement. If there is less storage of precipitation runoff and less evapotranspiration when wetlands are removed, a higher water yield is the consequence, particularly during floods, as the attenuation capacity of the landscape is reduced.

Request: Please clarify.

14) **Reference:** Response to SIR # 25b-2

Question: Would one not expect higher floods, and a generally higher water yield, to be the consequence of removed wetlands, with subsequent effects on erosion and sediment yield?

15) **Reference:** Response to SIR # 25c

Question: What are potential "*site-specific adaptive management strategies*" if the wetland monitoring results indicate that the groundwater drawdown has significant and negative effects on wetlands?

16) **Reference:** Response to SIR # 25d-1

Question: Why is it not possible to find both affected and adjacent undisturbed wetlands with similar hydrodynamic character, similar topography and hydrogeology?

17) **Reference:** Response to SIR # 25d-2
Question: Why were adjacent undisturbed wetlands not yet monitored, when the importance of baseline data for the assessment of mine impacts are clearly understood by Shell?

18) **Reference:** Response to SIR # 25d
Comment: The argument is made that there are diverse site specific characteristics that prohibit the comparison of affected and adjacent undisturbed wetlands. Yet, instead of using site specific actual evapotranspiration values, an average regional value is used. There appears to be two different levels of spatial resolution used in the analyses of hydrological effects of the Pierre River Mine.

19) **Reference:** Response to SIR # 39-a
Concern: Shell states that "*pit lakes are a necessary closure feature recognized by regulators and designed to perform water quality remediation functions*." The concept of end pit lakes (EPLs) is currently unproven, where the migration of toxins into the water and the eventual water quality of the EPLs remain unknown.
Request: With respect to the major uncertainties of the EPL's performance regarding the migration of toxins into the water, please clarify how EPSs can have water quality remediation functions.

20) **Reference:** Response to SIR # 40-a
Concern: Shell states that before reclamation, existing, currently-approved and disclosed mines will affect 48% of wetlands in the Muskeg River watershed. Yet, this impact is declared to be negligible on a regional basis. As long as one makes the impacted area (RSA) large enough, the percent impact can always be declared negligible.
Question: Why does Shell not admit that there will be major local environmental affects, and significant watershed impacts, based on the removal of 209 km^2 of wetlands? Please provide rationale and scientific literature to justify your claim.

3.1.3 Surface Water Quality

3.1.3.1 Comments Regarding ERCB SIRS

1) **Reference:** Response to SIR # 46
Concern: The response re-iterates Shell's confidence that end pit lakes will function as planned, that is, 'they will progress into biologically productive systems' (from the original EIA). The SIR is in

line with review comments provided in earlier technical reviews of the EIA, and the response provided here does nothing to indicate that progress is being made. Rather, appeal is made to ongoing research; the confidence is currently unfounded.

2) **Reference:** Response to SIR # 47
Concern: Shell recognizes its requirement to have a physical test pit lake running by 2018. They must be held to this, and interim results must be presented and interpreted regularly so as to document progress.
Question: Will Shell commit to allowing the Mikisew Cree review this information once it is available?

3) **Reference:** Response to SIR # 50
Concern: This deals specifically with capturing seepage from the external tailings disposal area (EDTA) through surficial deposits so that it does not reach the Athabasca River valley. Whereas this deals proximally with hydrogeology and groundwater quality, if the confidence expressed is unfounded, then surface water quality might come to be affected depending on the extent of interaction between ground and surface waters. Note that this interaction may be relevant to consideration of groundwater quality in SIR number 55, as well. SIR number 17 later discusses seepage management plans confidently and characterizes estimated seepage rates as being of 'moderate' confidence because of conservative assumptions used.

4) **Reference:** Response to SIR # 56
Concern: The SIR asks about Shell's planned response if groundwater contamination is found beyond the interception wells in the Athabasca River (*i.e.*, surface water is affected). The response provides detail with respect to groundwater, but does not acknowledge the question's preamble which is framed with regard to detection in surface waters.
Request: Please provide a response regarding detection of contamination in surface waters.

5) **Reference:** Response to SIR # 63b
Comment: Shell re-iterates that any overburden discharge will be directed to sedimentation (polishing) ponds before release to receiving waters. They must be held to this through licensing and regular reporting.

6) **Reference:** Response to SIRs # 72 and 73
Concern: Shell directs the questioner (SIR 72) to several sources (*e.g.*, RAMP, Alberta Environment, environmental setting report, other applications in area) in response to the request for citations regarding natural concentrations of various metals being relatively high. This does

answer the question, but perhaps Shell should take such SIRs and use the opportunity to expand on the ecology and physical/chemical processes in the area. Similarly, the response to SIR 73 regarding particular concentrations in sediments simply refers to earlier EIA components. The minimalist approach to responses may be adequate and not worth commenting on, but if the goal of all involved is to understand fully the potential implications of the project, then it seems that any question should be taken as an opportunity to educate the reader. The same issue arises in the response to SIR 29 where simple reference is provided to the section of the EIA where pit lake performance in degrading concentration of organic constituents is discussed. Given that pit lakes present appreciable challenges and uncertainty, the opportunity should be taken to expound rather than simply citing 'chapter and verse' of the EIA in the briefest fashion possible.

3.1.3.2 Comments Regarding AENV SIRS

1) **Reference:** Response to SIR # 15

Concern: This SIR asks about potential spillage from polishing ponds during 1-in-100 year events and what emergency response plans would be. The response (15a in particular) proceeds to discuss the main function of polishing ponds being to reduce concentration of total suspended solids and that in the event of flooding what was released from ponds would likely be similar of similar concentration to receiving waters also affected by high precipitation. This response sidesteps the issue of what other substances may be present in water held in polishing ponds at the potential effects of its release.

Request: Please discuss what other substances may be present in water held in polishing ponds at the potential effects of its release.

2) **Reference:** Response to SIR # 19

Comment: The SIR regarding estimated decay rates for various compounds that may be present in water in pit lakes is in line with review comments we have provided in the technical review of the EIA. The response includes details requested about sources of decay rates, but the confidence expressed is again based on use of conservative assumptions.

3) **Reference:** Response to SIRs # 30 and 31

Comment: The responses here regarding temperature and dissolved oxygen concentration differences (SIRs 30 and 31, respectively) in polishing ponds and receiving waters were more forthcoming and helpful.

4) **Reference:** Response to SIR # 41

Comment: This SIR questions why certain aquatic organisms such as algae and plants are not considered among the key indicator resources while others such as fish and benthos are. Some justification was provided, but it is not apparent that Shell is committed to understanding better the ecology of the oil sands region. Some investment in basic science and data collection would be worthwhile to advance the ability to assess potential effects.

3.2 Terrestrial Resources

3.2.1 Wildlife

The 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 and our previous review of the Pierre River Mine EIA. The SIR review was completed to determine if any of the SIRs, and corresponding supplemental information supplied by Shell, would be of interest to the Mikisew Cree. Although every effort was made to review the SIRs related to wildlife, we have not commented on every SIR, but rather focused on those that are likely to be of the greatest interest to the Mikisew Cree. In addition, it was noted during the review that many of the SIRs were follow-up questions and comments to earlier SIRs; we have only commented on some of these so as to not reiterate the entire review of the PRM project SIRs. Questions and commentaries are posed to either Shell or Government of Alberta representatives (i.e., ERCB, AENV, Alberta Sustainable Resource Development (ASRD)) for clarification of potential issues of concern with SIRs or SIR responses.

3.2.1.1 Comments Regarding Errata

In the PRM project Supplemental Information Round 2, Shell provided a written and tabular compilation of errata from the EIA, environmental setting reports, the 2008 EIA update and Supplemental Information provided (Sections 2.2 and 2.3, Table 2-1). We examined the information provided to determine if any of the errata involved information pertaining to wildlife.

1) **Reference:** PRM EIA Update, Supplemental Information, Volume 2 page 21-46 and Table 2-1, PRM SIRs Round 2

Concern: PRM SIR 294a was incorrect, in part, because of an error in estimating the potential impacts to wetlands as a result of a 0.1m surface water drawdown – instead of the initial estimate of potentially impacting 9% or 1,099 ha of wetlands within the "watershed areas" the estimate has been revised to 37% or 7,153 ha of wetlands within the LSA. No reason for this error has been provided.

Request: Please explain how this error occurred and how an almost 7-fold increase in negative impacts to wetlands will impact wildlife as assessed in the original EIA.

2) **Reference:** Section 13.1, page 13-5, SIR 49a and Table 2-1, PRM SIRs Round 2

Concern: AENV noted that Shell has provided no evidence that the use of proposed wildlife corridors to maintain genetic connectivity between wildlife populations will work in the Alberta Oil Sands Region. As such, the utility of proposed wildlife corridors along rivers and sandwiched between development projects such as the Jackpine Mine Expansion and PRM is questionable, at best. There is no proposed monitoring program to evaluate the apparent claims made by Shell associated with genetic connectivity and proposed corridors. Shell claims that they only intended to highlight observations from other studies suggesting the possibility for maintenance of genetic connectivity as opposed to asserting that genetic connectivity will be maintained. Shell has not considered specific species to determine maintenance of genetic connectivity. As such, Shell had to revise their responses to several earlier SIRs by AENV (See also 3.2.1.3 below).

Question: How confident is Shell that genetic connectivity, distribution, abundance and ultimately population viability will be maintained via the proposed corridors? Please elaborate and explain, with respect to what, exactly, any proposed corridors will be connecting and which wildlife species will benefit with respect to maintaining genetic connectivity, distribution, abundance and population viability.

3.2.1.2 Comments Regarding ERCB SIRS

The ERCB SIRs contained few to no requests for information surrounding wildlife. There are no reviewer comments or questions at this time.

3.2.1.3 Comments Regarding AENV SIRS

The following comments and questions were generated by reviewing the SIRS touching on wildlife-related issues under other discipline headings (i.e., Waste Management, Biodiversity and Fragmentation SIRs and AENV Wildlife SIRs 48-59.

1) **Reference:** Response to SIR # 4a, page 10-4

Concern: When Shell was asked to explain the design features and mitigation measures associated with the proposed Class II landfill, domestic garbage, and attracting wildlife, Shell stated that they will have a portion of the landfill designated for domestic waste that will be fenced.

Question: What is Shell's history with respect to the relative success of fencing landfills and minimizing or eliminating the attraction of wildlife? How will the success of the mitigation measure (fencing) be measured? How will fencing keep out avifauna? Please elaborate and explain.

2) **Reference:** Response to SIR # 49a, 49b and 49c, page 13-7 to 13-12; SIR 69a, page 13-58; SIR 70a, page 13-61

Concern: When asked to provide evidence surrounding their numerous claims that riparian corridors will act to maintain genetic connectivity for certain wildlife species, Shell does concede that they have no proof that this is the case in the Alberta Oil Sands Region. Given the current setting of numerous development scenarios and an apparent lack of understanding of what, exactly, riparian corridors will end up connecting, this is not surprising.

Recommendation: Until proof that specific goals and objectives are determined, we recommend that such claims surrounding the maintenance of genetic connectivity be removed from any further application materials related to the proposed projects.

Shell also purports that monitoring along the Muskeg River has demonstrated that many species use the riparian areas and upland areas adjacent to the various rivers in the region. Although it is not surprising that Shell has observed species in riparian areas, it is not clear what the objectives of the various monitoring programs were. Based upon past reviews of monitoring programs, we reiterate our observations:

The Mikisew Cree attended a meeting on 19 February 2010 where the following presentations were made:

1. History and Overview of the Wildlife Habitat Effectiveness and Connectivity Research (WHEC) Program – by Corey De La Mare, with Golder Associates and the CONRAD Environmental Reclamation Research Group (ERRG).

2. Wildlife Habitat Effectiveness and Connectivity Project – a look at equipment and moose capture techniques – by Holger Spaedtke, with the University of Alberta.

On several occasions, when questioned, the presenters deferred to AENV and ASRD for direction. Unfortunately, AENV and ASRD were absent and, as a consequence, they could not be questioned or provide the required direction.

As such, the following was highlighted for the Mikisew Cree's consideration:

1. Although the Regional Wildlife Monitoring Program is looking at aspects of habitat effectiveness and connectivity, it only involves large terrestrial mammals such as moose. Other important traditional wildlife resources such as birds, fish and small mammals are not part of the Regional Wildlife Monitoring Program.

2. There were not enough details presented in either the summary document or the respective presentations to gain a clear understanding of the methods and rationale behind most aspects of the Regional Wildlife Monitoring Program. Objectives, goals and underlying assumptions need to be made clear.

3. Although the use of remote cameras is highly touted when attempting to measure habitat effectiveness and connectivity for wildlife, it is not apparent how this will actually be done and for what species. Without establishing a proper sampling regime, the information gathered will be of no use in measuring habitat effectiveness or connectivity. Pictures of wildlife are not, necessarily, an index of wildlife abundance. The limitations of the data to be collected do not appear to be even acknowledged.

4. In some instances, different methods to measure wildlife distribution and abundance, resulting in different trends in wildlife populations. For example, the results of aerial survey for moose showed no difference at the local vs. regional scales, whereas winter tracking survey results did show a difference between local and regional scales.

5. The value in maintaining regional "corridors" in the Athabasca River Valley is not clear in the Regional Wildlife Monitoring Program. Corridors are usually seen as habitat for movement, connecting core patches of habitat. Corridors are not substitutes for habitat lost because of oil sands exploitation. It is currently not clear from the Regional Wildlife Monitoring Program what patches of habitat are being connected by the proposed corridors.

6. Moose capture and radio-collaring is likely already underway in the Alberta Oil Sands region without any apparent meaningful consultation with the Mikisew Cree.

7. The Mikisew Cree should request that ASRD and AENV explain the rationale behind the Regional Wildlife Monitoring Program:

    a. Is it research or is it compliance monitoring?
    b. Are there targets of population size in the region?
    c. Are there spatial objectives for the design of a corridor network in the region?
    d. Are there patches of core habitat envisioned that need to be or remain connected?
    e. What species is the Regional Wildlife Monitoring Program intended for and why?

Specifically to the PRM supplemental information provided by Shell, it is not clear what Shell will do if it is later determined that a 250 m corridor width is proven to be inadequate.

Question: Can Shell, AENV or ASRD expand or provide a clear explanation surrounding the work being done to date on regional wildlife movements – who is doing what and why (see above questions, comments and concerns)? What is the contingency plan if riparian corridors fail to achieve whatever the goals and objectives may be for WHEC?

It is not apparent how Shell has considered the effective corridor width along the Athabasca River in the sense of considering sensory disturbance from adjacent oil sands developments. Corridor length and reduced effectiveness do not appear to have been addressed. Shell does not believe that effective corridor width will be affected by the project, with no substantive rationale being provided.

Question: How does sensory disturbance along the edge of any riparian corridor affect wildlife key indicator resources (KIRs) that might utilize them? How does the length of the corridors impact wildlife use of riparian corridors in the Alberta oil Sands Region?

3) **Reference:** Response to SIR # 50a, page 13-12 and SIR 61a, page 13-39

Concern: Shell has proposed to conduct land clearing activities outside of April 1 to August 30 time period, but AENV requested an explanation of why the month of March was not included as owls can be found nesting sometimes as early as March. When asked about the apparent discrepancy, Shell indicates that owls do not have specific provisions under the Alberta Wildlife Act and that ASRD is developing guidelines to address habitat and protection needs for sensitive species. No provisions for adaptive management are provided and it is not clear what Shell will do with respect to pre-clearing bird surveys with respect to timing or if a nest is found. In addition, it does not appear that Shell can provide information with respect to the relative effectiveness in pre-clearing surveys in identifying nesting birds.

Questions: What time period will Shell be adhering to with respect to pre-clearing bird nest surveys?

In the absence of specific guidelines from ASRD, what would Shell do if, for example, an active owl nest was observed during a typical pre-clearing bird nest sweep?

How frequently are nesting birds found in pre-clearing surveys?

4) **Reference:** Response to SIR # 51a, page 13-13 and 13-14

Concern: When asked to justify the use of unnatural terrace landforms proposed for the closure landscape, as they do not appear to reflect landforms found in the pre-development landscape, Shell indicates that the terraces are mainly used for safety purposes and to permit progressive reclamation as material is lifted from the outside to the inside of the mined areas. Although Shell claims that they will design terraces to mimic natural landforms, they may not reflect the pre-development landscape. No details are provided as to how this mimicry will be achieved or if it is

acceptable to First Nation land users such as the Mikisew Cree. In addition, it is not clear if wildlife species will use these terraces landscapes.

Question: What discussions has Shell had with Aboriginal stakeholders, such as the Mikisew Cree, with respect to the use of terraces in a reclaimed landscape? Please provide specific details surrounding how they will be reclaimed to mimic natural landscape features, predicted wildlife use and contingency plans should reclamation (revegetation and wildlife recolonization) fail.

5) **Reference:** Response to SIR # 52a, page 13-14

Concern: When asked to provide the criteria that they used to determine whether an environmental or social consequence rating was 'acceptable' or 'unacceptable', Shell did not provide any information but rather posed that they would *"provide evidence regarding the acceptability of environmental impacts"* (supposedly at a later date). As such, they have not answered the question. It is not clear if Mikisew Cree issues of concern surrounding wildlife were considered as, to date, Shell has not addressed the official Statement of Concern (SOC) provided by the Mikisew Cree.

Questions: When will Shell address the Mikisew Cree SOC? Has Shell determined that the project is acceptable to the Mikisew Cree?

6) **Reference:** Response to SIR # 54a-54c, page 13-16

Concern: The raw water intake and pipeline will occur within the 250m setback that shell has proposed for along the Athabasca River, which appears to contradict Shell's statement that no disturbance will occur within the 250m setback. When asked to discuss how this will impact the effective width of the Athabasca River riparian corridor, Shell claims that it will not act as a barrier to wildlife movement, but will rather act as a wildlife filter (partial barrier) by reducing the rates of movement through the corridor while claiming that genetic connectivity will be maintained. No measurements of reduced potential habitat effectiveness are provided and to date the ability of riparian corridors to maintain genetic connectivity of a limited number of wildlife species has not been quantitatively evaluated. Exact dimensions of clearing and associated Zones of Influence (ZOI) have yet to be determined but could range between 80-230 m for the intake and 30-50 m for the pipeline. It appears that a significant portion of part of the 250 m wide corridor will be impinged upon. As such, Shell's claims are purely supposition and they have not answered the questions posed.

In addition, Shell has not provided the Mikisew Cree with the results of purported 'wildlife corridor monitoring' that took place between 2006 through 2008; a meeting held in February 2010 between industry and First Nation stakeholders indicates that these monitoring programs suffer from poor design and a lack of clear objectives and goals beyond meeting regulatory compliance and no Aboriginal input.

Questions: What is the effective width of the riparian corridor at the water intake and pipeline? How will this 'filter' (partial barrier) affect wildlife movement(s)? Please elaborate and explain, and discuss the cumulative effects from multiple intrusions into any proposed corridor network in the Alberta Oil Sands Region.
Will Shell provide the Mikisew Cree with the Wildlife Corridor Monitoring reports that have been completed to date?

7) **Reference:** Response to SIR # 58a, page 13-21
Concern: When asked to provide additional information surrounding other benefits and outcomes of maintaining adequate buffers along the Athabasca River and its tributaries with respect to wildlife, Shell claims that the maintenance of any buffers will provide corridors of mature forest for in-migration of wildlife onto the reclaimed lands from surrounding habitat, and that a 250m buffer is adequate. However, it appears that Shell has not considered that:

- not all wildlife species (or wildlife indicator species used in their assessment) will use riparian habitats;
- there is no understating of riparian corridor use by wildlife in the Alberta Oil Sands Region;
- the negative consequences of long riparian corridors appear to have been ignored;
- it is not clear what, exactly, riparian corridors will connect, and
- access management remains an issue.

Further, Shell does not appear to have any contingency plans in place should the goals and objectives for riparian corridors (whatever these may be) fail.
Question: How will Shell and AENV deal with the outstanding issues surrounding the use of riparian corridors as some sort of mitigation for wildlife? How will the 'success' of riparian corridors be evaluated and measured? What studies in the Alberta Oil Sands Region have been completed to date that have actually <u>measured</u> wildlife movements and the functionality of riparian corridors as small wildlife species reserves?

8) **Reference:** Response to SIR # 59a, page 13-23
Concern: Shell was asked to provide population estimates for each species currently listed under Schedule 1 of Species at Risk Act (SARA) and current Committee on the Status of Endangered Wildlife in Canada (COSEWIC)-listed species known to occur in the LSA; these estimates were to be based upon available survey data (presumably from field surveys in and around the LSA). For species where data was apparently lacking, Shell was asked to indicate when surveys and population estimates will be completed. Shell's overarching response is that they cannot provide the requested estimates as their wildlife data is inadequate for this purpose. Shell states that they believe that they have met the requirements of Canadian Environmental Assessment Act (CEAA) and SARA as outlined in the terms of reference (ToR) for the EIA. Although population estimates are not a

specific requirement, CEAA does require that an assessment of the environmental effects of a project include any change that the project may have on a "listed wildlife species, its critical habitat or the residences of individuals of that species". Given that Shell does not appear to have a good sense of listed wildlife populations in the LSA (there are no estimates for population size) the environmental effects of the project to wildlife populations in the LSA will apparently remain unknown. Further, it is not clear how any future wildlife monitoring programs will measure project impacts given that baseline (current) conditions of wildlife populations appears to be unknown.

Question: Will AENV require Shell to do additional field survey work to gather the data required to provide the population estimates for listed species?

AENV has the opportunity to hold Shell and other proponents accountable for the collection of robust-quality wildlife data via the ToR. However, based on this AENV SIR, it appears that standardized ToRs may not be explicit with regards to the information the proponent should collect. In addition, these standardized documents include minimal input from Aboriginal stakeholders such as the Mikisew Cree.

Question: Given that Shell has reverted to pointing out that population estimates were not required under the ToR, will AENV reconsider the use of standardized ToRs for oil sands projects and focus on preventing proponents from evading best management practices via the vague wording of ToRs?

9) **Reference:** Response to SIR # 59b, page 13-25

Concern: When asked to quantify the total area and proportion of ecosites for listed species that will be "destroyed" and to provide reclamation targets associated with listed species habitat, Shell states that environmental consequences of the project were based on changes in habitat availability between Base Case (current conditions) and Closure, after reclamation. Shell fails to understand the importance of the effective closure of the LSA to wildlife and, in turn, the Mikisew Cree and their Aboriginal and Treaty Rights for the period of time between the Base case and Closure (or beyond "Closure"). Like all oil sands proponents, Shell has no contingency plan should their proposed large-scale reclamation efforts fail, and there are no targets associated with wildlife species recolonization of disturbed land or specific habitat requirements of wildlife.

Request: Please provide estimates of impacts to Mikisew Cree traditional land use (TLU) as a result of the proposed project and a cumulative effects assessment to TLU for the lifespan of the project. Where does Shell and AENV predict displaced wildlife species to go for the lifespan of the project?

10) **Reference:** Response to SIR # 59b, page 13-25

Concern: When asked to quantify the total area and proportion of ecosites for listed species that will be "destroyed" and to provide reclamation targets associated with listed species habitat, Shell

states that environmental consequences of the project were based on changes in habitat availability between Base Case (current conditions) and Closure, after reclamation. Shell fails to understand the importance of the effective closure of the LSA to wildlife and, in turn, the Mikisew Cree and their Aboriginal and Treaty Rights for the period of time between the Base case and Closure (or beyond "Closure"). Like all oil sands proponents, Shell has no contingency plan should their proposed large-scale reclamation efforts fail, and there are no targets associated with wildlife species recolonization of disturbed land or specific habitat requirements of wildlife.

Request: Please provide estimates of impacts to Mikisew Cree traditional land use as a result of the proposed project.

11) **Reference:** Response to SIR # 62a- 62f, page 13-41

Concern: Shell claims that habitat abundance is not necessarily directly linked to a direct reduction in the abundance of wildlife KIRs and that other factors such as carrying capacity are also important. Shell offers moose as an example of species that will not suffer population decreases due to habitat loss. There is no evidence to suggest that Shell has an understanding of local and regional habitat carrying capacity for moose and that these indicate that habitats can readily accommodate additional moose. It is not clear how Shell presumes that moose population numbers will increase in conjunction with increased levels of human development in northern Alberta through a lowering of predation and harvest rates when oil sands exploitation is improving access for predators and human hunters. One can always make the argument that moose populations will increase if hunting and predation decrease. However, this would be tantamount to stating that moose in a Zoo do just fine given that they have lots of food and are safe from predation.

Indeed, MSES has already demonstrated that oil sands projects result in moose population declines. For example, data collected by Suncor indicates that moose populations are declining (Figure 1). Figure 1 is based on the data provided in of Suncor's Mine Dump 9 Application (Attachment 1 of the SIRs, Table 5-1, Suncor 2008). It demonstrates that moose density is declining in the region. The declining trend is statistically highly significant (Spearman rank order correlations r_s=-0.52, N=44, p<0.001). The declining population trend is not surprising given the increasing conversion of natural land surfaces to industrial development.

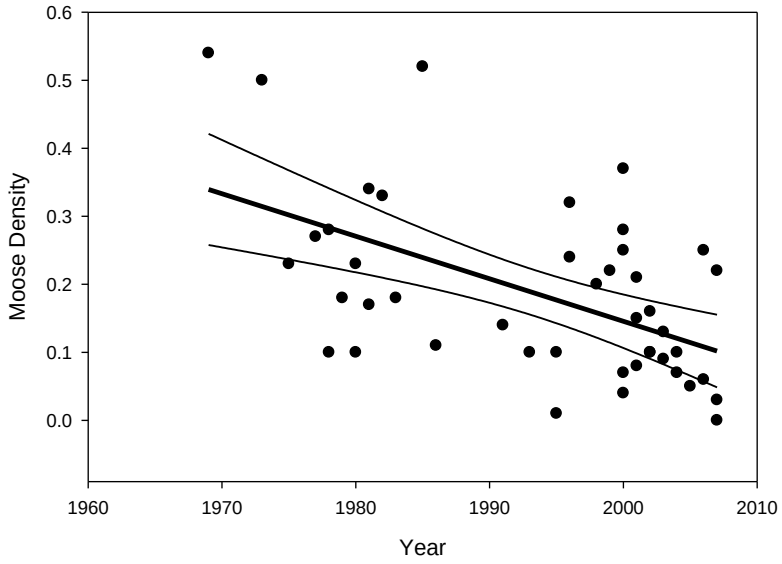

Figure 1: Moose densities (moose per km²) observed in various aerial surveys conducted by regulatory agencies or private industry between the years 1960 and 2008.

The data were obtained from Suncor (2008). Where a range of dates was given we plotted the most recent year, where a range of densities was given we plotted the highest indicated density. The trend line is y=-0.0063x + 0.7709, ± 95% confidence limits indicated by the lines above and below. The declining trend is statistically highly significant (Spearman rank order correlations r_s=-0.52, N=44, p<0.001).

Recommendation/Question: We recommend that the Mikisew Cree request that AENV and Shell provide specific regional examples where moose population numbers are increasing because of oil sands development.

Given the amount of leased land in northern Alberta for oil sands exploitation, please provide an estimate regarding the abundance of moose habitat in the region.

12) **Reference:** Response to SIR # 76a, page 13-72

Concern: Shell noted that woodland caribou were not included in the assessment because only a single set of tracks was observed in the LSA which does not fall within a delineated caribou zone and because woodland caribou are transient.

Recommendation: Given that woodland caribou are not informed about the delineated caribou zones, and the listed status of this species, we would recommend that, at minimum, Habitat Suitability Index (HSI) modelling be completed for this species.

3.2.2 Vegetation & Reclamation

3.2.2.1 Comments Regarding AENV SIRS

1) **Reference**: Response to SIR # 46b - Assessment of areas associated with diversions channels C6 and C11 (pg 13-4)

Concern: Shell has not studied the areas associated with diversion channels C6 and C11. The total area associated with these portions including the channel, assumed construction areas, and dykes is 599 ha. Shell asserts that the EIA was complete without these portions because the disturbance was assessed as part of the RSA and they are only a small part of the Pierre River Mine LSA. Shell concluded that the exclusion of these areas would not materially affect the EIA.

The same argument could be applied to any part of the LSA. If these areas will be directly affected by the Project, it is important that the resources being affected are well understood prior to development. For vegetation, this means that we need to know how much of the area is within different ecosite phases and wetland types and how much of each vegetation community will be directly affected. This is important baseline information that is required for reclamation and monitoring.

Question: **Will Shell collect baseline vegetation information in the 599 ha area associated with the diversion channels C6 and C11?**

2) **Reference**: Response to SIR # 66a - Inclusion of reclaimed areas in natural category (pg 13-54)

"*Shell is confident in its ability to reclaim the development area to self-sustaining ecosystems that will meet equivalent land capability at closure and conditions will be adaptively managed to ensure that the reclaimed areas are following the expected trajectory. Based on this the inclusion of reclaimed areas in the natural areas category is justified...*"

Concern: Shell is confident that it can reclaim *self-sustaining ecosystems* and achieve *equivalent land capability*. Unfortunately, neither have anything to do with creating the naturally occurring species rich ecosites and wetlands found in the boreal forest. Shell does not define *self-sustaining ecosystem*; however, its name implies that it is simply a site that contains plants that survive on their own. Similarly, equivalent land capability simply means that reclaimed sites will contain some planted tree and shrub species. More specifically, The Alberta Conservation and Reclamation Regulation states that "equivalent land capability" 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. For reclaimed sites that were previously forested and/or are surrounded by forest the expectation is to grow both trees and understorey species that are consistent with the surrounding land. For

example, if the development site was historically a boreal forest (and surrounding area is a boreal forest), then following reclamation the site must again be *capable of* supporting a boreal forest. That is, a boreal forest does not have to be present on site for reclamation certification to be granted, but it must be shown that the *capability* has not been diminished. Capability is assessed by comparing soil properties, hydrology, etc. with the surrounding lands; if these properties are consistent with surrounding lands, then capability is *assumed* to be restored on site. The vegetation component of the criteria is intended to give some assurance that the site is on the right vegetation trajectory. In other words, as long as some boreal species are present on site initially, it is *believed* that a succession of plant species will invade the site over time, resulting in a boreal forest with a higher diversity of species on the site at some point in the future. Unfortunately, direct evidence shows that a succession of species do not invade these sites over time (Appendix F in OSVRC 1998). Instead, species that establish in the first few years of reclamation dominate the site indefinitely such that reclaimed sites bear little resemblance to pre-development ecosites or wetlands in terms of the number of species, species composition (e.g. see Appendix F in OSVRC 1998), percent cover of species, and other characteristics that define naturally occurring ecosites and wetlands (e.g. Beckingham and Archibald 1996). Consequently, in contrast to Shell`s assertion noted above, including reclaimed sites in the natural areas category is simply *not* justified.

Request: **Given that self-sustaining ecosystems that meet equivalent land capability at closure will not resemble pre-disturbance boreal upland and wetland forests in terms of the number of species, species composition, percent cover, etc. as has been demonstrated with data from reclamation sites in the oil sands, will Shell remove reclaimed sites from the natural category?**

3) **Reference**: Response to SIR # 74

Concern: Shell states that it will not mitigate the losses of seven lichen species found in the project footprint because it is believed that lichen species are more abundant than currently known; it is believed that they have been classified as rare only because they are poorly studied: *˝..data concerning individual lichen species distributions are very limited and therefore the distributions of many species is uncertain.˝* Given the lack of data for these species and the possibility that Shell may extirpate these species provincially, it is puzzling why Shell would not want to confirm that these species are present within the local area by conducting detailed surveys.

Questions: **Given that Shell cannot show directly with data that lichen species are more abundant in the project footprint than currently known, will Shell complete detailed lichen surveys before drawing conclusions regarding the mitigation of losses of lichen species? If lichen species are found not to be as abundant as Shell currently believes, will Shell then mitigate the losses of lichen species?**

3.3 Air Quality

3.3.1 Air Quality

The main issues discussed in the ERCB and AENV air quality SIRs for the Shell Pierre River Mine were:

- Auxiliary Boiler usage;
- Asphaltene fired cogeneration units and pollution control technology;
- Mine fleet emissions;
- Benzene emissions;
- Effect of CALMET errors on CALPUFF predictions
- NO_2 concentrations;
- Odours.

Shell's responses to the SIRs were thorough. However, based on their responses there remain issues in regard to the affect that the PRM will have on the Mikisew Cree First Nation. The main issues in regard to air quality remain the asphaltene fired cogeneration units and the mine fleet. These are the main emission sources associated with the PRM and can pose a significant health risk to Mikisew Cree members if not properly designed and maintained. As well, benzene emissions from the tailings ponds, plant site, and mine face could also impact areas where the Mikisew Cree pursue traditional activities.

After all the work on the air assessment and response to SIRs for the PRM, the main conclusion that can be made is that there is a potential for off lease adverse impacts from air emissions on Mikisew Cree members. The impacts could be from nuisance odours to severe health effects during upset conditions. It can be argued that the incremental risk is low; however, this is an imposed risk on the Mikisew Cree members. Shell must endeavour to ensure the risk to the Mikisew Cree members from air emissions is as low as reasonably possible and show continuous improvement.

An important issue to the Mikisew Cree is for Shell to back up what is being said and presented in the EIA by making commitments. It is important for Shell to show transparency in their submissions and to be clear in what they are saying and leave no room for interpretation.

3.3.1.1 Comments Regarding ERCB SIRS and AENV SIRS

1) **Reference:** Response to ERCB Question 42 and AENV Question 6
Concern: It is acknowledged by Shell that there may be exceedances of the Alberta Ambient Air Quality Objectives (AAAQO) for benzene in areas where the Mikisew Cree pursue traditional activities.
Questions: What are the predicted health risks in these areas?
Indicate how Shell could reduce emissions of benzene.
What is Shell doing to reduce the health risks to Mikisew Cree members from benzene emissions?

2) **Reference:** Response to AENV Questions 14, 79 -82
Concern: Although odours are subjective and difficult to assess in an EIA, the main issue is that there will always be the potential for odours from the proposed PRM. It is important for Shell to be transparent on issues with their facility that may cause off site odours and to ensure that the issue is rectified so that there are no repeat occurrences. Shell should provide the protocol for Mikisew Cree members to report an odour, what is done when the complaint is received and the timelines around addressing that complaint.
Questions: How will Shell minimize the potential for off-site odours?
It is acknowledged that the odour complaint protocol was provided in response to AENV Question 79. Indicate the timelines involved for each stage of the process when an odour complaint is received?
What process is in place to ensure when an off-site odour has occurred that there is follow-up to ensure the cause of the incident is rectified?

3) **Reference:** Response to All Questions
Concern: Shell should strive for continuous improvement in energy efficiency and there should be trends of reducing emissions on an annual basis. We recommend that the Mikisew Cree request Shell provide a commitment to this which would be an important step towards transparency. It was pointed out that the use of asphaltene increases CO_2 emissions which cannot be considered as continuous improvement.
Request: Shell should provide evidence that there is a definitive trend of continuous improvement in relation to energy efficiency and emission reduction in their oil sands operations.

4) **Reference:** Response to ERCB Question 45 and AENV Question 9
Concern: It is noted that Shell will not commit to purchasing of Tier 4 compliant equipment unless the products are made available in both the US and Canada. We recommend that Shell should show due diligence and leadership in the oil sands areas and reduce the impacts from mine fleet emissions to as low as reasonably possible using best available technology.
Questions: Does Shell consider the non-commitment to purchasing Tier 4 equipment consistent with continuous improvement? Why?
How will Shell ensure mine fleet emissions are reduced over the life of the PRM?

5) **Reference:** Response to ERCB Questions 40 and 43, and AENV Questions 6, 12 and 13
Concern: Although asphaltene is a cheaper fuel, any fuel that is used in combustion should be considered clean such as natural gas. We recommend that stack testing should be done for a suite of pollutants including VOCs, PAHs and metals.
Request: Provide a comparison of emissions from the cogeneration unit using asphaltene and natural gas as fuel.
Explain how pollution equipment will be monitored to show that asphaltene will be used as fuel for a maximum of 15 minutes when pollution control equipment goes down.

3.4 Transport Canada Request

Transport Canada informed Shell that an assessment of the navigable waterways in and around the proposed PRM and Jackpine Mine Expansion Projects had been conducted (Section 1.2, page 1-5). The assessment identified the Athabasca River and the Muskeg River as being two waterways that were navigable and applicable to the Navigable waters Protection Act (NWPA). Transport Canada has requested that Shell provide additional information about the "*proposed works*" (construction of a pipeline bridge and water intake system, modification of an existing water intake system, diversion and modification of the Muskeg River). Some of the proposed works in the PRM and JPME projects will likely require applications to be submitted under the NWPA. **How will the Mikisew Cree be meaningfully involved in the federal NWPA process? Given the importance of the Athabasca River and Muskeg River to the Mikisew Cree, how will Shell and Transport Canada assess impacts to Aboriginal and Treaty Rights under the NWPA? How will cumulative effects be assessed?**

3.5 Follow Up & Monitoring

3.5.1 Monitoring & Follow Up

Shell's responses to the SIRs did not provide any more substantive information on monitoring programs. The overarching approach to monitoring was commitments 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 nor does it 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. Commitments to developing the details of monitoring programs appear to suggest that the Pierre River 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 Shell does not appear to accept its own past experience in running monitoring programs in the lower Athabasca River region.**

We acknowledge that Shell occasionally refers to results from past monitoring. For example, in the response to AENV's question 6a, Shell compares predicted rates of emission with actual ones obtained from air monitoring programs. Similarly, Shell refers to the results of wildlife corridor monitoring in questions, for example 49 and 59, in an attempt to demonstrate that wildlife still use areas in proximity of mine development. These are examples of where 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. In question 67 Shell purports that monitoring from elsewhere "*helps to determine whether the reclaimed land is returning to a state of equivalent capability for wildlife*". In this statement 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 along the trajectory to re-establishment of pre-disturbance conditions any given site might be. 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 an 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 question 25e 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. 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.

4.0 Discussion Points for Follow Up Meetings

This section lists 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 these 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) We recommend that groundwater solute transport modeling of the ETDA-sourced contaminant seepage should be carried out over a sufficient time scale to determine peak concentrations, and that the long term contaminant loadings be quantified and assessed in terms of cumulative impacts from all oil sands projects operating and planned within the Athabasca basin over the next 100 years and beyond. Without such information, it is not possible to accurately determine the long term cumulative impacts of groundwater contaminant loadings to the Athabasca basin.
2) Given the experience of other oil sands facilities with respect to EDTA-sourced contaminant releases to groundwater, in what way, if any, is the proposed Project ETDA seepage interception system superior to the above-noted ETDA interception systems which have not operated as intended and have resulted in ETDA-sourced contaminant releases to the environment. If the proposed Project seepage interception measures are essentially equivalent to the seepage interception systems used at other ETDA sites that have experienced contaminant releases, why is Shell not proposing a more environmentally-rigorous seepage containment system, such as a double-liner and leachate collection system, to ensure effectively 100% ETDA seepage containment?

Hydrology:

1) There is concern that Shell, along with other oil sand companies, rely on unproven technologies to substantiate their claims of negligible to low impacts on the environment. Reviewers of water related disciplines (hydrogeology, hydrology and water quality) noted that uncertainty still surrounds biodegradation, EPLs and ETDA seepage interception. We recommend that the

Mikisew Cree request Shell provide some evidence that these technologies are meeting the predictions outlined in the EIA application and SIRs rather than just assuming that they will.

2) The Mikisew Cree should request that "*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.
3) Actual evapotranspiration is a very important hydrological variable, which determines how much water is left in the watershed for streamflow. Shell does not estimate actual evapotranspiration based on climate, soil conditions, and land cover, but calculated it as the difference between precipitation and streamflow. Please discuss the rationale for this hydrological modelling approach as it appears to be contradictory to what is accepted in hydrological science.
4) With respect to the major uncertainties of the EPL's performance regarding the migration of toxins into the water, please clarify how EPSs can have water quality remediation functions.
5) Shell states that before reclamation, existing, currently-approved and disclosed mines will affect 48% of wetlands in the Muskeg River watershed. Yet, this impact is declared to be negligible on a regional basis. Please provide the rationale and scientific literature to justify this claim.

Surface Water Quality:

1) Shell re-iterates their confidence that end pit lakes will function as planned but there is no indication that progress is being made that provides evidence that supports this claim. Shell recognizes its requirement to have a physical test pit lake running by 2018. We recommend that the Mikisew Cree hold Shell to this commitment and request that they be allowed to review the results.
2) Shell was asked about their planned response if groundwater contamination is found beyond the interception wells in the Athabasca River (*i.e.*, surface water is affected). The response provides detail with respect to groundwater, but does not acknowledge the question's preamble which is framed with regard to detection in surface waters. Please provide a response regarding detection of contamination in surface waters.

Wildlife

1) Shell claims that they will design terraces to mimic natural landforms, but they may not reflect the pre-development landscape. Please provide specific details surrounding how they will be reclaimed to mimic natural landscape features, predicted wildlife use and contingency plans should reclamation (revegetation and wildlife recolonization) fail.
2) Please provide estimates of impacts to Mikisew Cree TLU as a result of the proposed project and a cumulative effects assessment to TLU for the lifespan of the project. Where does Shell and AENV predict displaced wildlife species to go for the lifespan of the project?

3) It is not apparent whether Shell has considered width of effective corridor relative to sensory disturbance from adjacent oil sands developments. Please discuss how sensory disturbance along the edge of any riparian corridor may affect wildlife KIRs that might utilize them. How does the length of the corridors impact wildlife use of riparian corridors in the Alberta oil Sands Region?
4) Shell does not appear to have any contingency plans in place should the goals and objectives for riparian corridors fail. Please discuss how Shell and AENV will deal with the outstanding issues surrounding the use of riparian corridors as some sort of mitigation for wildlife. How will the 'success' of riparian corridors be evaluated and measured? What studies in the Alberta Oil Sands Region have been completed to date that have actually measured wildlife movements and the functionality of riparian corridors as small wildlife species reserves?
5) It is not clear how Shell presumes that moose population numbers will increase in conjunction with increased levels of human development in northern Alberta through a lowering of predation and harvest rates when oil sands exploitation is improving access for predators and human hunters. Data collected by Suncor indicates that moose populations are declining and that the trend is statistically highly significant. We recommend that the Mikisew Cree request that AENV and Shell provide specific regional examples where moose population numbers are increasing because of oil sands development. Given the amount of leased land in northern Alberta for oil sands exploitation, please provide an estimate regarding the abundance of moose habitat in the region.
6) Even though the LSA does not fall within a delineated caribou zone, a set of caribou tracks were observed in the LSA during field studies. We would recommend that, at minimum, HSI modelling be completed for woodland caribou considering the listed status of this species.

Vegetation & Reclamation:

1) Shell has not studied the areas associated with diversion channels C6 and C11. The total area associated with these portions including the channel, assumed construction areas, and dykes is 599 ha. We recommend that the Mikisew Cree request Shell collect baseline vegetation information for these areas which will be important for reclamation and monitoring.
2) Shell does not define *self-sustaining ecosystem*; however, its name implies that it is simply a site that contains plants that survive on their own. Similarly, equivalent land capability simply means that reclaimed sites will contain some planted tree and shrub species. Unfortunately, neither have anything to do with creating the naturally occurring species rich ecosites and wetlands found in the boreal forest. We recommend that the Mikisew Cree discuss what plants they would like to see in the reclaimed landscape.

3) Given the lack of data for seven lichen species and the possibility that Shell may extirpate these species provincially, will Shell commit to conducting detailed lichen surveys before drawing conclusions regarding the mitigation of losses of lichen species?

Air Quality:

1) It is acknowledged by Shell that there may be exceedances of the AAAQO for benzene in areas where the Mikisew Cree pursue traditional activities. Please discuss the potential health risks to Mikisew Cree members and describe how Shell could reduce these emissions.
2) Shell should provide the protocol for Mikisew Cree members to report an odour, what is done when the complaint is received and the timelines around addressing that complaint.
3) It is noted that Shell will not commit to purchasing of Tier 4 compliant equipment unless the products are made available in both the US and Canada. We recommend that Shell should show due diligence and leadership in the oil sands areas and reduce the impacts from mine fleet emissions to as low as reasonably possible using best available technology.

Follow up & Monitoring:

1) Please discuss why Shell has not provided concrete monitoring programs based on the knowledge gained from previous monitoring programs associated with other Shell projects or input they received from the Mikisew Cree.
2) We request that Shell justify why exceedences of guidelines stated in approval conditions are not used to improve Shell's environmental performance. If Shell disagrees with this statement, please provide examples of changes to monitoring program designs that would improve and reduce such exceedences.
3) 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 an adaptive management plan to prepare for remedial actions that may be necessary if monitoring results show that the intended targets are not reached.

5.0 Literature Cited

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