

Chapter 2a Fort McKay Issues for Discussion - Air Quality

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 2.2.2.2, Page 18	<p>“Significance/Interpretation – The interpretation of assessment results is traditionally done using threshold criteria as a clear black and white “acceptable or unacceptable” line. Limits, however, are often just a numeric point along a continuum of possible effects. For example, a future maximum predicted hourly SO₂ value of 449 µg/m³ would generally be assessed as acceptable, whereas a future maximum predicted hourly SO₂ value of 451 µg/m³ would generally be assessed as unacceptable – because Alberta’s hourly ambient air quality objective for SO₂ is 450 µg/m³. The reality is that these two numbers, i.e., 449 and 451 µg/m³, are essentially the same and so are their respective health and environmental impacts. Since Fort McKay is a community that lives with the impacts of air emissions on their health and land, the Community’s assessment of significance and impact therefore goes beyond strict numeric comparisons and tries to assess the real impacts to the Community of air emissions.”</p>	<p>It is important to note that health effects would not be expected at either SO₂ concentration, and that this is not a strict numerical consideration.</p>
2	Sections 2.2.2.2, and 2.2.5.2, Pages 13 and 22	<p>“Fort McKay used the most current and relevant air quality and deposition critical levels and loads for the region that are based strictly on health and/or environmental protection.” p. 13 “Developing air quality criteria that are strictly health-based is a challenging task and one that is beyond the capability of Fort McKay.” p. 22</p>	<p>These two messages appear inconsistent. More explanation would help address this.</p>
3	Section 2.2.5.2, Page 24	<p>Table 2-5 Fort McKay’s Health and Odour based Ambient Air Quality Criteria for the Community and the Criteria Used in its Assessment</p>	<p>Fort McKay has used different criteria than used in the Shell Environmental Impact Assessment (EIA). Please see Appendix A for a comparison of criteria.</p>
4	Section 2.2.5.3, Page 23	<p>Keeping Clean Areas Clean – Fort McKay expects, in addition to meeting health and odour-based criteria, that the principle of KCAC will be applied to air quality in its community. Fort McKay defines KCAC as: “Ensuring that air quality in the community of Fort McKay is maintained at as close to pre-industrial levels as possible through rigorous pollution prevention and control measures.”</p>	<ol style="list-style-type: none"> Given that pre-industrial is 40+ years ago and that there has been additional population growth within the community during that time. It does not seem reasonable to expect pre-industrial levels in the community of Fort McKay, when all things are considered. It would be helpful to the reviewer if the Fort McKay Specific Assessment (FMSA) discussed whether Keeping Clean Air Clean (KCAC) or continuous improvement (CI) is more appropriate in the region. <p>CI: taking remedial and preventative actions to reduce emissions from anthropogenic sources towards the long-term goal of reducing overall ambient concentrations of air pollutants in areas below the Canada-Wide Standard (CWS) levels. [APPLICABILITY: areas where ambient concentrations are below primary targets but are significantly influenced by anthropogenic emissions].</p> <p>KCAC: preventative measures applied either across a jurisdiction or within a specified area that are intended to avoid or minimize increases in overall ambient concentrations of air pollutants in areas not significantly affected by local sources of emissions.</p> <p>Regardless of whether KCAC or CI are applied, rigorous pollution prevention and control will be undertaken to ensure that there are no significant health impacts from changes in air quality. The goal is to</p>

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Row	Reference	Key Issue for Discussion	Shell Response
			keep the air quality safe, as opposed to setting an unattainable goal that does not take into account other considerations such as population growth.
5	Section 2.2.5.3, Page 25 and Appendix 2-1, Page 8	Table 2-6: Fort McKay's "Keeping Clean Areas Clean" (KCAC) Community-based Air Quality Targets.	It would be helpful to the reviewer if the FMSA outlined how KCAC targets were derived, why 95 th and 50 th percentiles were used, and the reasons for using 2004 as a base year.
6	Section 2.2.5.3, Page 25	"Fort McKay used its Community-based KCAC air quality targets as assessment criteria to determine the effects and significance of existing, approved, Shell's proposed projects and the cumulative effect of all planned regional projects on air quality in Fort McKay. If EIA modeling predictions indicate that target levels are being, or might be, exceeded, then Fort McKay expects a detailed assessment of the causes for the predicted exceedances and a review of the actions that are necessary to prevent these conditions."	This section states that KCAC were used in an attempt to determine effects and significance. In future assessments Fort McKay may consider an impact assessment approach, similar to the Canadian Environmental Assessment Agency (CEAA).
7	Section 2.2.5.5, Page 28	"Fort McKay, in its assessment, uses its numeric assessment criteria but also incorporates judgements on uncertainties and how significant the predicted changes and/or impacts are to the Community."	EIA methodology based on defined categories (i.e., magnitude, frequency, geographic extent, etc) would be another option similar to what Shell used in its EIA.
8	Section 2.3.2.4, Page 34 Section 2.3.2.4, Page 50	Table 2-10 Table 2-22 Table 2-23	Please see Appendix A for a comparison of criteria.
9	Section 2.3.2.5, Page 36	Table 2-12: Summary of Ambient SO ₂ in Fort McKay for Years 1999-2006 and 2008 in Comparison to Pre-development Scenario SO ₂ Levels.	It would be helpful to the reviewer if it was explained in the FMSA how the 95 th percentile values were calculated. Shell gets 14.7 and 13.8 µg/m ³ for 1-hour and 24-hour, respectively. It would also be helpful to the reviewer if it was explained in the FMSA why the average 95 th percentile was used.
10	Section 2.3.2.5, Page 39	Table 2-13: Comparison of Current SO ₂ Levels (2008) in Fort McKay Relative to the HTES (2009) Criteria.	It would be helpful to the reviewer if it was explained in the FMSA where the 24-hour, 95 th and 50 th percentile 1-hour and annual average current levels come from as they do not seem to match Table 2-12.
11	Section 2.3.2.6, Page 46 Section 2.3.3.6, Page 59 Section 2.3.4.6, Page 74	Table 2-19 (SO ₂). Table 2-30 (NO ₂). Table 2-42 (PM _{2.5}).	There are Base Case exceedances of the 24-hour Healing the Earth Strategy (HTES), which would be considered a red situation; however, it was classified as yellow.
12	Section 2.3.3.5, Page 51	Table 2-24.	The Fort McKay annual average value was based on monitoring data, not predictions as for the other averaging periods. The methodology seems to be inconsistent.
13	Section 2.3.2.5, Pages 40 and 56	Tables 2-14 & 2-15 (SO ₂). Table 2-28 & 2-29 (NO ₂).	It would be helpful to the reviewer if it was explained in the FMSA where the 95 th and 50 th percentile Shell predictions came from.
14	Section 2.3.4.4, Page 65	Table 2-34: Comparison of Current AAAQO, Past and Current WHO Guidelines and Fort McKay's HTES Health-based Criteria for PM _{2.5} .	It would be helpful to the reviewer if it was explained in the FMSA how the 1-hour HTES criteria were derived.
15	Section 2.3.4.4, Page 65	Table 2-35: Fort McKay's "Keeping Clean Areas Clean" (KCAC) Community-based Air Quality Targets for PM _{2.5} .	The 95 th and 50 th percentile 1-hour targets do not match Table 2-6 or Appendix 2-1.
16	Section 2.3.4.5, Page 66	Table 2-36: Predicted Pre-development PM _{2.5} Levels in Fort McKay	The background PM _{2.5} levels were selected based on the lowest value

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Row	Reference	Key Issue for Discussion	Shell Response
		(circa 1965; Golder 2009) and 1999 Levels in Fort McKay.	between predicted pre-development values (circa 1965) and 1999 monitored values. While it is understandable that the most conservative values were selected, the methodology seems inconsistent.
17	Section 2.4.4.3, Page 86	Figure 2-12 - "This figure indicates that higher THC and TRS levels in the Community of Fort McKay occur when the wind is from the direction of existing industrial operations."	This seems to be a generalization, as when winds are from the east and northeast (i.e., from Muskeg River Mine), total reduced sulphur (TRS) and total hydrocarbons (THC) levels are not an issue.
18	Section 2.4.4.3, Page 88	"Therefore Shell's base prediction of 22 hours of peak concentrations above odour thresholds (Table 2-49) indicates that odour modelling is grossly under-predicting odour potential. Therefore Shell assessment can therefore only be used to perhaps provide a general indication where the highest levels of odours may occur and the possible relative increase in odour events."	Shell agrees there is uncertainty in the odour modelling; however, the EIA methods are considered appropriate. The odours detected at Fort McKay are predominantly due to regional upset events, which are not accounted for in the EIA odour assessment. In the EIA, there were several locations, including Fort McKay, where the number of Base Case peak 1-hour odour exceedances was above 300 hours per year. Note that another odour assessment was completed in Alberta Environment (AENV) PRM Round 2 Supplemental Information Request (SIR) 82. Potential odours were assessed by comparing three-minute peak chemical of potential concern (COPC) air concentrations with established odour thresholds.
19	Section 2.3.2.6, Page 45	"Exceedences of Fort McKay's 24-Hour SO ₂ criteria are predicted. However, the impacts of existing, approved projects, Shell's proposed project and planned, but not yet approved projects, are, at this time, only considered to represent a potentially significant impact, i.e., a yellow situation. This significance rating is based on anticipated significant reductions in overall regional SO ₂ emissions over the next few years. The occasional very high SO ₂ levels in the community are a concern and an issue that needs to be addressed."	The conclusions are not directly comparable because Fort McKay used the Pre-Development scenario as the basis, while the EIA used the Base Case.

Chapter 2b Fort McKay Issues for Discussion – Air Emission Effects

Row	Reference	Key Issue for Discussion	Shell Response
2	Section 2.1.4, Page 6	“There are some regional air-vegetation issues, however, that are not being addressed. “	It is not clear which regional air-vegetation issues are not being addressed by the Cumulative Environmental Management Association (CEMA). It would be helpful to state in the FMSA what issues addressed in the FMSA are not considered by CEMA.
3	Section 2.1.4, Page 6	“Also the use of a large regional study area (RSA) has the effect of minimizing the relative areas of impact, which are generally all on Fort McKay’s Traditional Lands. Impacts on vegetation and ecosystems are therefore more significant when viewed from a traditional land’s perspective and when these impact areas are added to the large, direct, and often total destruction associated with surface mining operations.”	We recommend that impact areas are evaluated relative to a 5% exceedance criteria such as a floating township approach as has been adopted by CEMA and the Clean Air Strategic Alliance (CASA). The terrestrial resources air emissions effects study area (TASA) is much smaller than the traditional areas of the Fort McKay First Nations (FMFN) and is even within the Intense Use area surrounding developments as shown in Figure 2-4 of the FMSA.
4	Section 2.1.4, Page 6	“The goal and expectation of Fort McKay is that air emissions from industrial operations will not have an adverse effect on the vegetation and ecosystems on its Traditional Lands, except perhaps in very small areas adjacent to development sites where adverse effects are likely unavoidable.”	Overall, this is consistent with relevant management frameworks. Differences stem from different definitions and perceptions of what is small.
5	Section 2.2.1.2, Page 7	“The assessment therefore attempts to address each of these three issues in a format and context that is scientifically rigorous yet meaningful to Community members. This approach allows Community members to better understand impacts specifically associated with the proposed project, as well as the cumulative effects brought about by regional development in general.”	Many of the thresholds in the FMSA represent management, anti-degradation or uncertainty criteria. This should be clarified in the FMSA.
6	Section 2.2.1.2, Page 8	“The predevelopment and current air quality and air-vegetation impact situations are the only meaningful benchmarks that can be used by Community members. Therefore these two conditions or scenarios (i.e., pre-development and current) factor significantly in Fort McKay’s assessment in addition to the standard environmental impact assessment (EIA) Base, Application and Planned Development Case assessments.”	It could be argued that only effects to receptors (odour, health conditions, vegetation and wildlife conditions) can represent meaningful benchmarks.
7	Section 2.2.1.3, Page 8	“Fort McKay has developed a draft, Healing the Earth Strategy (HTES), which outlines the Community’s expectations in terms of the acceptable levels of impact and the management of those impacts on air, water, land and wildlife within the Community, and on the Community’s Traditional Lands. The air quality management section of the draft HTES guided this air-related assessment as it reflects the Community’s goals, environmental criteria and outcomes and general expectations with respect to air quality and its impact on health and quality of life. Fort McKay recognizes that new and/or expanded oil sands development results in additional air emissions regardless of how well emissions are managed, and therefore recognizes that air quality will continue to deteriorate. Fort McKay’s position is that this deterioration should be minimized through “best practices” emissions management measures and ambient levels of air contaminants should be below health and/or environmental effect thresholds. Fort McKay, in the draft HTES, has developed thresholds that were used in this assessment and has also developed a position on emissions management that was used to guide the review of the adequacy of emission management in the region.”	The HTES is identified as having anti-degradation and effects-based components and that ambient air levels should be below effects thresholds. The findings of the HHRA indicate that, over time, ambient air concentrations are expected to remain below levels at which health effects would be realized.

Chapter 2b Fort McKay Issues for Discussion – Air Emission Effects (continued)

Row	Reference	Key Issue for Discussion	Shell Response
8	Section 2.2.3, Page 18	<p>“The air quality assessment study areas are shown in Figure 2-4 and include:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Fort McKay’s Traditional Lands – this was the area used for the assessment of potential adverse effects on vegetation, and <input type="checkbox"/> the Community of Fort McKay for the assessment of potential health and odour Impacts” 	Note that the study area used in the FMSA (Figure 2-4) is much larger than that used for the air and air emissions effects assessments.
9	Section 2.2.5.4 Pages 25-26	<p>“A substantial portion of Fort McKay’s Traditional Lands has been subject to total surface disturbance (See Section 9 – Access and Disturbance of this assessment for details). The amount of total surface disturbance will increase significantly as recently approved projects become operational and as planned projects get approval and also become operational. Fort McKay therefore expects that any undisturbed and undeveloped areas within its Traditional Lands will be protected from adverse air emissions-related impacts.</p> <p>The Community recognizes that 100% protection for undisturbed and/or undeveloped areas might be impossible, since some emissions-related impacts adjacent to developments are likely unpreventable even with rigorous emissions management strategies. Fort McKay is therefore adopting a 95% protection level criterion for vegetation and ecosystems on the undisturbed and/or undeveloped areas of its Traditional Lands.</p> <p>Fort McKay’s 95% protection level criterion means, for example, that for a single project with a total disturbance of 10,000 hectares (ha), no more than 500 ha (i.e., 5% of 10,000 ha) of undisturbed and/or undeveloped area can exceed the criteria for protection of vegetation and ecosystems as a result of the project. In terms of Base Case and Planned Development Cases, the 5% protection level criteria means, for example, that for a total regional cumulative disturbance of 50,000 ha, no more than 2,500 ha of undisturbed and/or undeveloped area on Fort McKay’s Traditional Lands should exceed the criteria for protection of vegetation and ecosystems as a result of Base or Planned Development cases.”</p>	<p>Shell does not agree with the use of the disturbance area as a benchmark to judge effects outside of the disturbance area. Based on these criteria, projects with larger surface disturbances would be allowed additional areas outside of developed areas where effects to vegetation and soils would be permissible and projects with relatively lower surface impacts, but equivalent emissions would have lower permissible affected areas outside of development.</p> <p>The use of the phrase “95% protection level” is misleading in this context because it is not to the CASA/CEMA use of the phrase and does not relate to “95% protection” as the area that is 95% protected is not defined. It states that an area that is 5% of the physically disturbed area is an acceptable area for effects to undisturbed areas. There is no undisturbed area defined for which there is a 95% protection level.</p> <p>Shell suggests that a moving township approach, as is used by CEMA, would be more appropriate to define a 95% protection level.</p>
10	Section 2.2.5.4, Page 25	<p>“Fort McKay’s HTES does not include vegetation and ecosystem affects criteria. For this assessment Fort McKay used the air-vegetation protection criteria outlined in Table 2-7. These air-vegetation protection assessment criteria have:</p> <ul style="list-style-type: none"> <input type="checkbox"/> in some cases been used in previous EIAs (e.g., SO₂, NO₂ and PAI criteria); <input type="checkbox"/> been recommended for the region (e.g., ozone) by a multi-stakeholder forum; or <input type="checkbox"/> been discussed extensively as the type of limits that might be relevant to the region (e.g., nitrogen deposition discussions at forums such as the CASA Science Symposium on Nitrogen (CASA 2006) and CEMA-NSMWG nitrogen critical loads workshop (NSMWG4 2008)). <p>The only parameter/criterion that has not been addressed in previous EIAs or as part of regional air management discussions is ammonia.”</p>	The tables in Appendix A provide a detailed comparison for values selected by Fort McKay and those selected by Shell. Some of the thresholds used in the FMSA are not the most applicable thresholds.

Chapter 2b Fort McKay Issues for Discussion – Air Emission Effects (continued)

Row	Reference	Key Issue for Discussion	Shell Response
11	Section 2.2.5.5, Pages 28-29	<p>“Assessing the potential significance of predicted air quality and acid and nitrogen deposition on health and the environment is challenging and involves more than just comparing the predicted changes to criteria or thresholds. Predictions have a significant degree of uncertainty. In many cases thresholds and criteria don’t represent a clear line between affects and no affects, and some impacts might be more acceptable than others depending on cultural, social and economic factors.</p> <p>Also, it has been Fort McKay’s experience, based on its review of many project EIAs, that numerically derived significance values depend on arbitrary categorization of negligible, low, moderate and high impact magnitudes.</p> <p>Fort McKay, in its assessment, uses its numeric assessment criteria but also incorporates judgments on uncertainties and how significant the predicted changes and/or impacts are to the Community. The following general guide was followed with respect to determining the possible significance of air quality and deposition changes and whether the predicted changes should be considered for more detailed assessment:</p> <p><input type="checkbox"/> <input type="checkbox"/> Health limits – any current and/or predicted exceedence of Fort McKay’s health based ambient air quality guideline was considered as a significant adverse effect that required further analysis and specific discussion (a red situation),</p> <p><input type="checkbox"/> <input type="checkbox"/> Keeping Clean Air Clean (KCAC) targets – if any of Fort McKay’s KCAC targets were predicted to be exceeded under the Base, Application and/or Planned Development Case then this was viewed as a potentially significant adverse effect that required further analysis and specific discussion (a yellow situation),</p> <p><input type="checkbox"/> <input type="checkbox"/> Odours – since odours are currently a major problem in Fort McKay, any predicted increase in odours in the Community was considered a significant adverse impact that required action to address/mitigate (a red situation),</p> <p><input type="checkbox"/> <input type="checkbox"/> Vegetation/Ecosystem Impacts – any exceedence of Fort McKay’s air-vegetation protection criteria on undisturbed and/or undeveloped areas of Fort McKay’s traditional land that exceeded more than 5% of the project development area or 5% of total cumulative development areas was considered a significant adverse impact that required further analysis and specific discussion (a red situation),</p> <p><input type="checkbox"/> <input type="checkbox"/> Application Project Impacts – a predicted increase of more than 5% in any ambient air quality parameter in Fort McKay as a result of the proposed project emissions was considered a potential adverse impact (a yellow situation), and a predicted increase of more than 10% was a potentially significant adverse impact that required further analysis and specific discussion (a red situation), and</p> <p><input type="checkbox"/> <input type="checkbox"/> Knowledge Gaps/Uncertainties – where there is uncertainty as to whether or not there are potential adverse effects associated with an impact this was viewed as a potentially significant adverse impact issue that required further analysis and specific discussion (a yellow situation).</p> <p>Using these significance criteria as a guide, a matrix was prepared for each issue, which included the parameters (stressors) analyzed under that issue and the five different assessment scenarios/cases (Pre-Development, Current, Base, Application and Planned Development). An assessment with commentary was provided for each stressor and assessment case and colour coded as:</p> <p><input type="checkbox"/> <input type="checkbox"/> Green (No or Minor Issue),</p> <p><input type="checkbox"/> <input type="checkbox"/> Yellow (Possible Issue) and</p> <p><input type="checkbox"/> <input type="checkbox"/> Red (Issue Requiring Immediate Action).</p> <p>For red and yellow issues recommended actions were provided.”</p>	<p>Criteria may not represent a clear line between effects and no effects, but rather a conservative, protective threshold where effects are not expected on either side. As such, an exceedence of an air quality guideline does not imply the occurrence of a significant adverse effect. Instead, it simply implies that the significance of this exceedence needs to be examined further.</p>

Chapter 2b Fort McKay Issues for Discussion – Air Emission Effects (continued)

Row	Reference	Key Issue for Discussion	Shell Response
12	Section 2.5, Page 95	<p>“Oil sands emissions in the Regional Municipality of Wood Buffalo (RMWB) have the potential for direct adverse, acidification and/or eutrophication (fertilization) effects on vegetation and ecosystems with SO₂, NOX, total nitrogen deposition, potential acid input (PAI), NH₃ and O₃ being the principal parameters of concern. These were therefore the parameters that are the focus of the Fort McKay’s assessment of the potential effects of regional and project emissions on vegetation.</p> <p>Regional levels of SO₂, NOX, total nitrogen deposition, PAI, NH₃ and O₃ are strongly impacted by regional industrial emissions. In particular, regional NOX and ozone levels are predicted to increase as is regional nitrogen deposition and PAI. Recent regional monitoring data also indicates that regional ammonia levels might be at effect levels and significantly contribute to regional nitrogen deposition loads.”</p>	<p>The statement that ammonia is above effects thresholds and contributes significantly to regional nitrogen loads is not supported by data or supporting reports.</p> <p>It would be helpful to the reviewer if additional information was provided to explain how estimates of nitrogen loading from ammonia relative to other species were developed.</p>
13	Section 2.5.3, Page 99	<p>“This involvement has satisfied Fort McKay that there is no evidence, or reason to suspect, that current regional air emissions are presently having a significant adverse effect on vegetation except perhaps immediately adjacent to emission sources.</p> <p>However, Fort McKay has identified direct effects on vegetation as a potential future issue that could significantly impact the nature, and use and enjoyment, of its Traditional Lands based on:</p> <ul style="list-style-type: none"> <input type="checkbox"/> predicted possible future regional emissions and associated ambient air quality levels, <input type="checkbox"/> ozone formation potential and predictions, <input type="checkbox"/> current estimated and future predicted nitrogen deposition loads and PAI, and <input type="checkbox"/> the potential for subtle adverse effects that can have significant long term impacts.” 	<p>Shell agrees that there is no reason to believe that there are effects on vegetation currently.</p>
14	Section 2.5.4, Page 99	<p>“Criteria have been developed that establish limits or effects levels for air contaminants that can impact vegetation. Criteria for contaminants and inputs that are relevant to this assessment are summarized in Table 2-54.”</p>	<p>The tables in Appendix A provide a detailed review of the criteria provided in Table 2-54.</p>
15	Section 2.5.4, Page 101	<p>“The assessment criteria used by Fort McKay are summarized in Table 2-55 (the assessment criteria used by Shell are also presented for comparison purposes).</p> <p>The criteria used by Fort McKay are:</p> <ul style="list-style-type: none"> <input type="checkbox"/> based on current science, <input type="checkbox"/> come from very reputable sources and organizations, <input type="checkbox"/> directly applicable to the types of vegetation and ecosystems on Fort McKay’s Traditional Lands, and/or <input type="checkbox"/> based on extensive input from Fort McKay i.e., CEMA management frameworks. <p>Fort McKay therefore considers its assessment criteria to represent a reasonable and responsible approach for assessing the potential impacts of regional air emissions on vegetation and for guiding the management of these impacts.”</p>	<p>A detailed review of the differences in the criteria used and the rationale for Shell’s criteria are provided in the attached tables in Appendix A.</p>
16	Section 2.5.5, Page 101	<p>“1. The direct effects of gaseous SO₂, NOX, ozone and NH₃ on vegetation; 2. The eutrophication/fertilization effects of nitrogen deposition; and 3. The acidification of soil due to acid deposition leading to adverse effects on vegetation.”</p>	<p>For item 1, the assessment should be based on direct toxic effects. Eutrophication effects of gaseous forms should not be considered based on CEMA recommendations.</p>

Chapter 2b Fort McKay Issues for Discussion – Air Emission Effects (continued)

Row	Reference	Key Issue for Discussion	Shell Response
17	Section 2.5.5, Page 101	“Due to the uncertainties associated with predicting ambient NO ₂ , O ₃ , and nitrogen and acid deposition levels, the emphasis of this Community based assessment is on the relative predicted increases in areas that might exceed effects levels as a function of the different development scenarios/cases.”	These uncertainties associated with predicting NO ₂ , nitrogen and acid deposition levels are addressed by using conservative assumptions for the modelling. It would be helpful for the reviewer if it was made clear why uncertainty would support assessing relative predicted increases rather than absolute predicted values.
18	Section 2.5.5, Page 103	“ NOX – current annual average NO ₂ within Fort McKay’s Traditional Lands range from approximately 9 to 28 µg/m ³ (WBEA 2007a). Regional annual average NO levels since 1999 have ranged from approximately 1 to 40 µg/m ³ (CASA 2009). The 40 µg/m ³ NO value was measured at the Millennium Air Monitoring Station and exceeds the Fort McKay 30 µg/m ³ annual average NOX criteria. The potential therefore exists that current NOX levels at certain locations in the region, likely near NOX emissions sources, are exceeding NOX direct effects thresholds.”	Note that the NOx threshold used in the FMSA is a fertilization (growth) threshold and not an eutrophication or toxic effects threshold.
19	Section 2.5.5, Page 103	“Overall, based on current measured and modeled regional SUM 60 values, Fort McKay is not concerned that current ozone levels are adversely impacting regional vegetation.”	Although different thresholds were used, Fort McKay also concluded no current effects of ozone.
20	Section 2.5.5, Pages 104-105	“An annular denuder intermittent sampler was located in Fort McKay in 2003 and 2004 and this sampler measured ammonia concentrations every sixth day. Based on this sampling the average ammonia concentration in Fort McKay was 0.78 µg/m ³ . This passive and denuder ammonia monitoring would indicate that ammonia values may currently be at levels that could adversely affect sensitive vegetation receptors such as lichens, and therefore regional ammonia levels are a concern to Fort McKay.”	The concentration (0.78 ug/m ³) is below the criteria used (1 ug/m ³). Additionally, the threshold is based on changes in tree bark pH and may not be applicable to the region (see discussion in the Appendix A tables).
21	Section 2.5.5, Page 106	“Estimates of current general regional nitrogen deposition, based on the above studies and monitoring, appear to range from 3 to 4 kg N/ha/yr to 5 to 10 kg N/ha/yr with the uncertainty around possible ammonia deposition being the major contributor to this large range in current nitrogen deposition estimates. Figure 2-9 indicates that between 20,000 (at a critical load of 5 kg N/ha/yr) and 3,000 ha (at a critical load of 10 kgN/ha/yr) of sensitive ecosystem/vegetation types (i.e., bogs, black spruce and coniferous), on Fort McKay Traditional Lands could be currently being affected by nitrogen deposition. While the model predictions used in Figure 2-14 are likely high (see NSMWG (2005)) they do not include all nitrogen species (e.g., HONO, NH ₃ and NH ₄ ⁺) and may therefore be underestimates of total nitrogen deposition. Based on the current information available related to nitrogen deposition in the region it appears that current levels on Fort McKay’s Traditional Lands in the vicinity of current mining developments may be at effect levels and therefore regional nitrogen deposition is a current concern to Fort McKay (a yellow situation).”	Inclusion of ammonia emissions from the Project would not appreciably change total nitrogen emissions from the Project (less than 10% increase relative to the estimates used in the EIA).
22	Section 2.5.5, Page 106	“Overall there is sufficient information to indicate that current ambient air quality levels of NO/NO ₂ , NH ₃ and/or nitrogen deposition levels may be approaching, at, or even above, vegetation affect levels. Fort McKay is therefore concerned that further regional industrial development has the potential to adversely impact the vegetation on its Traditional Lands.”	There appears to be some inconsistency in messaging as in Section 2.5.3, page 99 the FMSA states: “This involvement has satisfied Fort McKay that there is no evidence, or reason to suspect, that current regional air emissions are presently having a significant adverse effect on vegetation except perhaps immediately adjacent to emission sources.”
23	Section 2.5.5, Page 109	“ NOX – assessing the impact of predicted ambient annual NOX levels under the Base Case is challenging because all the available modeling is based on NO ₂ but the vegetation effect criteria of the WHO (2000), which is used by Fort McKay, is based on NOX. To address this issue the	The World Health Organization (WHO) NOx guideline is based on growth effects, which are better assessed based on nitrogen deposition.

Chapter 2b Fort McKay Issues for Discussion – Air Emission Effects (continued)

Row	Reference	Key Issue for Discussion	Shell Response
		<p>WHO value for NO_x effects on vegetation of 30 µg/m³ (annual average) was divided by 2 to give a critical level of 15 µg/m³ for NO₂ which is based on the assumption that, NO_x is comprised of 50% NO₂ on a regional basis. This approach has been used in previous EIAs (e.g., the Imperial Kearsley Project EIA). Using this criteria and regional Base Case annual average NO₂ model predictions from:</p> <ul style="list-style-type: none"> □□the Petro-Canada McKay River Expansion EIA (2005), which were calculated by Golder (2009) for Fort McKay, □□the Shell EIA (2007), and □□and the Imperial Kearsley EIA (2005) <p>The following approximate areas that may be subject to vegetation effects associated with regional NO_x emissions were estimated:</p> <ol style="list-style-type: none"> a. all or part of 73 townships (from Petro-Canada McKay River Expansion EIA (2005) NO₂ predictions), b. all or part of 42 townships (approximately 308,000 ha by graphical integration; from Shell EIA (2007) NO₂ predictions), and c. 152,851 ha (this is value presented in the EIA for the Kearsley project; from Imperial Kearsley EIA (2005). <p>The potential vegetation effects areas calculated using the annual NO₂ contour isopleth data provided by Golder (2009) are in generally agreement with the modeled effects area presented in the Imperial Kearsley and indicate that a very large area within Fort McKay's Traditional Lands is either at risk or already being impacted (a red situation)."</p>	<p>The WHO 2000 nitrogen dioxide (NO₂) guideline of 30 µg/m³ is based on a threshold for increased plant growth. Shell does not agree with the approach to assess eutrophication based on ambient NO₂ concentrations or use of NO₂ thresholds based on increases in plant growth rates, as was done in the FMSA. The eutrophication framework is being developed based on assessment using nitrogen deposition and not ambient NO₂ concentrations. See Table 1 in Appendix A for more information.</p> <p>Assuming that NO is half of NO_x may not be appropriate as the fraction will vary with distance from projects. It would be helpful to the reviewer if NO_x isopleths were provided.</p>
24	Section 2.5.5, Page 113	<p>"SO₂—Shell is proposing to use asphaltenes as the fuel source for two large cogeneration units (one at the Jackpine Mine Expansion project and one at the Pierre River Mine). Asphaltenes have relatively high sulphur content (in the 5% range). The proposed projects would therefore increase regional sulphur dioxide emissions and ambient SO₂ levels and could have a SO₂ related direct (fumigation) impact on vegetation. Shell assessed this possibility and concluded that an additional 7 ha of sensitive vegetation (lichens) could be impacted by the proposed projects. Fort McKay's concurs with these estimates and does not consider the SO₂ related vegetation impacts that might be associated with the proposed projects to be significant (a green situation)."</p>	This is consistent with the Shell EIA.
25	Section 2.5.5, Pages 113-114	<p>"NO_x— based on the use of a 15 µg/m³ NO₂ isopleth (see NO₂ section under Base Case) the area possibly adversely impacted by Base Case + Application Case NO_x emissions includes all or part of 45 townships and by graphical integration covers approximately 280,000 ha. This represents a project related increase in possibly affected area of 19,000 ha. Shell's proposed combined project development area (Jackpine Mine Expansion and Pierre River Mine) is 21,339 ha and therefore the potentially affected undeveloped area represents approximately 90% of the proposed development which is much higher than the 5% impact criteria being used by Fort McKay (see section 3.2.5.4). This indicates that a very large area within Fort McKay's Traditional Lands could be affected from the NO_x emissions associated with Shell's proposed project (a red situation).</p>	<p>See discussion for the Base Case (Row 23). The impact criteria used in the FMSA that results in an estimate of 90% potentially affected may not be consistent with the 95% protection concept used in the existing framework (see Row 9).</p>
26	Section 2.5.5, Pages 114	<p>Ozone— As noted under the Base Case discussion, Fort McKay's assessment of possible ozone related impacts was limited because the issue was not assessed quantitatively by Shell and has not been assessed quantitatively in any recent EIAs. Therefore, no numeric Application Case predictions are available for ozone. Increased regional emissions of NO_x and VOCs, resulting from proposed projects like Shell's, have been modeled in terms of future ozone levels and significant increases and potential impacts identified. The results of this modeling are discussed</p>	<p>The CEMA framework does not include assessment of SUM60 values that were used in the FMSA or the ozone monitoring work conducted by Environment Canada (2007). FMFN may recommend that SUM60 values be developed by CEMA through consultation with</p>

Chapter 2b Fort McKay Issues for Discussion – Air Emission Effects (continued)

Row	Reference	Key Issue for Discussion	Shell Response
		<p>under the Planned Development Case. It is Fort McKay’s assessment that the potential impact of Shell’s proposed projects on future regional ozone levels and vegetation impacts cannot be considered as negligible and need to be considered when establishing emission limits for the project (a yellow situation).</p>	<p>stakeholders.</p>
27	Section 2.5.5, Pages 114	<p>☐☐ NH₃ – As noted under the Base Case scenario discussion, regional ammonia level predictions were not part of Shell’s assessment and no ammonia emissions from the proposed projects were identified. There is therefore insufficient information on Base Case and Application Case ammonia emissions to allow Fort McKay to assess the potential regional annual ammonia level increases that could result from the Application Case. As noted under the Current Scenario, existing ambient ammonia levels may already be at, or near, effect levels and therefore, this is a potential impact issue requiring further evaluation (a yellow situation).</p>	<p>Inclusion of ammonia emissions from the Project would not appreciably change total nitrogen emissions from the Project (less than 10% increase relative to the estimates used in the EIA). The data provide suggest that existing ambient ammonia levels are below effects levels.</p>
28	Section 2.5.5, Pages 114	<p>☐☐ Nitrogen Deposition – Based on Fort McKay’s use of 8 kg N/ha/yr as a regional critical load for nitrogen, and graphical integration of the regional area with nitrogen deposition isopleths above this value (provided by Golder (2009) and Shell (2007) – see Figure 2-10), the model predicted area exceeding 8 kg N/ha/yr is approximately 55,000 ha under the Base Case scenario and approximately 60,000 ha under the Application Case scenario. The proposed projects would therefore increase the area with a nitrogen loading of greater than 8 kg N/ha/yr by approximately 5,000 ha. This increase occurs in the areas adjacent to the two proposed mines and approximately 2000 ha of this land is outside current or approved project development areas and Shell’s proposed project areas. Shell’s proposed combined project development area (Jackpine Mine Expansion and Pierre River Mine) is 21,339 ha and therefore the potentially affected undeveloped area represents approximately 9% of the proposed development which is higher than the 5% impact criteria being used by Fort McKay (see Section 2.2.5.4). This indicates that a significant area within Fort McKay’s undisturbed Traditional Lands could be affected from the N deposition associated with Shell’s proposed project emissions (a red situation).</p>	<p>CEMA’s Interim Nitrogen (Eutrophication) Management Recommendations and Work Plan (2008) were not available until after submission of the EIA. The United Nations Economic Commissions for Europe (UNECE) critical loads identified in the CEMA Nitrogen document have been used in subsequent assessment such as the Syncrude Aurora South Project 2009 Environmental Update, which includes the Shell Jackpine Mine Expansion (JME) and Pierre River Mine (PRM) Project in the Planned Development Case. The results of that assessment could be used to support the FMSA. The area estimates provided in the FMSA based on the 8 kg N/ha/yr threshold are consistent with the results of the assessment based on the UNECE critical loads.</p> <p>Although the results were similar, the conclusion of the FMSA differed from those of the assessment based on the UNECE critical loads due to the assessment criteria used related to the definition of the 95% protection level (see Row 9).</p>
39	Section 2.5.5, Page115	<p>☐☐ PAI – the PAI isopleths and impact area estimates from Shell (2007) were used by Fort McKay in its assessment of Application Case PAI impacts. The estimated area exceeding soil-series-specific critical loads in the Base Case was 1,836 ha of soils outside existing and approved developments and the area is 1,829 ha in the Application Case. Shell indicates that this decrease is not related to emissions management but is attributed to the modeled location of the Jackpine mine fleet, which was relocated in the Application Case (Shell EIA Vol. 3, p.5-226, Dec. 2007). Fort McKay considers the Application Case model PAI estimates and impact area calculations to be the best available information. Based on this available information, Fort McKay is not concerned regarding PAI exceedences under the Application Case (a green situation) but nevertheless considers that the predictions warrant an emphasis on rigorous emission management particularly since 806 ha of this area is woodland caribou habitat with high lichen food value (Shell EIA Vol. 3, p.5-234, December 2007); see Figure 2-16.</p>	<p>The Fort McKay assessment is consistent with the Shell EIA.</p>

Chapter 3 Fort McKay Issues for Discussion – Groundwater

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 3.2.6.2, Page 7	The assessment criteria are based on professional judgement and Fort McKay's perspective that measurable changes in groundwater quantity and quality are of concern.	<p>The perspective that any measurable change is of concern is simplistic and too broad.</p> <ul style="list-style-type: none"> • It needs to consider the use of groundwater, including frequency, location and quantity. • For example, a drawdown over 1 m in the Fort Hills area, where the water table is deep, would not affect traditional uses. • Similarly, changes in groundwater levels or groundwater chemistry that are within seasonal variations are not expected to affect traditional uses. • Importantly, a baseline needs to be defined to establish a reference point for measuring change.
2	Section 3.2.6.2, Page 7	An assessment will be provided for each issue and assessment case (Pre-Development, Current, Base, Application and Planned Development) and colour coded as: Green (no or very minor adverse effect), Yellow (possible adverse effect) and Red (significant adverse effect, requiring action).	Shell is in general agreement with the intention of the colour coding as a general criteria guide. However, baseline and threshold values need to be defined for the criteria guide to be effective.
3	Table 3.1, Page 8	"less than 0.1 metre groundwater level decline" --> Effects not significant. Impact verification monitoring likely not needed.	Shell agrees with the threshold value of 0.1 m.
4	Table 3.1, Page 8	"0.1 up to 1.0 metre groundwater level decline" --> Effects may be adverse and significant. Some impact verification monitoring required. Additional mitigation may be required	Shell notes that seasonal variations in groundwater levels are within this interval and that drawdown effects within this interval are generally not expected to affect traditional uses.
5	Table 3.1, Page 8	"Impact predicted to be greater than 1.0 metre groundwater level decline" --> Effects considered as being adverse and significant. Severity of impact monitoring required. Additional mitigation required.	<p>Shell considers a groundwater level decline in excess of 1 m to have the <i>potential</i> for adverse effects, the significance of which would need to be further analysed and confirmed. It may, or may not, affect traditional uses. Mitigation measures may, or may not, be required, depending on the severity of the effects. Shell considers it good practice to implement groundwater monitoring.</p> <p><i>Direct use of groundwater:</i> no wells are present in the area potentially affected by drawdown. (FMFN uses water from fens and wetlands on traditional lands).</p> <p><i>Indirect use of groundwater:</i> effects of drawdown on baseflow to creeks and rivers were analysed in the EIA, Volume 4a, Section 6.4.</p> <p><i>Indirect use of groundwater:</i> effects of drawdown on vegetation were analysed in the EIA, Volume 5, Section 7.5.</p>
6	Table 3.2, Page 8	"Effects not significant" "Effects may be significant" "Effects are significant"	<p>The threshold level "significant" needs to be defined. It depends on the baseline conditions and on the receptor.</p> <p>A change in chloride concentration from 20 to 40 mg/L, for example, is not be considered significant for either the health of the aquifer or traditional use.</p>
7	Section 3.2.6.2, Page 8	"It should be noted that the assessment criteria described in Table 3-1 and Table 3-2 apply to the groundwater resources outside the active mining area.	It is noted that the criteria guide applies to areas outside of the mining area. This is consistent with the EIA. The FMSA comment is noted here to indicate that that their comments do not apply to Kearl or Aurora (as these are already disturbed).

Chapter 3 Fort McKay Issues for Discussion – Groundwater (continued)

Row	Reference	Key Issue for Discussion	Shell Response
8	Section 3.3.3, Page 10	“The current Basal Aquifer groundwater levels and flow directions are presented in Figure 6.3-3 of the EIA (Volume 4, Shell, 2007).” “The current surficial deposits groundwater levels and flow directions are presented in Figure 6.3-12 of the EIA (Volume 4, Shell, 2007).”	Figures 6.3-3 and 6.3-12 do not represent current conditions, as they do not include any mine developments. The best approximation for the current conditions would be the Base Case for years 2012 (Figures 6.3-4 and 6.3-13). The Base Case includes the existing and approved developments. Because the Base Case includes approved developments, it also does not fully represent the current conditions.
9	Section 3.3.4, Page 10	“Base Case depressurizing of the Basal Aquifer will result in the decline of groundwater levels associated with the Basal Aquifer by as much as 50 to 80 metres (2033) along the Jackpine Expansion Mine boundary, and will extend into the proposed mining area...Fort McKay does not consider the effects to be significant from their perspective.”	Shell understands that Fort McKay does not consider drawdown’s associated with depressurization of the Basal aquifer to be an issue. Shell is in agreement that Basal depressurization is not an issue as it will not affect FMFN’s traditional land use because they do not use groundwater from the Basal aquifer.
10	Section 3.3.4 Page 10-11	“Base Case dewatering of the Pleistocene Channel Aquifer for the Shell Jackpine Phase 1 and the Imperial Oil Kearn project will cause drawdown predicted to be less [Fort McKay Specific Assessment] Groundwater Fort McKay IRC November 2009 11 than 20 metres up to two kilometres from the southern boundary of the Jackpine Mine Expansion project local study area...Since Fort McKay is not currently making direct or indirect use of the groundwater from this aquifer, the groundwater decline is not considered significant from their perspective.”	Shell understands that Fort McKay does not consider drawdown’s associated with dewatering of the PCA to be an issue. Shell is in agreement that this is not an issue as it will not affect their traditional land use; FMFN confirmed they do not use groundwater directly, but use water from fens and wetlands.
11	Section 3.3.4, Page 11	“Fort McKay considers the groundwater level decline [up to 20 m] to be significant [in the Quaternary deposits] since it is likely to have an effect on wetland plant productivity.”	The effects of drawdown are assessed in the EIA from an ecological perspective, Volume 5, Section 7.5.2 and in subsequent updates. The EIA concluded “The Project will result in a high environmental consequence to wetlands including peatlands within the LSAs”.
13	Section 3.3.5.2, Page 12	Cabin on Trapline #1714 and Cabin (Unknown Owner) on Trapline #1716: “These cabins are located outside of Shell’s Lease Boundary.”	These cabins will be affected by Kearn dewatering and removed by Kearn mining.
14	Section 3.3.5.2, Page 15	(Drawdown in Groundwater-dependant Traditional Use Plant-Gathering Areas) “drawdown impacts to fens and other wetlands are of concern to Fort McKay and might affect Fort McKay’s opportunities to use groundwater-related resources and plant communities.”	The effects of drawdown are assessed in the EIA from an ecological perspective, Volume 5, Section 7.5.2 and in subsequent updates. The EIA concluded the following: The Project will result in a high environmental consequence to wetlands including peatlands within the LSAs and negligible environmental consequence in the RSA. The effects of the Project on Groundwater-Dependant Traditional Use Plant Gathering Areas can be determined based on maps in the EIA delineating the extent of drawdown in and around the Local Study Area. If their Groundwater-Dependant Traditional Use Plant Gathering Areas are within the affected areas, then there will be impacts. If they are outside of the affected areas, then impacts are not anticipated.

Chapter 3 Fort McKay Issues for Discussion – Groundwater (continued)

Row	Reference	Key Issue for Discussion	Shell Response
15	Section 3.3.5.4, Page 15	Potential Process-Affected Seepage “Fort McKay is not satisfied that the proposed mitigation will result in all the process-affected seepage being intercepted and/or contained and that the effects on Traditional Lands will be significant.”	<i>Operations:</i> mine is a hole in the ground; all groundwater flows toward mine pits. <i>Closure:</i> reclamation and terrain contouring are done such that all groundwater, including seepage from an external tailings disposal area (ETDA), flows to pit lakes within the lease area. Low permeability berms/barriers along pit walls will be placed to prevent direct contact between granular Quaternary deposits and tailings backfill. Confidence is high for JME site that process-affected seepage will be intercepted and/or contained. Shell is in control of all closure and reclamation activities and surface contouring will direct groundwater towards pit lakes. For the PRM ETDA, confidence is also high as the mitigation is well understood and has been tested in other places. The impacts on Traditional Lands outside the actively mined area and outside of the PRM ETDA will not be significant.
16	Section 3.3.5.4, Page 17	“It is unlikely that all the process-affected seepage will be intercepted and/or contained. Wetland areas in the area surrounding the area that was actively mined are at risk to groundwater quality changes as process-affected seepages moving through the groundwater flow systems may discharge to the wetlands.” “Upon closure, groundwater flow in the reclaimed landscape will be directed from topographically high areas towards topographically low areas, where groundwater will discharge to treatment wetlands and end pit lakes for the Jackpine Mine Expansion Project. Process-affected seepage from the ETDA or backfilled mine pits will be contained within the reclaimed mine areas.”	Potentially affected groundwater will not discharge to areas outside the actively mined area; instead, it will discharge to the end pit lake. Note that there may be some inconsistency between the two paragraphs indicated in the Key Issue for Discussion column: in the second paragraph, FMFN acknowledged that process affected seepage from the ETDA or backfilled mine pits will be contained within the reclaimed areas in the closure scenario.
17	Section 3.3.7, Table 3-3, Page 18	Table 3-3.	It is not clear that the Table 3-3 addresses only the areas outside the JME mine footprint (see Row 7 of this document).
18	Section 3.3.7, Table 3-3, Page 18	Table 3-3, Groundwater Quantity row.	Shell agrees with uncertainty in effects prediction and with need for groundwater monitoring.
19	Section 3.3.7, Table 3-3, Page 18	Table 3-3, Groundwater Quality row.	It is not clear what the rationale is for the “expected increase in significant adverse effect on Traditional Lands”. <i>Outside mined areas:</i> groundwater quality will not be affected by seepage because groundwater flow will be toward the North Pit Lake. <i>Inside reclaimed mine areas:</i> groundwater quality will likely be affected by process water and seepage for some time. However, current research indicates that there should not be impacts to traditional plants in the reclaimed areas.
20	Section 3.3.7, Page 18	Cabins located on Kearl lease.	Cabins will be removed by Kearl prior to JME mining in the area.
21	Section 3.3.7, Page 18	Cabins located within JME.	Cabins could be re-installed on the north (up-gradient) side of the North Pit Lake. Groundwater north of the pit lake will not be impacted by process water. Cabins could also be re-installed by Kearl Lake, or Kearl Compensation

Chapter 3 Fort McKay Issues for Discussion – Groundwater (continued)

Row	Reference	Key Issue for Discussion	Shell Response
			Lake, which will not be impacted by process water.
22	Section 3.3.7, Page 18	“Drawdown of fens will result in adverse effects on 425 ha of fens within Fort McKay’s Traditional Lands”	Before any discussion on this topic, Shell needs to ensure that Fort McKay is aware of the current fen information and has reviewed the assessment presented in the SIRs. It should be kept in mind that FMFN did not have updated fen information when they did their assessment. The effects of drawdown are assessed in the EIA from an ecological perspective, Vol. 5, Section 7.5.2 and in subsequent updates. The Project will result in a high environmental consequence to wetlands including peatlands within the LSAs.
23	Section 3.3.7, Page 18	“Groundwater discharge to Muskeg River downstream from the Jackpine North Pit Lake and Muskeg Creek will decrease about 100 L/s compared to the current scenario.”	It is not clear which operational time snapshot they are comparing it to. It would be helpful to clarify what the 100L/s refers to, and the corresponding reduction of groundwater contribution. The hydrology assessment was done assuming no groundwater contribution from closed-circuit areas during operation. There will be some drawdown effect outside closed-circuit areas (possibly for a distance of about 1 km due to dewatering flow). Since most dewatering flows are eventually released to receiving stream, this will not affect the groundwater contribution to receiving stream.
24	Section 3.3.7, Page 19	“The Pleistocene Channel Aquifer is a preferential groundwater flow unit and may result in process-affected seepage from the ETDA moving northeast.”	<i>During operations:</i> mitigation measures will be implemented to intercept and capture seepage from the North ETDA. <i>After closure:</i> seepage from the North ETDA will move toward the North Pit Lake
25	Section 3.3.7, Page 19	A plume of process-affected seepage from the in-pit tailings pond will move slowly towards the Athabasca River. Seepage to the Athabasca River will be negligible compared to flow volume.	Shell agrees that seepage through the Basal aquifer pathway to the Athabasca River will be negligible.
26	Section 3.4.5, Page 21	“Specific groundwater-dependant traditional use sites such as specific groundwater dependant plant-gathering sites, springs and muskeg used for drinking-water have not been identified within the predicted drawdown areas since they were not asked about specifically within either the TLU study or the TEK study (FMA 2009). However, Fort McKay values and uses wetlands within their Traditional Lands and drawdown impacts on fens are considered as being significant adverse effects.”	FMA (2009) document states the following: Section 1.2.2: Water quality was listed as one of the topics discussed during the interviews. Section 1.3.3.4 (Traditional Foods and Water): The Muskeg River is identified as one river where clean water is available for fishing or drinking.
27	Section 3.4.5, Page 23	“Fort McKay is particularly concerned because the Pierre River Mining Project has an ETDA that is outside the active mining area. It is not satisfied that the proposed mitigation will result in all the process-affected seepage being intercepted and/or contained and is concerned that the effects on Traditional Lands will be significant.”	A mitigation measure comprising a system of recovery wells will be implemented to capture seepage from the ETDA and will not significantly impact traditional lands.
28	Section 3.4.7, Table 3-4, Page 23	Table 3-4, Groundwater Quantity row.	Shell agrees with uncertainty in effects prediction and with need for groundwater monitoring.
29	Section 3.4.7, Table 3-4, Page 24	Table 3-4, Groundwater Quality row.	Shell would suggest that the two “red” cells should be “yellow”, as there is “some uncertainty regarding effects on Traditional Lands due to process affected seepage”. The rationale for the “red” cells in Tables 3-3 and 3-4 do

Chapter 3 Fort McKay Issues for Discussion – Groundwater (continued)

Row	Reference	Key Issue for Discussion	Shell Response
			not appear to be consistent. A discussion of the rationale would be helpful.
30	Section 3.4.7, Page 24	Table 3-4, Groundwater Quality.	<i>Outside mined areas:</i> groundwater quality will not be affected by seepage because groundwater flow will be toward the North Pit Lake. <i>Inside reclaimed mine areas:</i> groundwater quality will likely be affected by process water and seepage for some time. However, current research indicates that there should not be impacts to traditional plants in the reclaimed areas.
31	Section 3.4.7, Page 24	"The declining water table elevation in the surficial deposits will result in reduced discharge of groundwater to the Pierre River during and after mining."	The hydrology assessment is done assuming no groundwater contribution from closed-circuit areas during operation. There will be some drawdown effect outside closed-circuit areas (possibly for a distance of about 1 km due to dewatering flow). Since most dewatering flows from muskeg and shallow Quaternary deposits are eventually released to receiving stream, this will not affect the groundwater contribution to receiving stream.
32	Section 3.4.7, Page 24	"Process-affected seepages from the ETDA will result in reduced groundwater quality and process-affected seepage to Big Creek and the Athabasca River Valley."	Mitigation measures will be implemented to capture seepage from the ETDA. This system will be operational during operations and after closure, until it can be demonstrated through monitoring that the quality of the groundwater is acceptable.
33	Section 3.5.1, Page 25	"The physical removal of an aquifer will prevent any future use by Fort McKay of groundwater from the aquifer for traditional uses. Dewatering and depressurization of aquifers can also prevent Community use of this resource during pumping, and possibly for some time after the pumping ceases while the water levels in aquifers recover. Removal of aquifers and pumping groundwater from aquifers can also impact surface waterbodies by reducing groundwater base flow to lakes and streams."	The pre-development groundwater system in the overburden deposits will be replaced with a functional groundwater system in the reclaimed mine area, which will also include wetlands. According to pages 10 and 11 of the FMSA, Fort McKay indicated that they do not consider drawdowns associated with depressurization of the Basal aquifer to be an issue, and do not consider drawdowns associated with dewatering of the PCA to be an issue.
34	Section 3.5.1, Page 25	"Process-affected seepage from tailings storage ponds can impact groundwater quality in aquifers and make them unusable by the community during mining and potentially for many tens of years after mine closure and reclamation. Process affected seepage can also impact surface waterbodies if it enters the groundwater flow system and is contributed as baseflow to lakes and streams. During operations, seepages from the external tailings disposal area (ETDA) or from the tailings-backfilled mine pits will be intercepted, captured and recycled. It is unlikely that all the process-affected seepage will be intercepted and/or contained. At closure, process-affected seepage from both the ETDA and the tailings-backfilled mine pits will be collected and directed to the end pit lakes or treatment ponds, where they will undergo natural treatment. It is unlikely that all the process-affected seepage will be collected; there is some uncertainty with the effectiveness of treatment ponds."	During operations, mitigation measures will be in place to intercept and capture seepage water. After closure, the reclaimed landscape will direct all seepage toward the pit lakes.
35	Section 3.5.1, Page 25	"Wetlands in the area surrounding the active mine area are at risk to groundwater quality changes as process-affected seepages moving through the groundwater flow systems discharge to the wetlands."	Process affected seepage will be directed to the pit lakes. Wetlands in the area outside and surrounding the active mine area are located in areas with higher elevation than the reclaimed mine areas and, therefore, groundwater will move from the wetlands area toward the reclaimed mine area.

Chapter 3 Fort McKay Issues for Discussion – Groundwater (continued)

Row	Reference	Key Issue for Discussion	Shell Response
36	Section 3.5.1, Page 25	"Reclamation of the tailings ponds will include the placing of a layer of coarse sand tailings on top of the tailings backfill and contoured such that any seepage from the tailings backfill will be captured in the sand cap and directed to end pit lakes through the sand cap. It is unlikely that all the process-affected seepage will be captured".	The sand cap offers a more permeable medium than the surrounding oil sands and will be contoured to drain to the lower elevation pit lakes. Low permeability barriers along the edge of pits will be installed to prevent contact between coarse grained Quaternary deposits and tailings backfill. Shell is confident in these measures, as Shell has control of the construction and contouring processes.
37	Section 3.5.1, Page 25	"Several computer model simulations have been used to assess and predict changes and impacts of the proposed development on the groundwater resources of the area. Due to the uncertainties in groundwater modeling in general, a Community based groundwater monitoring program is needed to address community-based concerns regarding impacts on the groundwater resources and the ability for Fort McKay residents to carry out their traditional pursuits on the Traditional Lands, during and after mining."	A groundwater monitoring program will be implemented.

Chapter 4 Fort McKay Issues for Discussion – Surface Water Hydrology

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 4.2.1, Page 1	"...surface water parameters...can be assessed on their own standing to identify at a high level the need for management action".	As stated in the EIA, Shell contends that impacts are best evaluated at an environmental or human health end point. Thus, while hydrologic statistics may provide a rough indicator of impacts, environmental and human receptors are the more appropriate measures of environmental impact. For hydrology, the key receptors would be fish, water quality and human health (via aquatics). An assessment based on hydrology statistics alone should be done, in Shell's opinion, only where the resources are unavailable to conduct a full assessment of environmental end points. This is because the effects of flow changes vary depending on the specifics of the watercourses in question. Any changes to hydrology are carried forward and evaluated by the water quality, fish and fish habitat and health components.
2	Section 4.2.6, Page 7	"Significance ratings for flows are provided: sustainable (<10% change in seasonal flow), Threatened (10-25% change), Endangered (>25% change)"	<ol style="list-style-type: none"> 1) It would be helpful to the reviewer if the source of these thresholds was included in the FMSA. The document references Jablonski (1978) and DeBoer (unpublished), but flow thresholds were not found in the Jablonski document. 2) The FMSA significance ratings are based on magnitude only. Accepted EIA practice includes other criteria, which often include the reversibility, duration, frequency, and geographic extent of an effect. Shell believes that this is an appropriate approach, and is not addressed in the FMSA. 3) The FMSA selected the use of seasonal flows as the appropriate flow statistic upon which to derive significance measures. From the perspective of environmental end points, the flow statistics of concern are typically very low flows and very high flows rather than seasonal averages. 4) The use of % change in flow statistics alone is problematic (i.e. an increase or decrease in a flow statistic is treated equally). For example, a 25% decrease in winter flows would be expected to have a more substantial effect than a 25% increase. <ul style="list-style-type: none"> • Shell would use statistics other than the seasonal statistics (e.g. 7Q10 and perhaps 10-year peak instantaneous). • Shell would avoid the use of seasonal averages or mean flow changes for establishing significance (although Shell do use them as indicators). 5) The terms "Threatened" and "Endangered" are quite strong. It would be helpful to the reviewer if the FMSA discussed what specifically is being threatened or endangered. It is not clear if FMFN contend that water flows have intrinsic value, or if it is ultimately a question of environmental and human impacts or uses.
3	Section 4.2.6, Page 7	"Significance ratings may also be based on affected watershed area: sustainable (<20% of watershed area affected); Threatened (20-40% affected), Endangered (>25% affected)"	Shell contends that affected watershed area is only a rough indicator of flow (which in turn is only a rough indicator of environmental effects). This is particularly true in a reclaimed watershed where the hydrology may be affected by pit lakes (attenuation and evaporation) and the transformation of lowland into upland terrain (greater runoff).
4	Section 4.2.6, Page 7 (and following pages)	'Under "Sustainable", "Threatened" and "Endangered" categories, water management plans are suggested to be unnecessary, required, and urgently required, respectively.'	This point is more directed at the government rather than Shell to develop watershed management plans. Shell will participate and will follow the Frameworks that are in place now and will be developed in the future. As noted in FMSA Section 4.3.5.2, Shell has committed to meeting the requirements of both the Phase 1 and Phase 2 (when released) Water Management Frameworks for the lower Athabasca River.

Chapter 5A: Fort McKay Issues for Discussion – Water Quality and Fish Health

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 5.1.2, Page 2	"Many of these substances lack guidelines because little or nothing is known about their toxicity, especially when they occur as mixtures with other chemicals."	It would be helpful to the reviewer if the FMSA acknowledged where the effects of mixtures can be characterized. For example: <ul style="list-style-type: none"> • Whole effluent toxicity (WET) acute tests used lethality as an endpoint. WET chronic tests used lethality, reproduction and growth as endpoints. Surface Water Quality Environmental Setting Report (ESR), Table E-1. • Groups of similar chemicals (i.e. aliphatic hydrocarbons and polycyclic aromatic hydrocarbons [PAHs]) were combined and compared to a worst case surrogate compound.
2	Section 5.2.1, Page 3	"Our HTES criteria and recommendations to maintain good water quality are conservatively based on the caveat that the long-term impacts of mixtures of contaminants is unknowable regardless of single contaminant concentrations."	Guidelines are considered protective and therefore no effects are anticipated when mixtures are comprised of individual constituents below guidelines. Alberta environment guidance is based on the premise that ecological protection associated with the effects of mixtures can be achieved based on a triad approach including chemical specific analysis, biological monitoring and WET evaluation (AEP 1995).
3	Section 5.2.5, Page 5	"Wherever feasible, Fort McKay applies CCME, AENV or USEPA water quality guidelines for the protection of aquatic life. These criteria are used by Fort McKay in its Healing the Earth Strategy as well as the Aquatic Change Index described below (HTES, Fort McKay IRC 2010)."	Water quality guidelines represent levels that if met in any surface water will provide a high level of protection to aquatic life. The Canadian water quality guidelines for the protection of aquatic life are intended to be protective for all aquatic life, all of the time. However, there are often orders of magnitude in the range of toxicity comparing species (Shell 2007). Guidelines do not identify the level of harm to the aquatic environment and are supposed to be conservative of the most sensitive species. A complete aquatic health analysis would include a detailed review of potential effects associated with constituents that are predicted to be above guidelines.
4	Section 5.2.5, Page 6	"The fisheries resource assessment examines impacts to fish health, which are assessed by examining: <ul style="list-style-type: none"> • Guideline exceedances in specific water quality parameters, and/or; • The magnitude of change of the water quality parameters (see the Aquatic Change Index below)" 	It is not clear how the two factors which are identified (guidelines and magnitude of change) were used to support the effects classification, either individually or in combination. The FMSA seemed to rely on magnitude of change to infer change to aquatic health. Relying on magnitude could potentially be misleading.
5	Section 5.2.5, Page 7	"Fort McKay assessed the potential change in water quality and fisheries resources for the watersheds using the approach used in the Healing the Earth Strategy (HTES, Fort McKay IRC 2010). An index to highlight the degree of change in water quality variables and loss of fishing opportunities was developed to assess the significance of the impact. The HTES approach to water quality change is an abbreviated version of the Canadian Council of Ministers of the Environment (CCME) Water Quality Index (CCME 2001)."	The Aquatic Change Index (ACI) used in the FMSA is not equivalent to the CCME Water Quality Index (WQI) (2001). The ACI only considers magnitude whereas the CCME WQI takes into account the number of variables whose objectives are not met, the frequency of non-compliance, and the amount by which the objectives are not met. It is expected that application of the CCME WQI would yield very similar results for pre-development conditions and the development cases considered in the FMSA.

Chapter 5A: Fort McKay Issues for Discussion – Water Quality and Fish Health (continued)

Row	Reference	Key Issue for Discussion	Shell Response
6	Section 5.3.4, Pages 10-13	<p>Table 5-2 "The primary tenet of the HTES (retain) is not satisfied for water quality or fish health under the Base Case scenario. Opportunities to retain or improve water quality and fish health are required."</p>	<p>The review identified some potential inconsistencies with Table 5-2 that could benefit from some clarification:</p> <ol style="list-style-type: none"> 1. Percent changes should not be evaluated for constituents that are rapidly degraded, transformed or removed such as PAHs, labile naphthenic acids, tainting potential and chronic toxicity. Background concentrations of these constituents are below detection. 2. Cadmium and sulphide concentrations should be bolded for pre-development and 2012. Naphthenic acids concentration should be bolded for 2065. Iron, aluminum, cadmium and sulphide change multiples should be highlighted yellow, some because of pre-development guideline exceedances. 3. Note that constituents highlighted in red have concentrations below applicable thresholds or guidelines and no effects are expected. Relative changes may be overemphasised when no effects are expected. 4. The FMSA used the CCME aquatic life guideline for naphthalene (1.1 µg/L) as a surrogate for naphthenic acid toxicity. Relatively recent research suggests that naphthenic acids are 3 orders of magnitude less toxic than this. Nero et al. (2006) suggests that chronic benchmarks for fresh Effluent NAs are 1.7 mg/L and closure benchmarks should be 24 mg/L (Nero et. al. 2006). The criteria suggested by Fort McKay require more references which imply that naphthalene is a relevant surrogate for naphthenic acids.
7	Section 5.3.4, Page 12	<p>"Despite survival, resident fish are likely to accumulate a variety of contaminants that are concentrated when dilution rates (flows) decline."</p>	<p>Although the mean annual flow is predicted to decline, the lowest flow periods are predicted to increase and would improve dilution when substances would be most concentrated.</p>

Chapter 5A: Fort McKay Issues for Discussion – Water Quality and Fish Health (continued)

Row	Reference	Key Issue for Discussion	Shell Response
8	Section 5.3.5, Page 14	<p>Table 5-3 "With an increased number of guideline exceedances as time goes on together with high increases of several substances, biota are likely to become stressed at certain times of the year or during sensitive life cycle stages. The long-term impact on organisms, communities and populations is unknowable at this time, but there is likely to be an overall significant adverse impact in the coming decades.</p> <p>The primary tenet of the HTES (retain) is not satisfied under the Application Case scenario. Changes to project design would be required to improve these aspects, fish habitat compensation lakes are the primary mode to reclaim losses, and further efforts are required to provide offsets by protecting water quality and enhancing fish habitat in currently undisturbed areas."</p>	<p>The review identified some potential inconsistencies with Table 5-3 that could benefit from some clarification:</p> <ol style="list-style-type: none"> 1. Percent changes should not be evaluated for constituents that are rapidly degraded, transformed or removed such as PAHs, labile naphthenic acids, tainting potential and chronic toxicity. Background concentrations of these constituents are below detection. 2. Cadmium and sulphide concentrations should be bolded for pre-development and 2012. Naphthenic acids, cadmium and nickel concentration should be bolded for 2065. Iron and cadmium change multiples should be highlighted yellow and the nickel change multiples for 2065 should be highlighted red. 3. Chloride is highlighted comparing the Pre-Development Scenario to the Application Case 2065 snapshot. The chloride value is 5 times below the CCME criteria which would imply a lack of effect. 4. The multiplier is incorrect for Total Phosphorus (P) and subsequent constituents.
11	Section 5.3.8, Page 18	<p>"It is important that guideline exceedances not be the sole focus of an assessment because there is still a poor understanding of the impact of mixtures of chemicals on aquatic ecosystems. In other words, even if there are few or no guideline exceedances, negative impacts to biota may occur under conditions of the combined incremental increases of mixed metals and organic contaminants."</p>	<p>The impact rating would be more defensible if a review of toxicity thresholds and WET were considered. Potential toxic effects should not be equated to high magnitude changes in concentrations.</p> <p>As stated in Rows 1 and 2, guidelines are generally considered protective for mixtures and there are accepted approaches for assessing mixtures.</p>
13	Section 5.3.8, Page 19	<p>"While not addressed directly in the Water Quality Index assessment, Fort McKay remains concerned about the viability of end pit lakes as a method of treatment for mature fine tailings and process-affected water. In a recent peer review of the CEMA End Pit Lake Technical Guidance document, all 12 external experts concluded that the knowledge presented in the document was unacceptable based on the unsupported assumption of the uniqueness of oil sands end pit lakes, lack of references, errors in fact, lack of expertise of the authors, and complete lack of peer review up to the present (CH2M Hill 2009)."</p>	<p>There are many peer reviewed journal articles on the effects of pit lakes (Nero et al 2006, Tetreault et al 2003, Colavecchia et al 2004, Colavecchia et al 2006, Van de Heuvel et al 1999a, Van de Heuvel et al 1999b, Gentes et al 2007, Gurne et al 2005, Leung et al 2003, Smits et al 2000). These studies have been conducted on various components of health ecosystems (i.e., fish, birds, plankton, and plants) and have examined sublethal effects. The studies indicate that pit lakes should provide viable ecosystems which will sustain aquatic life and support the current terrestrial systems.</p>
14	Section 5.3.8, Page 19	<p>"End pit lakes are not currently demonstrated to be a viable option of treatment that will result in future sustainable and healthy ecosystems. The outcome of the external review of the CEMA document means that there is currently no acceptable technical guidance documentation for end pit lakes in northern Alberta. Despite this, projects applications that include end pit lakes are routinely approved by regulators."</p>	<p>While pit lakes are still in the design phase (i.e. one has not been built yet) the experimental prototypes have had promising results to date and the research should continue.</p>

Chapter 5B Fort McKay Issues for Discussion – Fish and Fish Habitat

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 5.2.5, Page 6	(GENERAL COMMENT) Fish habitat and fish populations were not assessed directly, rather the assessment focussed on Fish Health and Loss of Fishing Opportunities.	The loss to fishing opportunities is primarily a traditional land use (TLU) and resource use issue, but is presented here as the “fish” assessment. A direct assessment of fish habitat losses, with consideration of the compensation plan, and resulting impacts to fish populations was not completed. This is a challenge to compare with the EIA, as the Terms of Reference (TOR) requirements for assessing fish and fish habitat has not been presented in the FMSA. There is also no direct measure of what constitutes lost fishing opportunities. It appears that any change in habitat is considered a lost fishing opportunity, regardless if the habitat provided a suitable fishing opportunity for target species to begin with.
2	Section 5.3.4, Page 12	“The state of surface water is assessed overall as endangered. As such, fish stocks will also be stressed, and fishing opportunities for Fort McKay in the Muskeg River watershed will be reduced.”	The conclusion of impacts to fish populations due to changes in flow in the Muskeg River is not supported. The “possibility” of stressed fish appears to have led to the conclusion of lost fishing opportunities in the Muskeg River. The change in flow may not stress fish, and improved low flow conditions may actually reduce stress on fish during periods when habitat and water quality are likely limiting fish populations under pre-development conditions. In addition, the opportunity to fish in the lower Muskeg River will be present, and the assessment is based in part on perception of lost opportunity due to lack of confidence in the safety of the fish to eat rather than an actual lost opportunity. They make no effort to understand the uncertainty, whereas the EIA and No Net Loss Plan (NNLP) has undertaken analysis to quantify changes to fish habitat and better address the uncertainty in changes to flow in the Muskeg River.
3	Section 5.3.4, Page 12	“Any food web contamination will result in lost fishing opportunities because of contaminated fish tissue. The impact to lost fishing opportunities for Fort McKay is therefore ranked as high and adverse, a red situation.”	The loss of fishing opportunities in the Muskeg River is based in part on speculation of increased fish tissue concentrations and not on the lost opportunity to catch fish in the Muskeg River in areas that support fish species that are targeted for fishing.
4	Section 5.3.5, Page 15	“The primary tenet of the HTES (retain) is not satisfied ... fish habitat compensation lakes are the primary mode to reclaim losses, and further efforts are required to provide offsets by protecting water quality and enhancing fish habitat in currently undisturbed areas.”	Enhancing habitat in undisturbed areas is not a typical approach for habitat compensation as it would ultimately disturb functioning fish habitat. This would also suggest that the existing undisturbed habitats are not currently providing good fishing opportunities. This has not been an item brought forward in previous NNLP consultation.
5	Section 5.3.5	(General)	Also note that in Section 5.3.5 for the assessment of JME within the Muskeg River, the FMSA does not reference the Cultural Significant Ecosystems (CSEs) at all, and the map shows that the area of the mine is a Low use CSE (Appendix 9-2, Figure 4). They do not seem to have taken into consideration the suitability of use for fishing when concluding an adverse and significant affect on fishing opportunity within the Muskeg River.
6	Section 5.3.8, Page 19	“fish that inhabit the compensation lake may be contaminated with methylmercury and other contaminants. Some of the fish high in the food chain would not be suitable for frequent human consumption. Therefore, Fort McKay community members who formerly enjoyed fishing in the Muskeg River watershed will lose this traditional use unless other safe opportunities are available. The loss of fishing opportunities is assessed as a significant adverse impact, a red situation”	<ul style="list-style-type: none"> • The compensation lake will be monitored and based on evidence from other artificial reservoirs; any increase in mercury would be temporary. • No specific area within the Muskeg River watershed within the project area has been identified as a key fishing location, most of the fishing locations noted are in the lower Muskeg River and would still be available. The habitat affected by the project supports forage fish and suckers; whereas the compensation lake will provide habitats suitable for species that are targeted for fishing such as walleye, northern pike and whitefish. • There is no definition of what would constitute other safe fishing opportunities

Chapter 5B Fort McKay Issues for Discussion – Fish and Fish Habitat (continued)

Row	Reference	Key Issue for Discussion	Shell Response
7	Section 5.3.8, Page 19	<p>“Some species may not thrive in the compensation lake, and regardless of the optimistic outlook of industry and regulators, the degree of success of the compensation lake is unknowable at this time.”</p>	<p>Reservoirs have been built worldwide and have been demonstrated time and again to support fish. The species identified for the compensation lake, which was done in consultation with Fort McKay, all thrive in lake environments. The losses assessed to the project have been calculated very conservatively and include species that are assumed to be present, even when they have never been captured or only captured in very low numbers. The compensation ratio provides an additional level of conservatism that the compensation habitat will more than offset the losses.</p>
8	Section 5.3.9, Page 20	<p>“DFO-authorized habitat compensation is not compensation or mitigation from the perspective of Fort McKay’s lost fishing and other traditional use opportunities due to unknowns about contamination of fish remaining in the system, concerns regarding potential mercury levels in fish in the compensation habitat, the loss of culturally-significant areas and the conversion of river habitat to artificial lakes.</p>	<p>Conversion of stream habitat to lake habitat is a necessity based on the regulatory process and the requirement to achieve 2:1 compensation. Achieving this ratio could not be achieved by constructing streams, which would result in additional huge land disturbances compared to the construction of a lake. In addition, the compensation plan does incorporate stream habitats as a component of the compensation. Most of the species found in the streams that are affected by the project are also well adapted to lake environments.</p>
9	Section 5.4.4, Page 23	<p>“the only remaining fishing opportunity off the Athabasca River in the project area is likely to be in the compensation lake. The fish in the compensation lake (reservoir) might be contaminated with methylmercury. While the compensation lake may be suitable from a DFO-regulatory perspective, Fort McKay community members that formerly enjoyed fishing in the area watersheds will lose this traditional use unless replacement opportunities are made available. The loss of fishing opportunities to Fort McKay, including the loss of traditional river fishing opportunities, is assessed as a significant adverse impact (a red situation).”</p>	<p>No key fishing areas have been identified in the tributaries affected by the Pierre River Mine. The fish species found in these areas are primarily forage species and sucker species. By indicating that all rivers are critical traditional fishing areas, all rivers are treated as equal for traditional fishing areas. This does not seem likely, particularly when many have not been identified as fishing areas in the Fort McKay Traditional Knowledge Report. The species composition and the population of sport fish species will be much greater in the compensation lake than what is available in the existing stream habitats within the Pierre River mine footprint. The conclusion of a significant adverse impact to fishing opportunity appears to not consider the opportunities that the compensation lake will provide in the future. The streams directly affected by the project currently provide poor fishing opportunities, based primarily on the low abundance of species of interest, and therefore any loss to fishing opportunities within the region in the short-term should be considered low as a result of the project. In the future, the compensation lake will provide for improved fishing opportunities within the region, and there would be no adverse impacts to fishing opportunities.</p>
10	Section 5.4.4, Page 23	<p>The Athabasca River mainstem and its tributaries within Fort McKay’s Traditional Lands are mapped as “Intense Use” Culturally Significant Ecosystems (McKillop 1992).</p>	<p>According to Figure 4 in Appendix 9-2 of the FMSA, the Athabasca River and tributaries within the Pierre River Mine are classed as Moderate to Low Use, not Intensive Use as indicated in the text. Further the Athabasca River mainstem within Fort McKay’s Traditional Lands has 119.6 km classed as Moderate Use, and 54.7 km classed in Intense Use.</p>
11	Section 5.4.7, Page 25	<p>“efforts beyond providing a fish habitat compensation lake at its currently planned location (distant from Fort McKay) would help to address the reclaim tenet in terms of lost fishing opportunities.”</p>	<p>The compensation lake should be easier access, as much of the areas lost due to the projects are heavily beaver impounded and movement up the streams during the open-water period by boat or overland would be very difficult. The compensation lake would be proximal to the Athabasca River and likely easier to access than the areas lost.</p>

Chapter 5B Fort McKay Issues for Discussion – Fish and Fish Habitat (continued)

Row	Reference	Key Issue for Discussion	Shell Response
12	Section 5.4.8, Page 26	<p>Project Specific Recommendations</p> <ul style="list-style-type: none"> • A minimum setback of 250 m from the Pierre River Mine project to the Athabasca River to be established. • A minimum setback of 100 m for all other fish bearing watercourses, including all the diversion channels that drain into fish bearing waters, to be established and mandated. • Detailed mitigation and compensation plan and accommodation strategy to be developed in consultation with Fort McKay. • Consultation with Fort McKay regarding the design of the project-specific water quality, sediment quality and fish monitoring program for the Pierre River Mine. 	<p>All of these recommendation are either included as part of the Shell project description or have been committed to in SIRs</p>

Chapter 6 Fort McKay Issues for Discussion - Wildlife

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 6.1, Page 1	"there is a substantial time lag (in many cases decades) between the initial disturbance and the completion of wildlife habitat reclamation, and for that period of time the wildlife populations and habitats that sustain them are unavailable to Fort McKay."	Yes, the EIA acknowledges this; however, from an ecological perspective, wildlife populations are not at risk in the Regional Study Area (RSA) and the RSA is the appropriate scale to scrutinize wildlife populations in an ecological context.
2	Section 6.1, Page 1, and Section 6.2.1, Page 2	"Fort McKay community members remain skeptical of future reclamation success and whether reclamation will result in the restoration of key boreal forest habitats that support their traditional uses." (1) "A major concern is that EIAs frequently conclude that impacts to wildlife habitat will be negligible because it is assumed that reclamation will re-establish lost habitat for wildlife species."(2)	FMFN says their cultural keystone species are moose and beaver. From a reclamation perspective, these two species are the easiest to bring back, so reclamation success for terrestrial species is much more certain. There are challenges regarding peatlands and wildlife species associated with those ecosystems, and industry is working to solve these challenges and is making good headway.
3	Section 6.1, Page1	"concerned about the effect of industrial pollution on wildlife health and the quality of wild meat."	Shell has assessed the effects of industrial pollution on wildlife health in the EIA. The results were summarized in Volume 3, Section 2.4.1.1 and presented in detail in Volume 3, Section 5.4. The findings of the wildlife health risk assessment are summarized as follows: <ul style="list-style-type: none"> In general, there is little to no change between the Base Case and Application Case risk estimates, indicating that the Project is not expected to contribute to potential adverse wildlife health effects. In general, there is little to no change between the Base Case and Planned Development Case (PDC) risk estimates, indicating that the contribution of future projects to wildlife health risks in the Oil Sands Region is expected to be minimal. The quality of wild meat was assessed in the Human Health Risk Assessment, which was presented in Volume 3, Section 5.3. The Human Health Risk Assessment (HHRA) concluded that the Project is not expected to adversely affect the quality of wild meat.
4	Section 6.2.1, Page 2	"There is frustration that observations made by Fort McKay members who spend many hours in the bush (e.g., hunters and trappers) are not taken seriously and are not incorporated into the EIAs."	Shell does report the observations of trappers and considers them as part of the assessment. However, it is not the only information that Shell gathers and Shell does need to consider all information when conducting the assessment. Trapper interviews were used to provide a perspective of various wildlife resources on Local Study Areas (LSAs) and how development has changed those resources (Shell EIA, Volume 5, Section 7.3.1). There is an apparent contradiction with the row below where FMFN suggests Shell should use more empirical data, when generally speaking Traditional Ecological Knowledge (TEK) is anecdotal.
5	Section 6.2.1, Page 2	"EIAs often base conclusions solely on habitat suitability index (HSI) models or other computer models, rather than on the empirical field data."	Empirical field data form the basis of many of the models, moose, Canada lynx, fisher/marten; empirical data are collected for all species of interest to FMFN; the conclusions of the EIA are based on more than HS modelling.
6	Section 6.2.1, Page 2	"Because impacts are assumed to be negligible on a local scale (i.e., local study area), it is viewed as unnecessary to complete an adequate cumulative effects assessment on impacts to wildlife habitat and populations on a regional scale (i.e., regional study area)."	Impacts are not assumed to be negligible on a local scale; during operation Shell acknowledges that the impacts to all wildlife are high in the LSA. An adequate cumulative effects assessment (CEA) is completed both at the LSA and the RSA scale, and both the Application Case and the PDC are CEA cases. In the PDC case, the effects are considered without taking into account reclamation, so it is a very conservative approach.

Chapter 6 Fort McKay Issues for Discussion – Wildlife (continued)

Row	Reference	Key Issue for Discussion	Shell Response
7	Section 6.2.1, Page 2	“Effects are measured against pre-development wildlife habitat levels to assess the cumulative effects of development on Fort McKay’s Traditional Lands and from the perspective of the Community, who view the time period prior to oil sands development as an appropriate baseline for assessment.”	Environmental effects in the EIA are measured from the Base Case to Application Case and PDC. Shell considers this appropriate for a project based EIA which is determining the effects of the Project and it’s contributions to cumulative effects.
8	Section 6.2.3.1, Page 4	“None of the three RSF models assessed (moose, Canada lynx, and fisher/marten) performed well. The validation results indicate that the moose RSF model performed especially poorly “	(Chapter 6, Section 6.2.3.1, page 5, paragraph 2): “However, Fort McKay believes that using computer models to assess quality and quantity of wildlife habitat is still a reasonable approach. RSF models are the best habitat models currently available because they can be easily validated using empirical data, but better RSF models need to be developed for the species considered in this assessment.” Shell agrees with this statement.
9	Section 6.2.4.2, Page 6	“The FTSA is 379,641 ha in area; (study areas that are reflective of traditional use and accessibility – p.10).”	Terrestrial study areas in the EIA are based on ecological parameters, not factors associated with human use, traditional or otherwise; this is more appropriate for an ecological assessment like the wildlife EIA. The FMSA approach reflects their traditional use interests and as such represents impacts to traditional use, not to wildlife from an ecological perspective.
10	Section 6.2.7, Page 7	“Various assessment cases/scenarios described above (i.e., Current Scenario/Base Case, Application Case, Planned Development Case) are compared against the environment prior to oil sands development (i.e., Pre-Development Scenario).”	Shell’s EIA measures responses from the Base Case to Application Case and PDC. Shell considers this appropriate for a project based EIA which is determining the effects of the Project and it’s contributions to cumulative effects.
11	Section 6.2.7.1 Page 8	Duration...a long time (i.e., over 20 years)	Shell’s EIA approach is the same.
12	Section 6.2.7.3 Page 8	“Magnitude-in this assessment the moderate-high and high are combined to determine the total change to wildlife habitat.”	Shell’s EIA approach is similar.
13	Section 6.2.7.3, Table 6-1, Page 9	Table 6-1 “ Geographic Extent -Regional: Effects extends beyond the LSA into the FTSA; Beyond Regional: Effects extended beyond the FTSA – regional effects are weighted as 2, beyond regional as 3 Duration is scored short-term, medium term and long term as 0, 2, 3”	Shell’s Geographic Extent considers regional effects to occur at the RSA, more appropriate for an ecological assessment than the FTSA, which should be considered to be their LSA; weighting is regional=1 and beyond regional=2. Shell’s Duration is scored short-term, medium term and long term as 0, 1, 2. Shell’s approach puts less weight on the geographic extent and duration of an effect. For the purpose of the EIA, Shell considers this more appropriate than the approach taken by FMFN which exaggerates the effects both by considering a relatively small area (the Forty Township Study Area [FTSA]) as the region and increasing the weighting factors associated with them.
14	Section 6.3, Page 21	“The cumulative decrease in moose habitat in the FTSA from Pre-Development to Planned Development Case is a high magnitude (>20%), regional, continuous frequency, long-term, and reversible (15+1+2+3-3). Habitat considered unsuitable (Nil) for moose increased to 33% of the FTSA. The adverse effect is considered high significance (18). This is considered a red situation.”	The assessment does not take into account reclamation. At Shell’s LSA scale, the FMSA findings are the same as Shell’s – during operations there is a high impact. Although this may be important to FMFN, from an ecological perspective it makes more sense to examine the effects of the Project on moose after reclamation. Reclamation for species like moose is well understood and achievable.

Chapter 6 Fort McKay Issues for Discussion – Wildlife (continued)

Row	Reference	Key Issue for Discussion	Shell Response
15	Section 6.3.4.1, Page 22	“Densities of moose from studies completed within Fort McKay’s Traditional Lands from 1973 to 2007 were plotted. The studies had moose density varying from 0.01 moose/sq.km to 0.52 moose/km ² . The data show a slight trend of declining moose density (r=0.13).”	The very low r value indicates that there is no significant trend here (i.e., r ² = 0.17; the line explains less than 2% of the variation in the data). There is too much noise in these data (different survey methods, different areas, etc.) to discern anything with any certainty.
16	Section 6.3.5.1, Page 23	“Moose populations throughout the oil sands region do not significantly change from the early 1990s to 2001. However, in 2009 there is a significant reduction in moose density in WMU 531.”	Again, the differences in survey techniques between 2001 and 2009 preclude arriving at any certain conclusions.
17	Section 6.4, Page 32	“The cumulative decrease in beaver habitat in the FTSA from Pre-Development to Planned Development Case is a high magnitude (>20%), regional, continuous frequency, long-term, and reversible (15+1+2+3-3). Habitat considered unsuitable (Nil) for beaver increase to 79% of the FTSA. The adverse effect is considered high significance (18). This is considered a red situation.”	The assessment does not take into account reclamation; at Shell’s LSA scale the FMSA findings are the same as Shell’s – during operations there is a high impact. Although this may be important to FMFN, from an ecological perspective it makes more sense to examine the effects of the Project on beaver after reclamation. Reclamation for species like beaver is well understood and achievable; the species will be among the first to recolonize reclaimed land. There will be no significant adverse impact to beaver habitat.
18	Section 6.5, Page 42	“The cumulative decrease in Canada lynx habitat in the FTSA from Pre-Development to Planned Development Case is a high magnitude (>20%), regional, continuous frequency, long-term, and reversible (15+1+2+3-3). Habitat considered unsuitable (Nil) for Canada lynx increase to 33% of the FTSA. The adverse effect is considered high significance (18). This is considered a red situation.”	The assessment does not take into account reclamation; at Shell’s LSA scale the FMSA findings are the same as Shell’s – during operations there is a high impact. Although this may be important to FMFN, from an ecological perspective it makes more sense to examine the effects of the Project on lynx after reclamation. Reclamation for species like lynx is well understood and achievable; the species will recolonize reclaimed land once a mosaic of mature forest develops and their primary prey is established. There will be no significant adverse impact to lynx habitat
19	Section 6.6, Page 52	“The cumulative decrease in fisher and marten habitat in the FTSA from Pre-Development to Planned Development Case is a high magnitude (>20%), regional, continuous frequency, long-term, and reversible (15+1+2+3-3). Habitat considered unsuitable (Nil) for fisher and marten increase to 31% of the FTSA. The adverse effect is considered high significance (18). This is considered a red situation.”	The assessment does not take into account reclamation; at Shell’s LSA scale the FMSA findings are the same as Shell’s – during operations there is a high impact. Although this may be important to FMFN, from an ecological perspective it makes more sense to examine the effects of the Project on fisher and marten after reclamation. Reclamation for species requiring terrestrial habitats is well understood and achievable; the species will recolonize reclaimed land once a mosaic of mature forest develops and their primary prey is established. There will be no significant adverse impact to marten habitat
20	Section 6.7, Page 53	“The environmental consequence of habitat change is high for all indicator wildlife species in the Intense Use CSE Area and in the FTSA” “In addition, recent moose surveys have shown that moose populations have decreased in WMU 531. This evidence suggests that habitat loss from oil sands development is adversely affecting moose populations.” “If moose populations are being adversely affected by oil sand development, it is likely that other wildlife species populations are also being adversely affected.”	Although the effects of the Project within the FTSA and the Intense Use CSE may be of interest to FMFN, it does not make sense to assess the effects of the Project on wildlife in this manner; the effects need to be assessed in an ecological context, at the LSA and the RSA scale at Application Case and PDC. Recent moose surveys do not provide this evidence; even with Alberta Sustainable Resource Development (ASRD) has said that there are indications that there may be a decline but the current data do not support or refute that suggestion, there is no evidence presented that suggests that habitat loss from oil sands development is adversely affecting moose populations. To suggest that other wildlife species are declining because moose are is speculation, there are no data to support this statement.
21	Section 6.7,	“ASRD surveys have shown that there has been a moose	See above response.

Chapter 6 Fort McKay Issues for Discussion – Wildlife (continued)

Row	Reference	Key Issue for Discussion	Shell Response
	Page 53	population reduction in WMU 531, which is located in the northwest corner of Fort McKay's Traditional Lands. Further, moose densities appear to be declining in Fort McKay's Traditional Lands. Adverse effects on to moose habitat and moose populations have occurred."	
22	Section 6.7, Page 55	"The moose population and density data presented in this report are based on field observations using similar aerial survey methods. However, because these data do not have confidence limits it is not possible to say, with statistical confidence, that there has been a reduction in moose density. These data should be interpreted as a general trend only."	ASRD has acknowledged that the current data does not prove anything; the r value indicates that there is no significant trend in the longitudinal data; there is too much noise in these data (different survey methods, different areas, etc.) to discern anything with any certainty...it cannot be used for general trends (i.e., $r^2 = 0.17$; the line explains less than 2% of the variation in the data).
23	Section 6.7, Page 55	"However, moose survey data from WMU 531 in the northwest portion of the Fort McKay's Traditional Lands do show a statistically significant reduction in moose populations."	ASRD has said that there are indications that there may be a decline but the current data does not support or refute that suggestion. Shell's own surveys of the upper Muskeg River indicate a healthy moose population in suitable habitat, Pierre River side has fewer moose but habitat is not as good so that's expected.
24	Section 6.8, Page 56	"while reclamation is critical, Fort McKay does not consider it mitigation due to the length of time the land is disturbed and uncertainties associated with recreating wildlife habitat and the length of time it would take to re-colonize that habitat."	Shell acknowledges that during operations the impacts on wildlife will be high in the LSA, but Shell has a high confidence in restoring terrestrial wildlife habitat, the key to many of the FMFN's cultural keystone species(in particular moose and beaver are species that will be among the first to recolonize the reclaimed landscape).

Chapter 7 Fort McKay Issues for Discussion – Vegetation

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 7.2.3.2, Page 5	RSA (Golder) versus FTSA (FMFN).	The RSA used in Shell's assessment is based on ecological criteria developed from indicators and projected effects (i.e., air emissions) (refer to Section 7.2.4, Pages 7-17/18 in Volume 5 of the EIA for specific details). The FTSA is based on community-specific requirements. We understand the approach used by the FMFN, but using the 40 township scenario eliminates consideration of the broader regional situation, which demonstrates that within the region effects are not as high in the long-term. Scale is of course subjective, therefore that is why the RSA is based on ecological criteria.
2	Section 7.2.1, Page 3	"The Pre-Development Scenario represents conditions prior to the occurrence of industrial development and is based on the condition of vegetation resources in the 1960s. It was prepared in the regional ecological land cover (ELC) data format based on Landsat data. It was not possible for Shell to develop AVI mapping (ecosite phase and wetland) for the Pre-Development Case for the FTSA due to lack of data from that period, and time constraints. The Late 1990s Scenario is a presentation of vegetation cover in the AVI data format as it existed in the late 1990s. This scenario was developed for the FTSA as a surrogate for pre-development. It represents vegetation conditions before a number of the newer mines were created; however, Syncrude's Mildred Lake and Aurora North, Suncor (Fee Lot 2 and Lease 86/17) and a number of other disturbances (i.e., roads, pipelines, cutlines, sawmills and wellsites) were developed by this time."	Use of surrogate 1990's Scenario (Alberta Vegetation Inventory [AVI]) and Pre-Development Scenario uses two types of imagery. Verification and reclassification of ecosite phases and wetlands types, based on plot data and air photograph interpretation, was not completed. This reduces the accuracy of data and vegetation maps used in the 1990's Scenario dataset.
4	Section 7.3.3.2, Pages 41-42	"In the PDC-closure, the net increase (57%) of upland forest results in a score of high environmental significance as compared to the Base Case."	High environmental consequence should not result in negative effect since more forest will be returned to reclaimed landscape.
5	Section 7.3.3, Page 46	"While a net increase in upland is considered positive for the indicator when viewed in isolation, the corresponding decrease in wetlands is negative; the combined effect will result in a more homogenous landscape at closure." (see Section 10 and Section 8.5). "The net increase in upland forest ranked with low rare plant potential when compared to Pre-Development conditions is also considered as negative consequence by Fort McKay."	Suggests that putting back uplands is negative; FMFN is regarding increase in uplands as a negative because wetlands are being lost. This assigns impacts to wetlands to two locations. Conclusion is repetitive since this is discussed in wetlands section.
6	Section 7.3.4 Table 7-4, Page 45	"PDC-Closure to Base Case for Rare Plant Potential-low."	High negative consequence attributed to indicator, rare plant potential low (increase 50%). This is not viewed by Shell as a negative since it is increasing.
7	Section 7.4.2.3, Page 52	"The three wetland land cover classes present in the Pre-Development Scenario remain in the Project Base Case but are reduced to 126,789 ha (33%) of the land area in the FTSA." <i>versus</i> "The area occupied by peatlands decreased to 24% (91,256 ha) of the FTSA in the Base Case."	Considerable differences between Pre-Development Scenario and AVI base dataset; this is a scale issue, although the differences are very high, with landsat based estimates being approximately 28% higher than the AVI data. This is likely due to not verifying or refining AVI data used in assessment.

Chapter 7 Fort McKay Issues for Discussion – Vegetation (continued)

Row	Reference	Key Issue for Discussion	Shell Response
8	Section 7.4.3.1, Page 54	<p>“Reclamation and closure will not be effective in mitigating the losses to wetlands. Following closure, wetlands will have decreased by 11,931 ha (12%) in the FTSA to 89,096 ha (23%) from 101,027 ha (27%) at the Base Case. Nine of the 10 wetland types found in the FTSA will decline in area following closure. The only wetland type that does not decrease in area as result of the Project(s) is the marsh unit (MONG). The wooded fen and shrubby fen experience the greatest declines at 4,806 and 3,537 ha, respectively; this represents a loss of 15 and 16% of the resource in the forty township block area for these units.”</p>	<p>Shell has assessed and acknowledged impacts to wetlands in the EIA. Overall, Shell has taken a conservative approach to wetland reclamation in the EIA given uncertainties associated with reclamation. The CC&R plan presented in the EIA indicates that some mineral wetlands will be reclaimed (254 ha for Pierre River mine and 978 ha for Jack pine mine as “littoral zone”). EIA also indicates there may be more opportunities for reclamation depending on final hydrological schemes established.</p>
9	Section 7.5.2.2, Page 69	<p>“While it is helpful to rank traditional use plant potential for assessment purposes, the criteria used in this ranking system may not coincide with the values or experiences of community members harvesting traditional use plants. Therefore results of this ranking system might not meaningfully articulate areas that traditional land users would consider of high value. For instance, plants that have low frequency and percent cover in the landscape [such as rat root (<i>Acorus americanus</i>)] may be of significant value to the community. In the system used by Shell (2007), these species do not influence the ranking system, and ecosites in which they occur may get a low TU potential ranking but are indeed of high significance to the Community.”</p>	<p>Uncertain how integrating low frequency/low percent cover species or weighting the species in Traditional Plant Potential assessment will change the results. Integrating this info is a subjective step, where as the assessment is quantitative in scope. Ultimately the Traditional Plant Potential assessment was not designed to measure community value but rather provide an estimate of relative frequency/abundance of traditional species on the landscape.</p>
10	Section 7.5.2.2, Page 69	<p>“The location of berry producing sites (FMFN 1994) has been overlain on FTSA subset of the Ducks Unlimited Enhanced Wetland Classification for the Al-Pac Boreal Conservation Project (Ducks Unlimited 2008) to show relationships between traditional use berry sites with the land cover class. Due to the scale of the Fort...”</p>	<p>It would be useful to the reviewer to state why Ducks Unlimited imagery was used here. The Ducks Unlimited imagery was not used in other parts of the assessment. Another option would have been to refine AVI/wetlands data for the FTSA. This would allow for more continuity.</p>
11	Section 7.4.2.2, Page 48 versus Section 7.5.2.2, Page 75	<p>Wetlands occupied about 36% (136,419 ha) of the landscape in the Late 1990s Scenario. Wooded fens were most abundant (12%) while wooded bogs and shrubby fens covered about 10% and 8%, respectively. A total of 10 wetland classes were mapped in the FTSA; this is eight fewer than the total number of classes mapped in the LSAs presented in the 2007 Application. Fewer classes are used because “the Golder ecosite phase and wetlands type automated mapping system was applied to the FTSA” (Golder 2009) and detailed verification and reclassification based on plot data and air photograph interpretation was not completed. Although these steps are generally completed for detailed mapping it was not possible for the FTSA given the time and budget constraints. This lack of differentiation may mask the effects to some wetlands types since they are not included in the FTSA mapping.</p> <p>“About 42% (160,508 ha) of the FTSA consisted of wetlands in the late 1990s/early 2000s as mapped by Ducks Unlimited (2008) (Appendix 7-1, Table 15). Excluding burned areas, the area occupied by wetlands, as delineated by Ducks Unlimited (2008) declined by about 44,150 ha (28%) over the same period to cover about 28% of the FTSA in the Base Case. Declines in area of all wetland types occurred over this period; these losses ranged between 17% and 31%.”</p>	<p>As per line above, refining available data (AVI/wetlands data) for the FTSA would have allowed for more continuity. Using two datasets does not improve the analysis, it only adds to the overall uncertainty. It would also be useful to state whether or not Ducks Unlimited ground truth their sites. We applied a ground-truthing step to the RSA and LSA areas.</p>

Chapter 7 Fort McKay Issues for Discussion – Vegetation (continued)

Row	Reference	Key Issue for Discussion	Shell Response
12	Section 7.5.3.1, Page 78	"Further, this assessment does not indicate the unique significance of wetland sites to support particular traditional use plants. Rather, it views all species as equal in significance and simply implies that if 11 to 17 species identified as having traditional use are present with moderate to high cover, then the site is of high value. Other factors, which may influence the selection of traditional use sites by the Fort McKay Community members, such as proximity to cabins, trails, or other historical sites, are not considered in the assessment methodology."	Unclear how this criteria would influence Traditional Plant Potential results. Inclusion of berry sites would provide some site specific detail, but may not change results. This is a measure of community value rather than a measure of environmental impact.
13	Section 7.5.3.1, Page 80	"The small increase (3%) in lands ranked with low potential results in a low magnitude, local, far future, partially reversible and low frequency adverse effect (5+0+3+0+0 = 8) of low significance (a green situation). Although the increase is positive in direction the effect is considered adverse since an increase in areas with the lowest traditional use potential is predicted."	Low potential does not mean "not present" or "low value", reclamation will allow for establishment of Traditional Use Plant species.
14	Section 7.5.3.2, Page 84	"Low ranked land is also expected to increase by 25% (21,741 ha) in the far future when compared to the Pre-Development Scenario. Fort McKay does not believe that the replacement of moderate ranked lands that occur in the natural landscape with low ranked, (reclaimed) non-treed wetlands and water bodies (i.e., pit lakes) is a positive effect."	There will be some diversity on the reclaimed landscape and overtime a greater number of species can be expected to establish on the reclaimed landscape and wildlife, wind and other factors facilitate seed spread. This effect is documented in the literature.
15	Section 7.5.3.2, Pages 85 and 85	"The decrease (34%) in land occupied by the low ranked class is expected to result in a negative, high magnitude, regional, far future, partially reversible, high frequency effect of (15+1+2-0+2=20) of high environmental consequence. The effect should be considered positive, as compared to the Base Case, because disturbed land is being reclaimed that will have some potential to contain traditional plants." <i>versus</i> "The increase (25%) in low ranked land is positive in direction, high magnitude, regional, far future, partially reversible, medium frequency effect of (15+1+3+0+1 = 20) of high significance. In this case the overall effect should be considered as negative and a red situation because the increase occurs in the lowest ranked class, which contains lower potential for traditional use plants when compared to undisturbed/natural conditions."	There are different effects attributed to low-ranked traditional plant potential depending on the scenario assessed. In one instance reclamation appears to be viewed positively while in the second instance reclamation appears to be viewed negatively. Shell believes reclamation should be viewed as a positive.
16	Section 7.5.4 Table 7-7, Page 90	Indicator: TUPP - low class Indicator: Wetlands and Traditional Plants	Low class does not imply "no" or "low value" Traditional Use Plant Potential, just that potential may be lower than other categories. Net change PDC to Pre-Development should not be "red". An explanation as to why wetlands are being "lumped-in" / combined with Traditional Use Plant Potential would be useful. This is repetitious because impacts to wetlands have already been assessed.
17	Section 7.7, Page 92	"The Jackpine Mine Expansion and Pierre River Mine Projects will result in the direct disturbance and loss of 22,284 ha of land. This includes the loss of 7,337 ha of upland forest over 28 ecosites phases and 11,942 ha of wetlands across as many as 18 wetland types."	Shell's EIA has similar conclusions.
18	Section 7.7, Page 92	"The incremental effects of the Projects are negligible or low for all upland vegetation indicators in the Application Case – closure, except for moderate adverse effect for the low ranked rare plant potential class, when compared to the Base Case."	This result is expected. Shell would likely get a similar result if FTSA used. Shell's EIA shows similar results as FMSA as it relates to effects to wetlands, despite the scale, so these results are expected.

Chapter 7 Fort McKay Issues for Discussion – Vegetation (continued)

Row	Reference	Key Issue for Discussion	Shell Response
19	Section 7.7, Page 92	"Effects of moderate and high significance are observed on upland vegetation indicators when cumulative effects of the Projects and all developments that have occurred since the late 1990s are compared to the Late 1990s Scenario."	This result is in part a function of the scale of the FTSA. But based on that scale, these conclusions would be expected.
20	Section 7.7, Page 93	"Effects of moderate and high environmental significance are observed for upland forest when the PDC is compared to the Base Case except for the moderate ranked rare plant potential indicator. The cumulative effects on upland forest and related indicators are considered of high environmental significance in the PDC when compared to Pre-Development conditions except for the moderate ranked rare plant potential indicator."	This result is expected. Shell would likely get a similar result if FTSA were used. Shell's EIA shows similar results as FMSA as it relates to effects to wetlands, despite the scale, so these results are expected.
21	Section 7.7, Page 93	"The assessment of the PDC-closure cases is predicted to result in high magnitude changes in the positive direction for upland forest and associated indicators since reclamation and closure will result in the net increase in the land area occupied by upland forest. The net increase in upland forest ranked with low rare plant potential when compared to Pre-Development conditions is also considered as a negative consequence by Fort McKay."	Low-potential forest can still yield Traditional Use Plant benefits. This should not be viewed as a negative consequence. Forest succession over time can be expected to result in the natural diversification of forest types, assuming a reclaimed landscape with diverse topographical features. It would be helpful to the reviewer if the FMSA explained why this is classified as a negative consequence.
22	Section 7.7, Page 93	"The incremental effects of the Projects as compared to the Base Case are adverse and highly significant for the direct loss of total wetland and peatland areas, as well as the high rare plant potential class for wetlands."	The results presented by the FMFN are scale dependent and it is not agreed that the loss of wetlands and high rare plant potential are adverse and highly significant in the RSA.
23	Section 7.7, Page 93	"A significant adverse effect is demonstrated for all wetland indicators when the cumulative changes predicted in the Application Case are compared to conditions in the Late 1990s. Cumulative losses in all wetland indicators of 26 to 37% have occurred since the later part of the 1990s."	Shell's results also account for existing disturbances and the use of late 1990's scenario shows incremental changes, rather than highlights new information. It is not agreed that cumulative loss of wetlands within the RSA, as used by Shell, results in a significant adverse impact. .
24	Section 7.7, Page 93	"The net change and associated environmental consequences associated with the PDC are considered as adverse and high (i.e., significant effect) when compared to the Base Case for the wetland area, peatland and high rare plant potential indicators. The effects are adverse and significant for all indicators in the PDC when compared to Pre-Development conditions."	This should not apply to upland forested areas that will be reclaimed.
25	Section 7.7, Page 93	"The assessment of the PDC-closure case demonstrates adverse, significant effects for the losses of peatlands and moderate rare plant potential areas when compared to the Base Case."	This result is expected. Shell would likely get a similar result if FTSA used. Shell's EIA shows similar results as FMSA as it relates to effects to wetlands, despite the scale, so these results are expected.
26	Section 7.7, Page 93	"Wetland area at PDC-closure is predicted to be 25% less when compared to Pre-Development conditions. Significant adverse effects are observed for all wetland indicators in the PDC-closure when compared to Pre-Development."	This result is expected and similar to the EIA results.
27	Section 7.7, Page 93	"Land with high traditional use potential will decrease in both the Application and PDC cases. The cumulative decreases in land with high traditional plant potential that are observed when the Application is compared to the Late 1990s and PDC to Pre-Development are considered adverse and significant. Following closure, the area of lands with high traditional use potential is predicted to increase. This is due to a predicted increase in the area covered by upland ecosites that have the potential, if successfully reclaimed to pre-disturbance equivalency, to contain a high number of traditional use plants with moderate to high covers."	This result is largely dependent of the scale of the FTSA. Use of the small scale regional RSA will result in more pronounced impacts.

Chapter 7 Fort McKay Issues for Discussion – Vegetation (continued)

Row	Reference	Key Issue for Discussion	Shell Response
28	Section 7.7, Page 94	"The effects to the land with moderate traditional use plant potential are expected to be significant in comparison of the PDC to the Pre-development Scenario and for PDC-closure to the Pre-Development Scenario. The decrease in moderate ranked lands is largely due to the loss of wetlands and the inability of reclamation to mitigate these losses, especially in peatlands."	This result is expected. Shell would likely get a similar result if FTSA were used. Shell's EIA shows similar results as FMSA as it relates to effects to wetlands, despite the scale, so these results are expected.
29	Section 7.7, Page 94	"Land ranked with low traditional use potential increases in all closure scenarios. In some cases this is due to the reclamation of disturbed land; however, the net increase in low ranked land in PDC-closure compared to pre-development conditions may be significant. Fort McKay believes this is a negative effect since naturally occurring wetlands and uplands are replaced with a larger area of low ranked sites (i.e., reclaimed non-treed wetlands and water bodies)."	The FMSA does not seem to include reclamation and value of low-ranked areas. Low-ranked areas do have ecological value. Non-treed wetlands and fringes of waterbodies may provide riparian habitat suitable for some traditional species. This is unknown at this time, but benefits of these area should not be categorically refuted (i.e. look to riparian areas around naturally occurring marshes and ponds).
30	Section 7.7, Page 94	"The irreversible loss of four traditional use berry sites is rated a moderate for the Application Case and the loss of 12% of the sites in the PDC compared to the Base Case is rated as highly significant. The cumulative losses of traditional berry sites are found to be adverse and significant when compared to the late 1990s or pre-development. While Fort McKay acknowledges that berry producing sites may be created with reclamation these historical traditional use sites cannot be re-created to pre-development conditions or to a modified form for at least two to three generations. The cumulative loss of 54% of the traditional use berry sites under the PDC since development began is highly significant to the Community."	While the direct replacement of lost berry picking sites is unlikely to be achieved by reclamation because of alterations to the landscape due to mining processes, it is reasonable to expect that berry sites can be re-established on the reclaimed landscape, if proper soil conditions exist.
31	Section 7.7, Page 94	"The loss of wetlands for traditional use is highly significant for all cases and scenarios considered in this assessment."	Loss of wetlands within the LSAs is significant; however at the RSA scale considered by Shell, it is not agreed that wetland loss is highly significant.

Chapter 8 Fort McKay Issues for Discussion- Biodiversity

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 1.7.1, Page 23	Duration <ul style="list-style-type: none"> • Short-term (< 3 years): score = 0 • Medium-term (3 to 10 years): score = +1 • Long-term (10-20 years): score = +2 • Far-future (one to several generations): score +3 	The duration criteria used in the FMSA may be appropriate for an assessment specific to the community of Fort McKay, however it is not appropriate for an EIA-level assessment of project impacts. The temporal considerations for the EIA are based on the description of the Project and include unique conditions that may affect environmental components differently. The Terrestrial Components of the EIA examine the Project under three temporal conditions: pre-development, full development and closure. Although there will be some phasing of both the removal and reclamation of terrestrial systems, this sequential development and reclamation process is not directly included in the assessments, which consider either that everything is undeveloped, developed or reclaimed. This is a conservative approach so effects are not underestimated.
2	Section 1.7.1, Page 23	Reversibility <ul style="list-style-type: none"> • Irreversible (occurs once): score = +3 • Reversible (intermittent): score = -3 • Partially reversible (continuous): score = 0 	Shell did not use a “partially reversible” (=0) score for the biodiversity assessment. Using a “partially reversible” score would not change the environmental consequences of the biodiversity EIA. This approach is appropriate for biodiversity and could be incorporated into future EIAs.
3	Section 8.2.1, Page 2	“The FTSA is intended to provide information on biodiversity indicators for land centered on the Community of Fort McKay for use in the assessment of the effects of the proposed Projects on biodiversity.”	The FTSA may be appropriate for an assessment specific to the community of Fort McKay, however it is not appropriate for an EIA-level assessment. The Terrestrial RSA was developed with consideration of all terrestrial components (soil and terrain, terrestrial vegetation, wetlands and forest resources, wildlife and wildlife habitat and biodiversity). The RSA was established to assess the importance of the Project within a broad, ecologically relevant, regional area. The RSA boundary was defined with consideration of the following terrestrial resources: <ul style="list-style-type: none"> • ecodistrict boundaries; • geographic or topographic boundaries such as the eastern shoulder of the Birch Mountains; • defined woodland caribou habitat areas (e.g., Audet, Firebag and Steepbank caribou areas); • average distance of two moose home ranges from oil sands developments (about 26 km); • allowances for the major river systems (e.g., Athabasca and Clearwater rivers) that act as natural study boundaries; and • inclusion of the community of Fort McMurray and other areas likely to expand in the future. The RSA covers an area of 2,277,376 ha. Therefore it is larger than the FTSA (379,641 ha) but smaller than Fort McKay’s Traditional Lands, which encompass 3,526,226 hectares. The LSAs cover 50,640 ha.
4	Section 8.2.3.2, Page 6	“Unless otherwise noted, the assessment of effects to biodiversity indicators in the Application Case-closure is based on Shell’s assumption that reclamation will be successful in creating the ecosites and wetlands as documented in the C, C&R Plan (Shell, 2007) or in the Planned Development Case-closure using plans developed for all other existing and approved projects within the FTSA.”	Shell assessed environmental consequences after reclamation because Shell is confident that their reclamation will be successful.

Chapter 8 Fort McKay Issues for Discussion- Biodiversity (continued)

Row	Reference	Key Issue for Discussion	Shell Response
5	Section 8.3.2.1, Page 12	"The four class ranking system differs from the three levels of biodiversity potential (i.e., high, moderate and low) used by Shell (2007) in the Project Application. In this assessment, the land cover classes that were not assigned a biodiversity score were separated from the low biodiversity potential class to form the very low class. These unranked classes include disturbances, cutblocks and burns."	This approach is okay for presentation purposes and could be incorporated into future EIAs. However, the use of this approach would not change the conclusions of the Shell 2007 EIA. Shell appropriately discussed changes in disturbance as it relates to biodiversity throughout the 2007 biodiversity assessment.
6	Section 8.3.3.1, Page 24	"The effects of the Projects to the landscape heterogeneity are assessed based on changes to cover class area in each of the scenario/cases for the FTSA. The patch type with the greatest decrease in class area, typically the wetland patch, is used to assess significance."	Similar approach used in the Shell EIA, however, Shell conducted a more detailed assessment of landscape fragmentation in their landscape-level analysis.
7	Section 8.4, Page 29	"Land ranked with high biodiversity declines in the FTSA as a result of the Projects (Application)."	Same conclusion as Shell's EIA. Shell EIA, Volume 5, Section 7.5.6.4: At the ecosystem level, the change in biodiversity potential in the LSAs is a result of the conversion of wetlands with high biodiversity potential to ecotone phases and wetlands types with moderate and low biodiversity potential.
8	Section 8.4, Page 29	"Effects of moderate magnitude and consequence are observed in both the Application Case and Application Case-closure."	Conclusions are proportional to the size of the study area: i.e., LSAs = high, FTSA = low to moderate, RSA = negligible to low. Shell EIA, Volume 5, Section 7.1.1: The changes in biodiversity at the three levels of biological organization is predicted to be negative and of high environmental consequence in the LSAs and low in the RSA. In the LSAs, the Project will result in high environmental consequences for wetlands.
9	Section 8.4, Page 29	"A significant adverse effect is demonstrated when the cumulative changes of clearing in the Application Case is compared to the Late 1990s Scenario."	It is difficult to compare to findings of Shell's EIA due to the scenario gap. A pre-disturbance/late 1990s case was not assessed as Shell's EIA cases are defined in compliance with the EIA TOR.
10	Section 8.3.3.2, Page 25	"In the PDC - closure, the amount of land occupied by the high potential wetland types is expected to increase by 9% over the Base Case."	Despite an increase in wetlands types with high biodiversity potential in the PDC-closure, the FMSA rates the environmental consequence as adverse and low because high-ranking non-peatland wetlands will replace high-ranking peatland wetlands in the closure landscape. Shell does not agree with this approach because non-peatland wetlands are known to support high levels of biodiversity. For example MONG and SONS (non-peatland wetlands) are ranked the same as various types of treed fens (peatlands) in their ability to support rare plants. Therefore, an increase in habitats with high biodiversity potential at PDC should not be treated as a net loss of land with high biodiversity potential.
11	Section 8.4, Page 29	"The net loss of land with high biodiversity potential in the PDC is a moderate consequence in comparison to the Base Case, however the loss to high ranked land in the PDC compared to the Pre-Development Scenario is significant and adverse. Some disturbed area is expected to be reclaimed to land with high biodiversity potential following reclamation and closure. As a result, the net decrease and consequence in the PDC-closure when compared to the Base Case is low."	This statement contradicts the statement in Section 8.3.3.2 on page 25: "In the PDC - closure, the amount of land occupied by the high potential wetland types is expected to increase by 9% over the Base Case." Shell's conclusion was more consistent with the above statement (EIA, Volume 5): At closure in the PDC, areas with high biodiversity potential will increase by 18,045 ha (1%) in the RSA (Table 7.6-10). This is mainly a consequence of an increased abundance of non-treed wetlands, specifically riparian shrubland, which have potential to become high-ranking wetlands types.

Chapter 8 Fort McKay Issues for Discussion- Biodiversity (continued)

Row	Reference	Key Issue for Discussion	Shell Response
12	Section 8.4, Page 29	"The consequence to high ranked land is moderate for the loss that occurs from the Pre-Development Scenario to PDC-closure. The magnitude of loss is very near to creating an adverse effect for this indicator."	It is difficult to compare to findings of Shell's EIA due to the scenario gap. A pre-disturbance/late 1990s case not assessed as Shell's EIA cases are defined in compliance with the EIA TOR.
13	Section 8.4, Page 29	"It should also be noted that the low and moderate consequences in the PDC-closure are dependent on reclamation restoring biodiversity values comparable to pre-disturbance conditions." "Although Shell (2007) has high confidence in the biodiversity rankings assigned to each ecosite phase, wetland type or regional land cover type there is only low to moderate confidence in the reclamation of these vegetation types at closure. Fort McKay has low confidence that reclaimed wetlands will restore high biodiversity values, equivalent to pre-disturbance conditions, across many tens of thousands of hectares of the landscape for many generations."	Shell believes that their reclamation will be successful based on the holistic approach Shell has towards reclamation. 'Successful reclamation' includes creating functioning ecosystems typical of the boreal forest region. Targets and benchmarks are being developed to measure how ecosystems are functioning, and when they can be considered for certification. Traditional species typical of the boreal forest are anticipated to be present within the closure landscape, as they were in pre-development conditions.
14	Section 8.4, Page 31	The assessment found that the effect to lands with moderate biodiversity potential is low and negligible in the Application Case and Application Case-closure compared to the Base Case. The loss of moderate ranked land is adverse and significant in the Application Case when compared to the Late 1990s Scenario. The decrease in moderate ranked lands in the PDC results in a low consequence effect. However, a significant adverse effect is associated with the cumulative losses of moderate ranked lands in the PDC compared to the Pre-Development. A net increase in the area of land with moderate biodiversity potential that occurs in the PDC-closure compared to the Base Case is a positive, significant effect. A positive increase of moderate consequence is observed in the PDC-closure when compared to the Pre-Development Scenario.	Shell reached the same conclusion when similar scenarios are compared i.e., base case to PDC-closure. For example, at closure in the PDC, areas with moderate biodiversity potential will increase by 82,474 ha (4%) in the RSA (Shell EIA Vol 5, Section 7).
15	Section 8.4, Page 31	At the landscape level an increase in terrestrial land cover in combination with a decrease in wetland cover result in a more homogeneous landscape for several scenario and cases.	Shell reached the same conclusion. Shell EIA, Volume 5, Section 7.5.6.4: The composition of the landscape in the LSAs will be more homogeneous at closure because patch richness decreases and wetlands types will be replaced with more uniform terrestrial habitat types.
16	Section 8.6, Page 32	"This Fort McKay Specific Assessment has demonstrated that adverse effects of low to moderate consequence will occur to specific biodiversity indicators as a result of the Projects in the Application Case and at Application Case-closure."	Conclusions are proportional to the size of the study area. Shell would likely have reached similar conclusions for biodiversity had they used the FTSA as their RSA.
17	Section 8.6, Page 32	"Significant adverse effects to several biodiversity indicators have been demonstrated when the Project and Planned Development Cases are compared to the late 1990s and pre-development."	It is difficult to compare to findings of Shell's EIA due to the scenario gap. A pre-disturbance/late 1990s case was not assessed as Shell's cases are defined in compliance with the EIA TOR.

Chapter 8 Fort McKay Issues for Discussion- Biodiversity (continued)

Row	Reference	Key Issue for Discussion	Shell Response
18	Section 8.6, Page 32	"The incremental effects of the Projects in the Application Case – closure are of negligible to moderate consequence when compared to the Base Case. Moderate adverse effects are demonstrated for the high biodiversity potential class and for landscape heterogeneity at closure."	Conclusions are proportional to the size of the study area. Shell would likely have reached similar conclusions for biodiversity had they used the FTSA as their RSA.
19	Section 8.6, Page 32	"Adverse effects of high significance (red situation) are observed on all biodiversity indicators when cumulative effects of the Projects and all developments that have occurred through the Application Case are compared to the Late 1990s Scenario."	It is difficult to compare to findings of Shell's EIA due to the scenario gap. A pre-disturbance/late 1990s case was not assessed as Shell's cases are defined in compliance with the EIA TOR. Furthermore, Shell only assessed environmental consequences after reclamation because Shell is confident that their reclamation will be successful.
20	Section 8.6, Page 33	"Effects of moderate environmental consequence (yellow situation) are observed for biodiversity indicators (i.e., high, moderate and low biodiversity potential classes and to heterogeneity) when the PDC is compared to the Base Case."	Shell only assessed environmental consequences after reclamation because Shell is confident that their reclamation will be successful.
21	Section 8.6, Page 33	"Significant adverse effects (high/red situation) are observed for all biodiversity indicators when the PDC is compared to pre-development."	It is difficult to compare to findings of Shell's EIA due to the scenario gap. A pre-disturbance/late 1990s case was not assessed as Shell's cases are defined in compliance with the EIA TOR. Furthermore, Shell only assessed environmental consequences after reclamation because Shell is confident that their reclamation will be successful.
22	Section 8.6, Page 33	"Significant increases in the abundance of moderate and low ranked biodiversity classes occur in the PDC-closure when compared to the Base Case. Fort McKay considers the increase in land with low ranked potential to be adverse and significant since higher ranked lands are replaced in the landscape. A significant adverse effect is also demonstrated for the landscape heterogeneity indicator."	Shell obtained similar results for moderate biodiversity in the PDC-closure when compared to Base Case in the RSA (i.e., a 4% increase). Because Shell included disturbed areas in the low-ranking biodiversity class, comparisons can not be easily made between the FMSA and Shell's EIA. Overall, Shell reported a decrease (4%) in areas ranked low for biodiversity potential in the RSA. However, the overall conclusions are proportional to the size of the study area. FMSA reports adverse consequences ranging from low to high in magnitude. Shell reports negative and high environmental consequence in the LSAs at Application and negative, low environmental consequences in the RSA at PDC. For the landscape-level analysis, at closure in the PDC, the permanent loss of wetlands (including peatlands) and old growth forests was predicted to have a low, negative environmental consequence after closure and reclamation (EIA, Vol. 5, Section 7.6.4.1). This differs from the FMSA conclusion and the difference can be attributed to the discrepancy in study areas.
23	Section 8.6, Page 33	"A significant adverse increase in the abundance of the low ranked biodiversity class and landscape heterogeneity indicator occurs in the PDC-closure compared to pre-development."	It is difficult to compare to findings of Shell's EIA due to the Scenario gap. A pre-disturbance/late 1990s case not assessed as Shell's cases are defined in compliance with the EIA TOR.
24	Section 8.6, Page 33	"Returns to pre-disturbance levels of diversity on reclaimed areas have not yet been demonstrated at the ecosystem or landscape level."	See AENV SIR, Round 1, PRM 437a for a description of limitations and research related to the re-establishment of peatlands

Chapter 9 Fort McKay Issues for Discussion – Disturbance and Access

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 9.3.2.4, Page 16	<p>“The incremental loss of 22,796 ha on an already adversely affected Base Case is considered a significant adverse effect (a red situation) that requires immediate mitigation and accommodation, for project-specific and cumulative effects, to be developed in consultation with Fort McKay”.</p> <p>“Currently, over 130,000 ha of land within Fort McKay’s Traditional lands is directly disturbed; this is a substantial amount of land disturbance, which adversely impacts Fort McKay’s ability and opportunities to use the land for traditional purposes.”</p> <p>“The Base Case incrementally adds another 34,465 ha loss within Fort McKay’s Traditional Lands; about two-thirds (21,695 ha) of this loss occurring within the FTSA.”</p> <p>“Shell’s proposed projects would add another 22,796 ha direct disturbance – all of it occurring within FTSA and 97% of that within Intense and Moderate use CSEs.”</p> <p>“Tables 8.3.10, 8.3.11, and 8.3.12 (Shell 2009) also show that about 97% of the Projects will within the Intense or Moderate use areas of the All Traditional Uses, Large Game Harvesting, and Traditional Plant Harvesting CSEs. The Fish, and Furbearer CSEs were not available to be calculated by Shell 2009. The above Tables also show that the Projects represent about 3% of the Intense or Moderate use areas of CSEs.”</p> <p>“Tables 8.3.10, 8.3.11, and 8.3.12 (Shell 2009) also shows the percent disturbances for the Low, Moderate, and Intense Use areas of the All Traditional Uses, Large Game Harvesting, and Traditional Plant Harvesting CSEs.”</p>	<p>Shell assessed disturbances to LSA, FMFN’s Traditional Lands (“All Traditional Uses” CSE), “Large Game Harvesting” CSE, and “Traditional Plant Harvesting” CSE for three case scenarios but did not assign significance.</p> <p>FMSA identifies “ability and opportunity to use land for traditional purposes”. It would be useful to the reviewer if specific pathways and endpoints were given.</p> <p>While the significance is rated ‘red’, the method to assign significance is not explained. For example, although Fort McKay indicates in FMSA Section 9.2.4 that disturbance and access effects near their TLU lands, traplines, and Intense and Moderate Use CSEs are considered ‘high magnitude’, there is no discussion of a possible range of effects, or whether it could be possible to have an effect that was positive in direction (e.g., increased access to traplines for older trappers that rely on motorised transportation).</p> <p>The FMSA assessment is not clear on what mitigations were considered.</p> <p>Note: Under the Base Case, Shell calculated 168,213 ha disturbance (not including burned areas) within the All Traditional Uses CSE.</p>
2	Section 9.3.2.5, Page 16	<p>“Under the Planned Development Case a total loss of 316,303 ha is predicted. This cumulative loss of land upon which to practice traditional activities is assessed by Fort McKay as a significant adverse effect (a red situation), that requires mitigation and accommodation, to be developed in consultation with Fort McKay”.</p>	<p>Shell (2007) assessed PDC disturbances in the TLU assessment as well as in the biophysical assessments.</p>

Chapter 9 Fort McKay Issues for Discussion – Disturbance and Access (continued)

Row	Reference	Key Issue for Discussion	Shell Response
3	Section 9.3.3.5, Page 18	"In the Base Case there is substantial loss of Traplines, indirect impacts (e.g. noise, dust) and access issues (e.g., access through and around mine sites, increased access [to] recreationalists and non-aboriginal hunters). The incremental effects of the Application Case would worsen an already significantly adverse (red) situation related to Traplines and associated traditional land use".	The linkages could be more explicit. There is reference to potential effects of noise and dust on traplines, but it is not clear if these are potential effects to wildlife (noise), vegetation (dust), or to trapline users. There is also reference to changes in access and potential effects on aboriginal and non-aboriginal resource users in the trapline areas. Shell (2007, Volume 5, Section 8.3.5.4) assessed the disturbances to traplines and also indicated that "[a]lthough much of the [wildlife] habitat will be reclaimed at closure, this will occur long after the current trapper's lifetimes."
4	Section 9.3.3.6, Page 18	"In the PDC due to the substantial loss of trapline area, on-going indirect effects on Traplines (noise, odours, traffic, vandalism), the access issues associated with portions of Traplines being blocked off due to industrial development and the potential for even further disturbance, cumulative PDC effects on Traplines are considered significant and adverse (a red situation)".	There is reference to "...access issues with portions of Traplines being blocked off ...", yet the assessment for the Base Case above refers to "increased access [to] recreationists and non-aboriginal hunters". FMSA seems to state that the general public has increased access to trapline areas whereas aboriginal people do not. Clear pathways and assessment endpoints are missing, as well as a discussion about the range of effects that would constitute 'red', 'yellow' or 'green' situations.
5	Section 9.3.4	Traditional Land Use – Culturally Significant Ecosystems (CSEs)	This section does an assessment of the amount of disturbance in the Moderate and Intense Use areas of six CSEs. Generally, the FMSA approach is to state what percentage of the Project is within the Moderate or Intense Use CSE (typically high), but not state the percentage area that the Project occupies within the Moderate or Intense Use areas (typically low). The CSEs are geographically large, and although the Project will cause disturbance, the FMSA does not discuss the Moderate or Intense Use areas that are still available to the FMFN for harvesting.

Chapter 9 Fort McKay Issues for Discussion – Disturbance and Access (continued)

Row	Reference	Key Issue for Discussion	Shell Response
6	Section 9.3.4.4, Page 29	“Due in part [to] to high overlap between industrial development and Moderate and High Use CSEs for all categories, Fort McKay considers the Current Scenario and Base Case Losses to CSEs to be adverse and significant (a red situation). Since Shell’s projects add another industrial loss to each of the harvesting categories and contribute to cumulative effects, effects of Shell’s projects are considered significant as well.”	Impacts to wildlife resources are assessed in Volume 5, Section 7 of the EIA. Shell acknowledges high impacts to wildlife resources at the LSA scale during operations. However, environmental consequences of wildlife are determined after closure and reclamation in the Shell EIA and given that the reclamation of terrestrial landscapes is well understood, the environmental consequences are reduced after closure and reclamation. Issues with regard to the current challenges with the reclamation of wetlands are taken into account in the EIA when cumulative effects are determined (i.e., assumes that peatlands cannot be reclaimed).
7	9.3.5.4, Page 33	“The extensive development of many of the watersheds within Fort McKay’s Traditional Lands not only influences specific traditional land use areas (e.g., fishing areas, Kearl Lake, Traplines); development threatens the very sustainability of some [of] these watersheds. ... the entire watershed say be lost in terms of the resources that is [sic] sustains (e.g., wildlife habitat and corridors, fish habitat, traditional plants) ... These watershed losses also in turn affect the Athabasca River (e.g., flow, benthic drift, regional fish spawning and rearing areas).” “Given that there are no substantive watershed management plans in place for any of these watersheds, Fort McKay concludes that there would likely be significant adverse effects on all the watersheds assessed as threatened or endangered”.	Impacts to wildlife resources are assessed in Volume 5, Section 7 of the EIA. Shell acknowledges high impacts to wildlife resources at the LSA scale during operations. However, environmental consequences of wildlife are determined after closure and reclamation in the Shell EIA and given that the reclamation of terrestrial landscapes is well understood, the environmental consequences are reduced after closure and reclamation. Issues with regard to the current challenges with the reclamation of wetlands are taken into account in the EIA when cumulative effects are determined (i.e., assumes that peatlands cannot be reclaimed).
8	Section 9.4.1.4, Page 39	“Fort McKay considers the existing loss of traditional trails within the FTSA to be a significant adverse loss (a red situation). The loss of trails within this area ... has implications for travel and harvesting throughout Fort McKay’s traditional lands as the trails radiate out from the Community and along the major watercourses and the loss of substantial portions of a trail can result [in] the entire network being disrupted. As well, losses to traditional trails are considered permanent. While new trails could be created on reclaimed land they could be re-created to pre-development conditions and would be traversing entirely different landscapes and would require that people have an ability to harvest on that reclaimed land – a place where the trail leads to. The incremental increase in loss of traditional trails associated with the Application Case adds to already significant adverse loss. The losses or trails due to the proposed Jackpine Mine Expansion block off the remaining trails to Kearl Lake and along the south side of the Muskeg River. The proposed Pierre River Mine eliminates trails and impedes access north along the west side of the Athabasca River”.	The stated focus on this section is ‘Access’, yet disturbance to the trails themselves appears to be a factor in the assessment. For example, it is not clear how other forms of access (e.g., public roads) or Shell’s proposed mitigations (e.g., providing access to traplines) have been considered in the evaluation. FMSA Figure 9-6 indicates ‘disturbed trails’ in the FTSA. It is not clear what constitutes a disturbed trail for access purposes. For example, Figure 9-6 suggests that a trail going northeast from the Susan Lake area has been disturbed due to development. Part of this trail appears to be in the same location as the winter road to Fort Chipewyan (see Resource Use Assessment, Figure 2.3-5 (Shell 2007). Trapper interviews conducted for Shell (2007), indicated that trapline access occurs along the Canterra Road, the winter road, the old winter road, and the Synenco access road (Shell 2007: TLU Assessment, Section 8.3.5.4). Also, in the assessment on Traplines (Section 9.3.3.5 above) FMSA state that there has been increased access to traplines for recreationists and non-aboriginal hunters. It is not clear how this is reconciled with this portion of the access assessment.
9	Section 9.4.1.5, Page 40	“The cumulative effects of development on traditional trails are considered by Fort McMurray to be adverse and significant (a red situation). Like other losses of specific traditional sites (e.g., berry-picking sites; see Section 7.6.4) losses to traditional trails are considered irreversible, as reclamation cannot recreate a particular trail and the specific landscape that it traverses”.	See comments in Row 8. It is not clear from the FMSA if traditional trails are being assessed in the context of access or as valuable components in and of themselves. Pathway effects and endpoints are not clear. For example, the assessment refers to reclamation not being able to recreate a particular trail “and the specific landscape that it traverses”. This suggests that potential effects to the land (assessed in other FMSA sections) are also influencing the assessment on ‘access’.

Chapter 9 Fort McKay Issues for Discussion – Disturbance and Access (continued)

Row	Reference	Key Issue for Discussion	Shell Response
10	Section 9.4.2.5, Page 45	<p>“Due to the extensive linear development within Fort McKay’s Traditional Lands, and lack of access management plans or restrictions, Fort McKay assesses the current state of linear development as causing significant adverse effects on the landscape within Fort McKay’s Traditional Lands and the resources that it supports (a red situation). The additional linear development associated with the Application Case is relatively small compared to the existing linear disturbance. ... Shell’s Projects will add to an already adversely affected situation.”</p>	<p>See comments for 9.3.2.4 above. Linear disturbances were included in the FMSA calculations for impacts on the Forty Township Area, and for Traditional Land Use (9.3.4 above). There is no pathways analysis, or clear methodology on how the significance was determined. For example, the assessment is focused on access, but states in part, “...Fort McKay assesses the current state of linear development as causing significant adverse effects on the landscape within Fort McKay’s Traditional Lands and the resources that it supports [emphasis added]....” It is not clear if access or effects to landscape are being assessed. There is no discussion or assessment of how linear disturbance affects access for trappers. For example, in the TLU assessment (Shell 2007, Section 8.3.5.4), the trapper on RFMA #1716 stated that because of his age, he relies on road access to his trapline. Access can have both positive and negative implications for TLU, and these are not addressed in this section of the assessment.</p>
11	Section 9.4.2.6, Page 46	<p>“The cumulative effects of planned linear development are considered significant and adverse (a red situation). Further work needs to be done to more fully quantify the effects of linear development and to manage access within Fort McKay’s Traditional Lands”.</p>	<p>See comments for ‘Linear Development’, Section 9.4.2.5, in Row 10.</p>
12	Section 9.4.3.1, Page. 46	<p>“Changes in the human population within Fort McKay’s Traditional Lands have an influence on resources (e.g. hunting, fishing pressure, vegetation, damage from quading as discussed in Section 9.4.2) and the accessibility of resources through impacts on Fort McKay community members’ enjoyment and sense of safety on the land.”</p>	<p>“Regional Population Levels” do not directly relate changes in population to changes in activity on traditional lands (e.g. hunting, fishing, quading, etc.). According to page 35 of the Cultural Heritage Assessment (CHA) Baseline, other indicators, that more directly measure the impact population might have on resources, were brought forward during community workshops including: # of people with hunting permits; recreation activities (clubs, tours); and # of incidents on McKay trap lines. It is not clear why the FMSA did not use more specific indicators that were directly related to activities carried out on the land.</p>

Chapter 10 Fort McKay Issues for Discussion – Reclamation

Row	Reference	Key Issue for Discussion	Shell Response
1	Section 10.4.3 Page. 17	<p><i>“Reclamation is not considered effective mitigation for the purpose of environmental assessment or management of adverse effects due to the (a) uncertainty of the effectiveness of current reclamation processes and technology, (b) the lack of knowledge and ability to restore organic wetlands, (c) the length of time reclamation will take and (d) the inability to restore the land to its pre-disturbance state.”</i></p>	<ul style="list-style-type: none"> • Many of the recommendations in Chapter 10 line up with topics that have been discussed previously in other meetings like the Technical Review: <ul style="list-style-type: none"> ○ Limiting the area of disturbance and facilitating progressive reclamation ○ Designing reclamation landscapes to include more potential wetland areas ○ Isolating materials with high salt or other constituents in landforms that keep them away from surface or groundwater ○ Looking at how conservation offsets and protected areas might be developed in consultation with Ft McKay; and ○ Working out how certification processes will be measured and completed. • These are important concerns, but due to time constraints for the FMSA meeting, there are four main points to focus on that are new or raise different issues to the Technical Review. • The first issue is that of reclamation as effective mitigation, as stated in Section 10.4.3. This statement appears to underpin any other concern from Ft McKay about reclamation and the validity of reclamation planning and activities. Shell has seen reclamation work in oil sands and elsewhere, and is in the process of carrying out reclamation on mine sites, and we know that Ft McKay has seen reclamation and has been keen to help through Shell’s reclamation committee. Ft McKay has made reclamation recommendations to us through that committee, in technical reviews and has made agreements and recommendations with other oil sands operators – some very recently. The linkage to other concerns in Chapter 10 is unclear in relation to this overarching statement about reclamation as a mitigation, especially when it is also stated that “reclamation is the only tool that Shell has to ultimately mitigate the impacts of mining on FMFN’s traditional use” (page 13). To summarize, all other Ft McKay actions related to reclamation planning appear to support reclamation, and this statement runs counter. Is this correct, and if so, is this the opinion of the Ft McKay community, or a technical opinion within the specific assessment? • Shell is committed to reclamation as a mitigation for our mine development areas, in addition to conservation offset work that Shell has already got underway (about 10% of disturbance footprint to date in conserved areas). There is a set of principles about how Shell designs a CC&R plan and assesses the mitigation provided by reclamation that have been discussed in previous technical reviews, and in the body of the plan itself: <ul style="list-style-type: none"> ○ The CC&R plan is designed as an executable, conservative, conceptual plan in an application. ○ It must demonstrate that the materials can be conserved and that planning has been completed for equivalent capability, but it does not claim to be (a) static in content or (b) stand alone as the project

Chapter 10 Fort McKay Issues for Discussion – Reclamation (continued)

Row	Reference	Key Issue for Discussion	Shell Response
1 (con't)			<p>progresses.</p> <ul style="list-style-type: none"> ○ It is the first, and least detailed because we do not have an approved mine footprint, of at least 15 to 20 CC&R plans developed during the life of a mine. ○ It uses information that Shell is confident can be executed – therefore uncertainties regarding wetland reclamation and old growth forest development have been recognized in the plan, and used as conservatively as possible so that impact ratings are not unduly reduced in the EIA. That, in essence, is the key use of a CC&R plan at this stage of a mine application – as a way to conservatively estimate impact. <ul style="list-style-type: none"> • In summary, Shell believes that we have designed an appropriate conceptual CC&R plan, that we have been appropriately conservative and that we can execute the plan. • There is concern about the use of the word “restore” in the language of this recommendation. “Restoration” has a specific meaning in ecological science - referring to returning an ecosystem to its historical trajectory. While many of the reclamation attributes Shell uses are very similar to those of restoration, we are clear in our CC&R plans that landforms will change in location, topography and hydrology, and that reclamation planning works with these changes to identify the best way to return ecological function given the opportunities and constraints of the landscape and bearing in mind the requirement for equivalent capability. The use of the word “restore” in this section therefore implies actions that Shell has not, and cannot commit to in the context of returning historical trajectories to exact areas within an oil sands mine.

Chapter 10 Fort McKay Issues for Discussion – Reclamation (continued)

Row	Reference	Key Issue for Discussion	Shell Response
1 (con't)			
2	<p>Section 10.1, Page. 1</p> <p>Section 10.3.2, Page. 3</p> <p>Figures 10-1; 10-2; 10-3; 10-4</p>	<p>Guidance from the Elders of the Ft McKay Community to the oil sands industry's questions about reclamation of the land has been: "reclamation is too slow" [HTES 2010]</p> <p><i>Concern: Reclamation is too slow.</i></p>	<ul style="list-style-type: none"> • The concern states (page 4) that "the duration of time that the land is unavailable for use is generally a result of the mine plan or design" and that "the tailings management plan is a primary controlling factor in the timing of when land becomes available for reclamation activities". These statements are correct, but it is a misinterpretation of (a) the level of detail in the CC&R plans between MRME and JPME/PRM and (b) comparing different tailings process timelines between these mines that makes the comparison in the figures problematic in the text of Chapter 10. • CC&R planning has improved in attention to detail and providing background for assumptions about tailings handling and timing in the last few years – and in this case, the difference between the MRME CC&R plan and JPME/PRM plans is a good example. Here are a few changes that end up generating differences in the accuracy of reclamation versus development timelines: <ul style="list-style-type: none"> ○ When the MRM CC&R plan was produced, the requirement was to show 10 years annually, then a 5-year span and finally the point at the end of mine. This means that the mine plans shown in the approved application jump from 2020 to 2044, and there is less accuracy in the reclamation forecast – Figure 10-3 shows this up as an unchanging rate of reclamation beyond 2014 which is an indication that there was not as much information available within this period. The pace (or speed) of reclamation is indicated by the slope of the line shown in these figures – because speed in this case is equal to area divided by time. Overall it is about 200 ha/yr until the end of mine life when reclamation rate accelerates. ○ JPME and PRM both use an alternative tailings technology (TT and NST) to MRM (CT). Shell believes that this is a technology improvement, and that we have had the chance to test in the Tailings Test Facility to check on drying and consolidation rates. The JPME and PRM plans therefore used data on deposition, consolidation and drying times that was not available when the MRM plan was put together, but that will be used in the 2011 CC&R plans for MRM. ○ JPME and PRM CC&R plans used annual increments for 10 years and then 5 year increments throughout the mine life to end of mine, tailored for the specific kind of tailings at each stage – Figs 10-1 and 10-2. This is much more detail than the MRME plan required at the time it was written. The pace of reclamation is about 200 ha/year until the end of mine life when reclamation accelerates – so it is exactly the same as the rate of reclamation at MRM, but with more incremental jumps due to the greater detail for each tailings cell and a

Chapter 10 Fort McKay Issues for Discussion – Reclamation (continued)

Row	Reference	Key Issue for Discussion	Shell Response
2 (con't)			<p>more detailed timing in the CC&R plan.</p> <ul style="list-style-type: none"> ○ The pace of reclamation during active mining is extremely similar for all three mines, therefore the statements on Page 3 related to the rate of reclamation being faster and executed earlier at MRM would appear to be misinterpretations. Both MRM and JPME have about 10 years of construction of mine areas before reclamation areas start to be available and that is extended at PRM because area is cleared to access the mine location before construction can begin. • Shell also hopes that the pace of reclamation will increase with new tailings technologies, but in the meantime we have been consistent in rate calculations between our mines to date, we have used the best available information to give more definition to long-range mine plans, and the plans do not currently have the level of disparity that is suggested in Section 10.3.2.
3 (con't)	<p>Section 10.1, Page.1</p> <p>Section 10.3.1, Page.2</p>	<p>Guidance from the Elders of the Ft McKay Community to the oil sands industry's questions about reclamation of the land has been: "to put it back the way it was" [HTES 2010]</p> <p><i>Concern: Put the land back the way it was.</i></p>	<ul style="list-style-type: none"> • There are a series of concerns presented in Section 10.3.1 about the location, hydrology and wildlife use of reclaimed areas, and there are recommendations in Section 10.4.2 that have been discussed previously related to footprint, progressive reclamation and surface hydrology. • These concerns seem to relate primarily to the function and areal extent of reclaimed areas. The EIA has assessed the impact of the duration of many of these issues. The CC&R plan has described how developed areas will be reclaimed in relation to creating functional ecosystems and how we will return equivalent capability across the reclaimed site. • The CC&R plan recognises that landforms at closure will not be the same as pre-development and the specific assessment does not seem to dispute this. There has been reference to how the HTES addresses this issue, dating back to comments from FMFN consultants from the technical review meeting in March 2010. Shell looks forward to seeing the HTES, because any information that helps Shell and Ft McKay design better functioning reclamation areas is of key importance.
4	<p>Section 10.3.3 Page.13</p>	<p>Community members have expressed the concern that when the landscape is reclaimed the land will lose "spirit" and medicines and other plants grown on the reclaimed sites will not be as effective.</p> <p><i>Concern: You can't put the spirit back into the land</i></p>	<ul style="list-style-type: none"> • This is a concern that Shell seeks help with understanding - firstly and most importantly because the people that understand the spirit best are Ft McKay community members, and secondly because there don't seem to be any recommendations in Chapter 10 that provide guidance on this issue. • The HTES has been mentioned often in relation to helping other

Chapter 10 Fort McKay Issues for Discussion – Reclamation (continued)

Row	Reference	Key Issue for Discussion	Shell Response
			stakeholders (including Shell) to understand more about the spirit of the land. Recent feedback from Ft McKay elders has been that if "reclamation is committed with the right spirit, the spirit of the land may respond and come back in time".

Fort McKay Issues for Discussion – Cultural Heritage Assessment

Row	Reference	Key Issue for Discussion	Shell Response
1	<p>Project Specific CHA, Section 4.0, Page 17</p> <p>Baseline CHA, Section 11.2, Page 101</p>	<p>“Each of the indicators helps the Community assess how the project may affect the land thereby providing a measure of the project affects on cultural heritage.”</p> <p>“Qualitative information augmented with quantitative data on measurable parameters can assist in determining degree of change in culture and values.”</p>	<p>The conclusions of significance and adversity for project-specific affects appear to rely heavily on the quantitative environmental indicators derived from the FMMSA.</p> <p>Were FMMSA’s findings for the quantitative environmental indicators (i.e., dashboard indicators) presented to the community or used as an input during community discussions and workshops on assessing/determining baseline, project and cumulative effects on culture?</p> <p>To what degree were your findings of cultural significance and adversity for baseline, project-specific and cumulative effects dependent upon the quantitative environmental indicators identified in the FMMSA (i.e. dashboard) and to what degree were they dependent upon the qualitative interpretations of Fort McKay community members? For example, how did qualitative information augment the quantitative environmental data with regards to determining cultural heritage effects?</p> <p>According to information in Appendix B of the FMMSA (Framework for Selecting Indicators), the quantitative environmental indicators used are only one of several potential levels of indicators – a number of other quantitative indicators were also suggested including: participation in cultural programs; funding for cultural education; number of people participating in advisory groups, etc. Why were no other quantitative indicators, other than the environmental indicators from the FMMSA, used? Given the absence of other quantitative indicators, can the quantitative environmental indicators used provide the appropriate composite picture to assess changes in culture heritage since the pre-development period (1960s)?</p>
2	<p>Project Specific CHA, Section 7.0, Page 49</p>	<p>“The Community’s ability to adapt to environmental change while simultaneously supporting their cultural heritage and values is linked with maintaining or regaining sovereignty over how associated issues are addressed.”</p>	<p>Industry already provides additional resources to First Nations in the region to support cultural retention and build community capacity. These are resources not available to First Nations in many other parts of the country.</p> <p>Was there any discussion among community members about these additional resources made available to regional First Nation communities through industry support (e.g. IRCs, Elders/Day Care Centre, specific cultural programs, etc.)?</p> <p>Were these industry-supported resources/initiatives taken into consideration when determining the significance of industry effects upon cultural heritage? And if so, how were they taken into consideration?</p>
3	<p>Baseline CHA, Appendix B, Page 115</p>	<p>“Track What is Getting Better” ... “Identifying cultural resources or cultural capital that have been developed as well as those lost can provide a better understanding of the community in its contemporary context.”</p>	<p>Can the FMMSA consultants explain why there appear to be no indicators for tracking the cultural resources and cultural capital that has been developed as a result of industrial development in the region? For example, funding for cultural programs, community participation in industry-funded initiatives, etc.?</p>

Chapter 10 Fort McKay Issues for Discussion – Reclamation (continued)

Row	Reference	Key Issue for Discussion	Shell Response
4	Baseline CHA, Section 6.0, Page 24	<p>“Many Aboriginal groups across Canada are affected by similar influences.”</p> <p>“One of the key purposes of this assessment is to attempt to distinguish between the various sources of cultural stress, in particular to identify the role of industrial development.”</p>	<p>A challenge with this type of analysis is to clearly delineate attribution for changes in culture since the pre-development period (1960s) to:</p> <ul style="list-style-type: none"> • specific oil sands projects; • oil sands development in general; and • other external factors such as government policy, education, technology, etc. <p>While the report highlights the weakening of many cultural values as a result of industrial development, it is not clear to what degree the current weakened state of these cultural values is related to industrial development and to what degree other external factors affecting culture had a role to play in weakening these values. The report does state, correctly, that “many Aboriginal groups across Canada are affected by similar influences.”</p> <p>Did the FMSA consultants explore with the community what the current cultural state of the community would be in the absence of industrial development?</p> <p>Did the FMSA consultants consider using a comparator community in their analysis to better differentiate between the different contributors to cultural stress? Perhaps a northern Aboriginal community which has not experienced heavy industrial development near or on their traditional lands?</p> <p>Did the FMSA consultants consider the development of indicators not specifically related to industrial development but to other external factors such as technology changes, government policy, and education?</p>
5	Baseline CHA, Box 10-3, Page 96	<p>“Regional population levels ... the gauge is in the red due to the 3600% increase in population in the region.”</p>	<p>It should be noted that “3600%” refers to population growth over a forty-or-more-year period. Also, while population growth is a pathway for many effects, the level of that population growth alone is not a good indicator of the significance of those effects because it does not consider processes or systems that might be in place to mitigate effects.</p> <p>To what degree were current or planned mitigation measures taken into consideration when considering the effect regional population levels might have on Fort McKay members’ access to land? For example, did placing the gauge in the “red” take consideration of industry measures to limit camp-based workers ability to leave camp, such as:</p> <ul style="list-style-type: none"> • bussing or flying workers into camp (limiting the number of workers with private vehicles); • providing workers with extended work schedules to keep them busy while in camp; and • providing workers with enhanced recreational facilities and social activities in camp.

Table 1 Comparison of Air Emission Effects Thresholds

Parameter	Source for Criteria/Objectives/Guidelines			Criteria Used in Assessment By		Comments	Shell Response
	(AENV 2008) ^a	(WHO 2000)	Other	Fort McKay	(Shell 2007)		
SO ₂	30 µg/m ³ annual average	<ul style="list-style-type: none"> 10 µg/m³ annual average (for lichens) 15 µg/m³ annual and winter average (for forests and natural vegetation) 	-	<ul style="list-style-type: none"> 10 µg/m³ annual average (for lichens) 20 µg/m³ annual and winter average (for forests and natural vegetation) 	<ul style="list-style-type: none"> 10 µg/m³ annual average (for lichens) 20 µg/m³ annual and winter average (for forests and natural vegetation) 	Both are the same; based on WHO (2000) and the Convention on Long-range Transboundary Air Pollution (CLRTAP 2004).	There may be a typographic error in the WHO 2000 column as the WHO 2000 annual criteria for forests and natural vegetation should be listed as 20 µg/m ³ . The values used for the Fort McKay and Shell assessments are the same.
NO ₂	60 µg/m ³	<ul style="list-style-type: none"> 75 µg/m³ 24-Hr average (as NO_x i.e., NO + NO₂) 30 µg/m³ annual average (as NO_x) 	-	<ul style="list-style-type: none"> 75 µg/m³ 24-Hr average (as NO_x i.e., NO + NO₂) 30 µg/m³ annual average (as NO_x) 	<ul style="list-style-type: none"> 60 µg/m³ annual average as NO₂ and 200 µg/m³ for a 24-Hr average 	Fort McKay's assessment criteria is based on WHO (2000) and CLRTAP (2004), which is considered more relevant to vegetation protection than the AENV (2008) annual average and 24-Hr limits of 60 µg/m ³ and 200 µg/m ³ , respectively.	<p>The NO₂ assessment completed for the JME and PRM projects was for toxic effects associated with fumigation whereas the WHO (2000) and CLRTAP (2004) guidelines are for non-toxic effects such as growth stimulation.</p> <p>The WHO guideline of 30 µg/m³ for annual average NO_x was developed based on effects to biochemical processes, physiology and growth (WHO 2000). Effects observed at the lowest exposure levels include increased growth and enhanced nitrate reductase activity, which indicates that the plant is capable of assimilating the NO₂ at those levels. WHO (2000) recognized that an effects threshold derived using the compiled data would be substantially higher if enhanced nitrate reductase activity and increased biomass production were not assumed to be adverse effects.</p> <p>Eutrophication effects were evaluated using N deposition. The CEMA eutrophication management recommendations (CEMA 2008) recognized that deposition of nitrogen is made up primarily of dry deposition of NO₂; however, the framework does not make recommendations to derived critical levels for ambient NO₂ concentrations. Total N deposition is a better variable because the various forms of N are expected to result in an additive effect.</p> <p>WHO (2000) does not identify a 24-hr concentration for NO₂ effects to plants in their guideline summary, although it is identified in supporting documentation. WHO recognises that the threshold for toxic effects on a 24-hr averaging period may be reduced from 200 µg/m³ to 75 µg/m³ when O₃ or SO₂ are above their critical levels, which is not currently the case in this region (WHO 2000). CLRTAP 2004 identifies the critical level of 75 µg/m³ 24-hr to be associated with growth effects and recognizes that use of annual critical levels is preferable for evaluation growth effects associated with NO₂:</p> <p>"it is strongly recommended that only the annual mean values are used, as mapped and modelled values of this parameter have much greater reliability, and the long-term effects of NO_x are thought to be more significant than the short-term effects."</p>
NH ₃	-	<ul style="list-style-type: none"> 270 µg/m³ 24-Hr average 8 µg/m³ annual average 	<ul style="list-style-type: none"> 1 µg/m³ annual (lichens and bryophytes) 3 µg/m³ annual (forest ground flora) Recommendations from ECE (2007a)	<ul style="list-style-type: none"> 1 µg/m³ annual (lichens and bryophytes) 3 µg/m³ annual (forest ground flora) 	(Not assessed)	Recommendations from ECE (2007a).	<p>The critical level of 1 µg/m³ was based on increases in tree bark pH resulting in species shifts in lichen communities. This single study was not based on a toxic threshold and may not be applicable to the Oil Sands Region.</p> <p>If CEMA, through consultation with stakeholders, develops thresholds for ammonia toxicity, or changes to lichen community composition through changes in tree bark acidification, they will be incorporated into future assessments completed by Shell.</p> <p>CEMA recommends that eutrophication effects be evaluated using total N deposition.</p> <p>Shell agrees that ambient ammonia concentrations and emissions should be further characterized to determine whether they represent a substantial contribution to N deposition.</p>

Table 1 Comparison of Air Emission Effects Thresholds

Parameter	Source for Criteria/Objectives/Guidelines			Criteria Used in Assessment By		Comments	Shell Response
	(AENV 2008) ^a	(WHO 2000)	Other	Fort McKay	(Shell 2007)		
O ₃		<ul style="list-style-type: none"> 10 ppm-h AOT 40^b (6 months – daylight hours) 	SUM60 ^c values of: <ul style="list-style-type: none"> 0 to 2000 ppb hrs over a 3 month period (Baseline) 2000 to 4400 ppb hrs over a 3 month period (Surveillance) 4400 to 6600 ppb hrs over a 3 month period (Management) > 6600 ppb hrs over a 3 month period (Exceedance) From CEMA (2007)	SUM60 ^c values of: <ul style="list-style-type: none"> 0 to 2000 ppb hrs over a 3 month period (Baseline) 2000 to 4400 ppb hrs over a 3 month period (Surveillance) 4400 to 6600 ppb hrs over a 3 month period (Management) > 6600 ppb hrs over a 3 month period (Exceedance) 	(No criteria used in assessment)	From CEMA (2007)	<p>The air assessment was based on the Canada-wide Standard/Clean Air Strategic Alliance (CASA) exceedance threshold for ozone, which is 65 ppb and is based on the fourth highest 8-hour reading annually, averaged over three-years (CCME 2000, CASA 2003). Values for current monitoring data are below the Canada-wide standard. The predicted change in ozone concentrations associated with the project was 1 ppb and the project is not expected to result in exceedance of the 65 ppb threshold. Potential effects of the project associated with ozone are considered negligible, independent of effects levels considered, because the predicted change in ozone concentration due to the project is so small.</p> <p>The Fort McKay specific assessment or the ozone monitoring work conducted by Environment Canada (2007) considered SUM60 values. Health Canada derived thresholds for vegetation based on SUM60 values. Lowest observable adverse effects (LOAEL) of 5,900 - 7,400 ppb-hours for crops and 4,400 - 6,600 ppb-hours for trees.</p> <p>The CEMA ozone management framework (CEMA 2006) does not include consideration of SUM60 values. The CEMA (2007) document has not been made available. If thresholds based on SUM60 values are developed by CEMA through consultation with stakeholders, they will be incorporated into future assessments completed by Shell.</p>
Nitrogen Deposition		<ul style="list-style-type: none"> 5-10 kg N/ha/yr ombrotrophic bog 10-15 kg N/ha/yr coniferous trees 	<ul style="list-style-type: none"> < 8 kg N/ha/yr for bogs 5-10 kg N/ha/yr boreal forests Recommendations from ECE (2007b)	<ul style="list-style-type: none"> 8 kg N/ha/yr 	<ul style="list-style-type: none"> 0.25 keq N/ha/yr (3.5 kg N/ha/yr) <u>as a possible effect level</u> (increased growth of moss in bogs) 2.0 keq N/ha/yr (28 kg N/ha/yr) <u>as an adverse effect level</u> in bogs 	Based on Recommendations from ECE (2007b), discussion at a CEMA/NSMWG December 2008 Nitrogen Critical Workshop in Calgary, and the conclusion that significant impacts would be expected at Shell's criteria based on ECE (2007b) and CLRTAP (2004)	<p>In May 2008, CEMA completed a report on <i>Proposed Interim Nitrogen (Eutrophication) Management Recommendations and Workplan for the Regional Municipality of Wood Buffalo Area</i> (RMWB; CEMA 2008). The workplan is being undertaken to determine if European critical loads, specifically those provided by the United Nations Economic Commission for Europe's (UNECE) Convention on Long-range Transboundary Air Pollution (UNECE CLRTAP; Bobbink et al. 2002). These critical loads are considered to be a reasonable surrogate for critical loads pending the CEMA decision on final critical loads for the RMWB. Although the CEMA report recognised that revisions of some of the UNECE critical loads have been recently proposed by United Nations Economic and Social Council (UNESCO 2007 referred to as ECE 2007 in the Fort McKay specific assessment), these updated (lower) critical loads for ombrogenous bogs and boreal forest (less than 8 kg/ha/y and 10-15 kg/ha/y respectively) were not adopted for the analysis completed in the CEMA report (CEMA 2008).</p> <p>The UNECE critical loads were applied for the Syncrude Aurora South Project 2009 Environmental Update, which includes the Shell JME and PRM in the Planned Development Scenario. Under the Planned Development Scenario, predicted nitrogen deposition rates were above critical loads for 29,808 ha of vegetated areas, relative to 18,361 ha under the Approved Development Scenario and representing 2% of the vegetated portions of the TRSA. Nitrogen deposition rates were predicted to be above critical loads for 24,265 ha of the treed bog and poor fen land-cover class, representing 5% of this land-cover class in the TRSA and 81% of the area where deposition rates were predicted to be above critical loads. The treed bog and poor fen land-cover class is considered to be the regional land-cover class that is most sensitive to the effects of eutrophication and has the lowest critical load. These estimates are consistent with those presented in the FMSA; however, because the area of treed bog and poor fen that is potentially affected represents less than 5% of the TRSA, this should be considered a green condition.</p>

Table 1 Comparison of Air Emission Effects Thresholds

Parameter	Source for Criteria/Objectives/Guidelines			Criteria Used in Assessment By		Comments	Shell Response
	(AENV 2008) ^a	(WHO 2000)	Other	Fort McKay	(Shell 2007)		
PAI	(Not considered)	(Not considered in this assessment)	CEMA (2004)	CEMA (2004) + CEMA (2006) criteria	CEMA (2004) + CEMA (2006) criteria (with a slight variation)	Fort McKay was heavily involved in the development of CEMA's Acid Deposition Management Framework and supports its implementation and use in assessing PAI impacts.	Consensus on use of the CEMA acid deposition management framework.

(a) Note: it does not seem clear to Fort McKay how the SO₂ and NO₂ annual average ambient air quality objectives relate to vegetation protection.

(b) AOT 40 – Accumulated exposure to ozone Over a Threshold of 40 ppb.

(c) SUM 60 - SUM60 is the sum of all hourly ozone readings at or above 60 ppb between 8:00am and 8:00pm over any consecutive 3-month period in the period May 1 to September 30.

References for Last Column:

Bobbink, R., M. Ashmore, S. Braun, W. Flückiger, and I. J. Van den Wyngaert. 2002. Empirical Nitrogen Critical Loads for Natural and Semi-Natural Ecosystems: 2002 Update. Background Document for the Expert Workshop on Empirical Critical Loads for Nitrogen on (Semi-) Natural Ecosystems, Berne, Switzerland, November 11-13, 2002 held under the UNECE Convention on Long-range Transboundary Air Pollution. 123 pp.

CASA (Clean Air Strategic Alliance). 2003b. Particulate Matter and Ozone Management Framework. Prepared by the Particulate Matter and Ozone Project Team. September 2003.

CCME (Canadian Council Ministry Environment). 2000a. Canada-Wide Standards for Particulate Matter (PM) and Ozone. Accepted November 29, 1999 for Endorsement in May 2000

CEMA (Cumulative Environmental Management Association). 2004. *Recommendations for the Acid Deposition Management Framework for the Oil Sands Region of North-Eastern Alberta*. Approved February 25, 2004. Fort McMurray, AB. 39 pp.

CEMA. 2006. *Ozone Management Framework for the Regional Municipality of Wood Buffalo Area*. Final April 2006. Fort McMurray, AB. 19 pp.

CEMA. 2008. *Proposed Interim Nitrogen (Eutrophication) Management Recommendations and Work Plan for the Regional Municipality of Wood Buffalo Area*. Prepared by the NOxSO₂ Management Working Group of the Cumulative Environmental Management Association (CEMA) for presentation at the March 26/27 CEMA Board Meeting and approval at the June 4/5 CEMA Board Meeting.

Health Canada. 1999. National Ambient Air Quality Objectives For Ground-Level Ozone- Summary - Science Assessment Document. 1999 ISBN: 0-662-28042-3. Cat. No.: En42-17/7-1-1999E. http://www.hc-sc.gc.ca/ewh-semt/pubs/air/naaqo-onqaa/ground_level_ozone_tropospherique/summary-sommaire/index-eng.php

UNESCO (United Nations Economic and Social Council). 2007. Workshop on Effects of Low-level Nitrogen Deposition. Available at: <http://www.unece.org/env/documents/2007/eb/WGE/ece.eb.air.wg.1.2007.15.e.pdf>

WHO. (World Health Organization). 2000. *Air Quality Guidelines for Europe, Second Edition*. WHO Regional Publications, European Series, No. 91. Copenhagen, DK.

Table 2 Comments on Table 2-5 of Fort McKay Specific Assessment

Parameter	Averaging Period	Criteria Used in Assessment		Comments
		Fort McKay [$\mu\text{g}/\text{m}^3$]	Shell HHRA [$\mu\text{g}/\text{m}^3$]	
SO ₂	10-minute	500	500	Chemicals of potential concern that are regulated at the federal government level in the form of either a National Ambient Air Quality Objective (NAAQO) or as a Canada-Wide Standard (CWS) were not subjected to the same selection process for exposure limits in the HHRA. Instead, the federal guidelines from Health Canada, which have been adopted as Ambient Air Quality Objectives (AAQOs) by AENV, were given priority. SO ₂ is one of these chemicals. See note below for additional information.
	1-hour	300	450	
	24-hour	20	150	
	Annual	NG	30	
NO ₂	1-hour	200	400	See comments on SO ₂ above.
	24-hour	NG	200	The NO ₂ guidelines used in the HHRA are considered appropriate for characterizing health risks associated with existing and future ambient air quality.
	Annual	40	60	See note below for additional information.
Ozone	1-hour	NG	NA	As described in Volume 3, Section 5.3 (page 5-30), ozone was not assessed in the HHRA. Because of the uncertainty associated with the sources of ozone in northeastern Alberta, the chemical reactions associated with ozone formation and destruction, and the possible transport of ozone over long distances, ozone concentrations were not predicted in the Air Quality Assessment. The Project's estimated increase in ozone precursor emissions (3% regionally) could result in a nominal increase in peak-hourly ozone concentrations of less than 1 ppb.
	8-hour (daily maximum mean)	100	NA	
PM _{2.5}	24-hour	30	30 ^(a)	See comments on SO ₂ above.
	24-hour (99 th %ile)	25		
	Annual	10		
PM ₁₀	24-hour (99 th %ile)	50	NA	Health effects associated with PM _{2.5} are better understood than those associated with PM ₁₀ . The finer fraction also penetrates the lung deeper than the coarser fraction (i.e., PM ₁₀). As such, PM _{2.5} is generally viewed as posing the greater threat to human health. The HHRA conservatively assumed that all combustion-related PM fell into the PM _{2.5} range.
	Annual	20	NA	
CO	1-hour	15,000	15,000	Same
	8-hour	6,000	6,000	Same
Benzene	Lifetime	0.17	1.3	The FMSA criterion is based on an incremental lifetime cancer risk of 1 in a million. However, the HHRA based its carcinogenic criteria on a 1 in 100,000 risk level, which is in accordance with provincial and federal guidance. The acceptability of a cancer risk level is policy-based, as opposed to science-based. If the FMSA based its criteria on the same risk level, its criterion for benzene would be less conservative than the one used in the Shell HHRA (i.e., 1.7 vs. 1.3 $\mu\text{g}/\text{m}^3$).
Benzo(a)pyrene	Lifetime	0.000012	0.00012 ^(b)	Both criteria are based on the same unit risk value from WHO. The difference is in the level of risk deemed negligible. The FMSA value is based on a 1 in a million risk level, while the HHRA based its value on a 1 in 100,000 risk level, which is consistent with provincial and federal protocol.
Arsenic	Lifetime	0.00066	0.0016	If the FMSA based its criteria on the same risk level, its criterion for arsenic would be less conservative than the one used in the Shell HHRA (i.e., 0.0066 vs. 0.0016 $\mu\text{g}/\text{m}^3$).
Nickel	Lifetime	0.0025	0.0077	If the FMSA based its criteria on the same risk level, its criterion for nickel would be less conservative than the one used in the Shell HHRA (i.e., 0.025 vs. 0.0077 $\mu\text{g}/\text{m}^3$).

Table 2 Comments on Table 2-5 of Fort McKay Specific Assessment (“Fort McKay’s Health and Odour based Ambient Air Quality Criteria for the Community and the Criteria Used in its Assessment”) (continued)

Parameter	Averaging Period	Criteria Used in Assessment		Comments
		Fort McKay [µg/m ³]	Shell HHRA [µg/m ³]	
Total Reduced Sulphur	30-minute	7	NA	Reduced sulphur compounds were assessed on an individual basis in the HHRA.

(a) Based on 98th percentile 24-hour average.

(b) Value originally used in the HHRA was 0.32 µg/m³. However this was changed in the SIRs.

NG = No Guideline.

NA = Not Assessed.

Notes:

SO₂ criteria:

Sulphur dioxide (SO₂) is regulated at the federal level in the form of a National Ambient Air Quality Objective (NAAQO). National Ambient Air Quality Objectives are an air quality goal for the protection to the general public and the environment of Canada (Health Canada 2006). On this basis, the 1-hour, 24-hour and annual NAAQOs developed for SO₂ by Health Canada were adopted by Alberta Environment (AENV 2009) as the 1-hour, 24-hour and annual Ambient Air Quality Objectives (AAQOs). In the human health risk assessment (HHRA) for the Shell Project, these NAAQOs and AAQOs were used to assess the potential short- and long-term health effects associated with the inhalation of SO₂. In the acute (short-term) effects assessment, more “weight” was placed on the health-based 1-hour NAAQO and AAQO than the 24-hour NAAQO and AAQO (which is based on vegetation effects).

In addition, the World Health Organization’s (WHO 2006) 10-minute air quality guideline (AQG) was used in the acute effects assessment of SO₂. The WHO (2006) also provides a 24-hour AQG of 20 µg/m³ for SO₂, which was recently reduced from 125 µg/m³. The basis of the revised 24-hour AQG involves data obtained from epidemiological studies in which people were likely exposed to a mixture of chemicals (WHO 2006). These epidemiological studies reported associations between daily SO₂ exposures and childhood respiratory disease and mortality in all age groups. It is not clear in the supporting documentation from the WHO how the 24-hour AQG was specifically derived, but the WHO acknowledges that “... there is still considerable uncertainty as to whether sulphur dioxide is the pollutant responsible for the observed adverse effects or, rather, a surrogate for ultrafine particles or some other correlated substance” (WHO 2006).

A recent review conducted by Alberta Health and Wellness (AHW 2006) observed that many of the epidemiological studies available in the literature for SO₂ are of low quality, potentially confounded by exposures to other air pollutants, or are inconclusive. Various government agencies, including the US EPA and WHO, have recognized the difficulties associated with isolating health impacts in a population that are specifically attributable to SO₂.

In fact, as of June 22, 2010, the US EPA has revoked their 24-hour and annual standards for SO₂, stating that “...there is little health evidence to suggest an association between long-term exposure to SO₂ and public health effects” (US EPA 2010).

Because the weight of evidence suggests that the toxicity of SO₂ is primarily short-term with responses occurring within the first few minutes following inhalation exposure (AHW 2006, US EPA 2010, WHO 2006) and there is considerable uncertainty associated with the WHO 24-hour AQG, preference should be given to the WHO 10-minute AQO and AENV 1-hour AAQO in the acute effects assessment for SO₂.

NO₂ criteria:

The HHRA characterized NO₂-related health risks using the AENV AAQOs for the 1-hour, 24-hour and annual averaging times (e.g., 400 µg/m³, 200 µg/m³ and 60 µg/m³).

The World Health Organization’s (WHO 2006) 1-hour air quality guideline (AQG) is based on data obtained from short-term experimental human toxicology studies (WHO 2006). The 1-hour AQG is based on a clear lowest-observed-effect level of 375–565 µg/m³ for small changes in lung function and airway responsiveness reported in several studies. The WHO incorporated a 50% margin of safety in the development of the 1-hour AQG because of a statistically significant increase in bronchial responsiveness reported following exposure to 190 µg/m³ and a meta-analysis suggesting changes in airway responsiveness below 365 µg/m³. However, the WHO (2000) acknowledges that “The significance of the response at 190 µg/m³ (100 ppb) has been questioned on the basis of an inappropriate statistical analysis.”

A recent meta-analysis of NO₂ exposure and airway hyper-responsiveness in asthmatics (published in the Journal Critical Reviews in Toxicology) suggests that there is no evidence that NO₂ causes clinically relevant effects in asthmatics at concentrations up to 1,100 µg/m³ (i.e. 0.6 ppm) (Goodman et al 2009).

It remains the view of the study team that the AENV AAQOs offer adequate protection for NO₂-related health effects.