Appendix C

Table of Technical Questions on the Shell Jackpine Mine Expansion Project Submitted by the Athabasca Chipewyan First Nation to Shell in December 2009 and Shell's Responses to these Questions

Shell Canada Jackpine Mine Expansion Project
ACFN Technical Review Clarification Questions
(including questions received March 2009)

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
1	Ground water	1	Traditionally important plants dependent on groundwater flow for survival may be impacted. The ACFN could be impacted by the loss of groundwater-supported wetland areas that may contain traditionally important plants that are dependent on groundwater for survival. Traditionally important plants which are found in non-wetland areas may also be lost if they are dependent on groundwater that would be lowered by the proposed project. Such losses would be permanent, unless reclamation provides suitable areas where the plants could re-establish. Wetlands that develop after reclamation may have the potential to be impacted by process-affected groundwater from areas where tailings have been stored and may be less desirable areas for the collection of plants. **Request:** **Discuss the locations of traditionally important plants that may be in areas impacted by the project. Confirm Shell's awareness of their locations and, where necessary, mitigation measures for their protection.**	**Note same as Q1 – PRM** Information on traditionally important plants is provided in: - Appendix K of the Terrestrial Vegetation, Wetlands and Forest Resources ESR. - Section 3.4 of the Traditional Land Use ESR and includes an assessment of the project-related effects to groundwater levels and quality. Effects to Traditional Plant Potential is described in:Section 2.7 of the EIA Update (Table 2.7-14). Mitigation measures are described in the Application and EIA, of which reclamation is the primary mitigation to re-establish areas with the capacity to support traditional plants.
		2	Access to traditionally important groundwater sources may be impacted. ACFN individuals could be impacted by the loss of groundwater sources (waterwells, dugouts, muskegs or springs) used when visiting traditional lands located in the proposed mine site or the immediate surrounding area. Groundwater sources in the mining area will be permanently impacted and / or be unsuitable for further use. Groundwater sources located in the surrounding area may be permanently or temporarily impacted, and may or may not be unsuitable for further use after closure and reclamation. **Request:** **Discuss the locations of traditionally important groundwater sources that may be in areas impacted by the project. Confirm Shell's awareness of their locations and, where necessary, mitigation measures for their protection.**	**Note same as Q2 – PRM** See Figures 6.3-32, 6.3-35 and 6.3-28 and Figures 6.3-82, 6.3-85 and 6.3-88 of predicted dewatering effects in surficial deposits for the JMPE and PRM areas, respectively. Regarding Shell's awareness, Figure 3.1-2 of the TLU ESR provides RFMA holder areas in relation to the Project area. One ACFN member holds a single trapline, RFMA #1714 that will be directly affected by the Project. Shell does not know of any other specific groundwater sources used traditionally by ACFN members.
		3	Reporting of groundwater incidents not confirmed. It is unclear whether the ACFN will be advised of any unexpected changes in groundwater quantity and / or quality.	**Note same as Q3 – PRM**

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			Request: **Confirm that the ACFN community will be advised of any groundwater incidents reported to the authorities. Confirm that Shell will meet with the ACFN to discuss the incident, the subsequent investigation, any follow-up action, and their results.**	
		4	Computer-predicted impacts, or lack of impacts, are subject to some uncertainty. Groundwater monitoring must demonstrate that project activities are proceeding without unreasonable impacts on the groundwater resources in the area. **Request:** **Prepare a table summarizing computer-predicted and professional judgment impacts on groundwater resources, and outline the groundwater level and / or quality monitoring to be undertaken to verify these predictions. As monitoring data becomes available add them to the table and share the updated table with the ACFN. Reassess deviations from the predicted impacts, update the table, and reassess mitigation measures. Provide the ACFN with the results of any reassessment of mitigation measures.**	**Note same as Q4 – PRM** The Aquatics Monitoring Program is found in Volume 4B, Appendix 4-9, Section 2.1. Reassessment of mitigation measures may be part of future negotiations towards an agreement.
2	Surface Water Quality	5	Kearl Lake Integrated drainage plan and subsequent impacts unclear. Shell states (Section 6.5.5.3) that the integrated drainage plan for this project (including Kearl Lake) and other projects has been changed. It is unclear whether Kearl Lake was always intended to receive direct discharge from the Aurora South End Pit Lake. The ACFN has raised concerns with Imperial and Syncrude on the impacts to, and uncertainty about, the viability and integrity of Kearl Lake. **Request:** **Provide additional details regarding the changes to the integrated drainage plan. Provide additional information on the differences between the predicted impacts of the old and new plans on the water and sediment quality of Kearl Lake.**	Details regarding the changes to the integrated drainage plan during the Closure phase are presented in the Closure Drainage Plan for the EIA (Volume 4, Appendix 4-3). The Aurora South Pit Lake discharge was not changed as a result of proposed drainage integration.
		6	Only guideline exceedances are considered - not increases in the values. Shell concludes in the EIA that for the Muskeg River, Jackpine Creek and Kearl Lake, the impacts on water quality will be low to negligible. Shell outlines in Table 1.3-4 the impact description criteria when a constituent has a guideline available, and when there is no guideline. The implications of these ratings differ	To assess the impact on aquatic life due to changes in water quality, the most stringent guideline was adopted from Alberta Environment, the Canadian Council of Ministers of the Environment and the U.S. Environmental Protection Agency for each constituent.

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			substantially: when a parameter has a guideline associated with it, only guideline exceedances are considered to be significant. Any absolute increases in the actual values are completely discounted. Several of the aquatic parameters are predicted to increase by over a degree of magnitude, but because the guideline isn't exceeded, they are rated as having no impact. Substantial changes in water quality may still impact aquatic organisms, even if guidelines are not exceeded, particularly within natural systems and not a controlled laboratory. **Request:** **Provide additional discussion on the impacts of absolute increases in parameters with guidelines, irrespective of whether guideline exceedances occurred.**	As stated in the Canadian Environmental Quality Guidelines (CCME 1999), "Guidelines are numerical limits or narrative statements based on the most current, scientifically defensible toxicological data available for the parameter of interest. Guideline values are meant to protect all forms of aquatic life and all aspects of the aquatic life cycles, including the most sensitive life stage of the most sensitive species over the long term." Guideline values are generally derived by determining, through toxicological testing, the lowest concentration that would result in no adverse effects on the health of aquatic organisms, then dividing the concentration by ten as a margin of safety. Therefore, guidelines are considered highly protective, and further assessment for constituents that are predicted to increase but remain below guideline values is not required.
		7	Information provided in the water quality impact tables insufficient. Although the ratings criteria used the percentage increase to determine the magnitude of change for water quality constituents, no percentage increase values are provided in the text or tables. As a result, it is very difficult and inconvenient to check the results tables against the ratings criteria to determine how the ratings have been applied and whether they have been applied correctly. **Request:** **Provide the percentage change, rather than just the absolute change, in the results tables for the water quality assessment to allow comparison with the ratings criteria.**	**Note same as Q10 – PRM** Shell believes that there is sufficient information for ACFN to calculate the percentage change. The existing tables provide sufficient information for a reviewer to calculate percentage change.
		8	Ratings system for constituents with guidelines unclear. Where water quality guideline exceedances are found to result from the project, it is unclear whether the ratings criteria use the higher acute guideline or the lower chronic guideline, or both, to determine the ratings impact. For example, Table 6.5-6 shows that median aluminium concentrations in the Muskeg River from 2012 to 2065 will increase from 0.23 mg/L (Base Case) to 0.3 mg/L (Application Case). The acute guideline for aluminium is 0.75 mg/L, while the chronic guideline is 0.1 mg/L. Clearly, these exceedances will occur over a	**Note same as Q11 – PRM** The terms "slightly", "marginal" or "substantial" are not used to rate water quality guideline exceedances; the criteria listed in Volume 4, Section 6.5.5.3, Page 6-399 are applied without any subjective rating. Assessing guideline exceedances are as follows: If a constituent increases 10% above pre-development and Base Case conditions, and it exceeds a guideline (regardless of whether the

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			chronic time period; therefore, the 0.1 mg/L guideline should be applied. The question becomes whether this increase (a difference of 0.07 mg/L) is considered to be negligible, low, moderate or high. The ratings criteria are vague and give subjective criteria (low is when the release contributes slightly to existing background values over guidelines, medium is a marginal contribution and high is a substantial contribution). It is unclear what the definitions of "slightly", "marginal" and "substantial" are. **Request:** **Provide additional rationale and clear ratings classifications for the ratings system when guidelines are present. State whether the rating is provided against changes to the acute guideline, chronic guideline or both. Define "slightly", "marginal" and "substantial" exceedances.**	exceedences is due to the Project), the effects of the increase are assessed in the Aquatic Health component (Volume 4, Section 6.6). Concentrations of all constituents are also assessed in the Human Health (Volume 3, Section 5.3) and Wildlife Health (Volume 3, Section 5.4) components for effects on these receptors. The lowest applicable guideline is always applied to each constituent. Therefore, if a constituent has both a chronic and acute guideline, the chronic guideline is applied.
		9	Pit lakes will have relatively small littoral zone. Shell states that the littoral zones of the pit lakes will be adequate to provide biological activity and support a viable ecosystem. The littoral zones will be up to 15% of the total area. This relatively small compared to other reclamation waterbodies, in which generally 20 to 30% of the area of the lake is comprised of littoral zone. Since the littoral zone is the most productive part of a lentic system, its relative area should be maximized, not minimized. **Request:** **Discuss the adequacy of a maximum 15% littoral zone area for these end pit lakes in light of the more standard 20 to 30% area. Redesign pit lakes if necessary.**	The littoral zone of pit lakes is expected to be 10 to 30% of the total lake surface area (see Closure Drainage Plan - Jackpine Mine Expansion, Appendix 4-3; Pierre River Mine, Appendix 4-4). The pit lake designs are conceptual; the exact areas of littoral zones will be determined during the detailed design stage of pit lake development.
		10	Unclear if pit lake discharge to surface waters will exceed water quality guidelines. Shell states that the pit lakes from the proposed project will discharge to surface waters only when water quality is of sufficient quality and when discharge water quality limits are met. It is unclear what is considered sufficient quality and what these discharge limits will be. It is reasonable to hope that the limits will be the same as the current water quality guidelines, however, this is not likely the intent, since at closure, when discharge will begin, guidelines (molybdenum, PAHs and total nitrogen) may be exceeded in several pit lakes. **Request:** **Define what is considered to be sufficient**	Shell will construct and manage pit lakes and the Treatment Lake such that they will meet discharge criteria as currently being developed by CEMA and ultimately to be enforced by AENV.

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			quality for the water of the pit lakes and what the discharge limits will be. Discuss the rationale behind discharging water from pit lakes that exceeds water quality guidelines.	
		11	Sediment quality of pit lakes has not been modelled. Shell provides the sediment quality of the Mature Fine Tailings (MFT) to be added to the bottom of the pit lakes, but does not characterize the sediment quality of the lakes at the time of closure. Similarly, in the pit lake where MFT will not be stored, the sediments have not been characterized. It is unclear why these have not been modelled. **Request:** **Explain why the sediment quality of the pit lakes at closure has not been or cannot be characterized.**	**Note same as Q14 – PRM** The solid composition of the MFT that will be added to the pit lakes for the Project is expected to be comparable to the MFT for existing oil sands operations, as summarized in the EIA, Volume 4, Table 6.5-15. The solid composition of the MFT will be similar for the PRM and JPME, because both will use similar extraction processes.
3	Aquatic Health and Fish/Fish Habitat	12	Elevated nickel and vanadium levels in fish tissue is predicted. The fish tissue analysis found that nickel would exceed the toxicological benchmark within the Muskeg River, and nickel and vanadium would exceed the benchmark in several pit lakes. However, these findings are rated as having a negligible impact on aquatic health; which is justified, in part, in that the nickel and vanadium benchmarks are based largely on non-detectable fish tissue concentrations, which artificially elevated the benchmark value. However, the percentage of non-detectable values is not provided, nor are the detectable values, so it is difficult to determine whether this conclusion is valid. Another means for justification was that the nickel benchmark is based on a No Observed Effect Concentration (NOEC) level, where concentrations in excess may not necessarily result in detrimental effects. However, the potential toxicological effects of nickel likely to occur at the concentrations predicted are not discussed in this section. More information is required to determine whether a negligible rating is appropriate, despite the predicted benchmark exceedance. **Request:** **Provide additional details on the toxicological effects of guideline-exceeding levels of nickel within fish tissues. Provide the percentage of non-detectable values and the median and peak nickel/vanadium concentrations of the detectable values.**	Two lines of evidence were used to comment on the potential impacts to aquatic health from water quality. The first component was a comparison of predicted water quality concentrations to chronic effects benchmarks (CEBs). The second line of evidence used in the assessment was based on chemical concentrations in fish tissues. This line of evidence requires a calculation of predicted tissue concentrations that is based on water concentrations. Fish were collected and their bodies were sent to a laboratory for chemical analysis. A Bioconcentration Factor (BCF) was computed based on the pre-development water quality modelling and the fish tissue concentrations. Bioconcentration factors were used to approximate the transfer of chemicals in water to fish tissues. Tissue benchmarks are based on tests that evaluate how much of a chemical measured at a target organ is required to cause a specific response (e.g., growth, behaviour, reproduction, mortality). In re-examining the results of the water quality modelling for nickel, an erroneous input was detected for the Base Case in the 2029, 2049, 2065 and Far Future snapshots. The input was corrected, and new results for nickel will be included in the Errata section of the JPME Project Update. Concentrations for nickel in the

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
				Muskeg River following additional water quality modelling for the Base and Application Cases were below water quality guidelines and the CEB. The modeled tissue concentrations for fish in the Muskeg River were slightly above the tissue concentration benchmark for nickel. However, the endpoint was a no observable effects concentration (NOEC) and the conclusion was that the effects of nickel for the project would be negligible. Concentrations of vanadium in the Muskeg River were lower than the CEB for the application case. All concentrations of vanadium were below the tissue concentration benchmarks. Therefore, it was concluded that the effects of vanadium emissions to the Muskeg River would be negligible.
		13	Benchmark exceedances dismissed. The results of the aquatic health and fish tissue analysis found that several constituents (total dissolved solids, nickel, aluminium, cadmium, chromium, strontium, and iron) will exceed the toxicological benchmarks. However, these findings are rated as having a negligible impact on aquatic health; which is justified, in part, by the following: the benchmarks don't really represent an impacted state, are not appropriate for the area, or are overestimated due to the conservative assumptions used to complete the assessment. If the benchmarks can be so easily disregarded, then perhaps a more stringent method of determining benchmarks should be employed, so that meaningful results can be determined. There is little value in assessing impacts, and then disregarding the results because the methods were flawed. **Request:** **Provide appropriate and meaningful benchmarks, such that compliance and non-compliance can be better assessed. If this is not possible, discuss the utility of these benchmarks and how they may be improved in the future.**	**Note same as Q17 – PRM** This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA
		14	Assessment on aquatic health for benchmark exceedances lacking. Several metals are found to exceed their benchmarks within the Muskeg River watershed and the pit lake,	**Note same as Q18 – PRM** The findings of the assessment were that none of the parameters would

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			including total dissolved solids, aluminium, cadmium, chromium, strontium, and iron. While the impacts are rated in terms of duration, frequency, location etc., no information on the actual impacts of these exceedances is included. It would be helpful to know the potential impacts of the metals, individually and synergistically, on the survival, growth, reproduction and behaviour of aquatic life. **Request:** **Provide a discussion of the potential effects of these benchmark exceedances on aquatic health.**	pose long-term impacts to aquatic health. The lowest chronic effects benchmark from the literature review was selected as to be protective of all relevant endpoints (i.e., the lowest number of survival, growth, reproduction and behaviour). If the endpoint was a No Observable Effects Concentration (NOEC), it would be protective of all relevant endpoints. All exceedences of benchmarks (either water concentration or fish tissue) were flagged for further assessment. These parameters were then discussed in terms of uncertainty and reversibility.
		15	Inconsistent extents of littoral zone in the pit lake. In the water quality assessment, Shell noted that the littoral zone of the pit lake will be up to 15% of the total area. In the aquatic health assessment, Shell noted that the littoral zone will be between 10 to 30% of the area. **Request:** **Provide the correct littoral zone area for the pit lake.**	**Note same as Q19 – PRM** The littoral zone of pit lakes is expected to be 10 to 30% of the total lake surface area (see Closure Drainage Plan - Jackpine Mine Expansion, Appendix 4-3; Pierre River Mine, Appendix 4-4). The pit lake designs are conceptual; the exact areas of littoral zones will be determined during the detailed design stage of pit lake development.
		16	Effects on fish habitat are not extrapolated to fish abundance. While Shell assesses the impacts on fish habitat to be a result of several impact pathways and linkages, these potential changes are not extrapolated to the implications for fish abundance or populations. For example, the declines in peak spring floods in the Muskeg River are mentioned in terms of potential decreases in migration for northern pike and Arctic grayling, as well as spawning site losses for northern pike. However, these potential changes are not discussed in terms of impacts on fish populations. Similar concerns exist for impacts of decreased fish passage and accessibility on fish abundance. **Request:** **Discuss the potential impacts of changes to fish habitat on fish abundance and on local and regional fish populations.**	**Note same as Q21 – PRM** Potential changes to fish habitat is described in the Conceptual Compensation Plan (see Volume 4, Appendix 4-6), Also, information would be provided in the No Net Loss Plan, once completed., This could be a subject for discussion as part of the NNL Compensation consultation process. ACFN withdrew from the JPME and PRM NNL consultation process in a letter to DFO dated May 12, 2009. Shell encourages the ACFN to reconsider its decision to withdraw from consultation on NNL plans for this project.
		17	No determination of productive capacity of fish habitat. Compensation for fish habitat losses is based on the productive capacity of fish habitat. However, the productive capacity of fish habitat has not been determined for any of the habitat losses proposed as a result of the project. Shell states that this will be	**Note same as Q22 – PRM** The adequacy of the estimated compensation requirements for the JPME & PRM Project, as presented in the Conceptual Compensation Plan, will be confirmed in the future when

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			completed as part of the detailed No Net Loss Plan. Until the productive capacity of all the existing and compensation habitats have been calculated, it is impossible to determine whether the compensation efforts proposed are comparable, appropriate, and adequate for the project. Shell states that a lake with an area of 4 km^2 is sufficient to provide adequate compensation. The lengths of the compensation channels would be 13 and 15 km. Generally, this project would require at least a 2:1 habitat compensation ratio, but no information is provided to document that the proposed habitat would meet this ratio. Despite this, Shell states that a net gain in the productive capacity of available fish habitat will occur, with no predicted adverse impacts on fish habitat. Without the detailed habitat unit information, it is impossible to determine whether the goal of no net loss of productive capacity will be achieved. In addition, without species-specific habitat losses, it is not possible to determine if the project would exacerbate the stresses and population declines already experienced by several fish species in the region. **Request:** **Provide details on the productive capacity of the habitat losses and compensation habitat. Provide all information necessary to prove that the compensation habitat will provide at least a 2:1 compensation ratio. Provide species-specific habitat losses, and discuss these impacts on fish species currently experiencing stress and population declines in the region. Also, provide the ACFN with a copy for review and comment of the draft No Net Loss Plan when available.**	detailed analyses are conducted (as part of the preparation of the detailed No Net Loss Plan). This could be a subject for discussion as part of the NNL Compensation consultation process. ACFN withdrew from the JPME and PRM NNL consultation process in a letter to DFO dated May 12, 2009. Shell encourages the ACFN to reconsider its decision to withdraw from consultation on NNL plans for this project.
		18	Lack of compensation riverine habitat. The Conceptual Compensation Plan (CCP) does not identify the proportion of riverine or lacustrine habitat units lost or created as a result of the project. Presumably, the majority of fish habitat losses are from riverine habitat, however, the CCP can be assumed to consist primarily of lacustrine habitat (the Redclay Compensation Lake). More effort to creating riverine habitat may be warranted. While opportunities for compensation in the form of newly created riverine habitat or enhancement of existing habitat may be limited in the region, this is not discussed in	**Note same as Q23 – PRM** Section 5.3.2 of the Conceptual Compensation Plan discusses the current plan for riverine habitat development as part of the compensation plan. This could be a subject for discussion as part of the NNL Compensation consultation process. ACFN withdrew from the JPME and PRM NNL consultation process in a letter to DFO dated May 12, 2009. Shell encourages

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			the CCP. No explanation is given for why more riverine habitat cannot be recreated locally or enhanced regionally in order to replace lost habitat with like habitat. **Request:** **Discuss the lack of riverine habitat and the regional implications from this plan and other fisheries habitat compensation plans - which focus almost entirely on lacustrine habitat compensation.**	the ACFN to reconsider its decision to withdraw from consultation on NNL plans for this project.
		19	Information on the timing of compensation lacking. Shell states that the compensation lake will be constructed early in the project and that the compensation channels will generally be constructed later in the project, but no dates are provided. As a result, it is unclear how the compensation habitats will be developed in a timely manner to provide available fish habitat. While construction of the compensation lake may occur at the same timeline as the beginning of the existing habitat losses, this is not the same as providing habitat actually capable of supporting fish. There will be a timelag between construction and development of productive fish habitat (and actual use by fish). This timescale differences and the potential impacts on local fish populations are not clearly outlined in the Conceptual Compensation Plan (CCP). Regional impacts are also not discussed, although this same time lag issue exists for all mine developments. **Request:** **Provide details regarding the timing of the construction of compensation habitat, and when they will be capable of supporting fish and other aquatic organisms as part of a sustainable and diverse ecosystem. Discuss the local and regional implications of this and other compensation plans that will not provide compensation habitat at the same time as habitat losses.**	**Note same as Q24 – PRM** The specifics or timing are being worked on in developing the No Net Loss Plan. Information will be provided in the No Net Loss Plan, once completed. This could be a subject for discussion as part of the NNL Compensation consultation process. ACFN withdrew from the JPME and PRM NNL consultation process in a letter to DFO dated May 12, 2009. Shell encourages the ACFN to reconsider its decision to withdraw from consultation on NNL plans for this project.
4	Hydrology	20	All flow statistics for the Updated Mine Plans are not provided. In the EIA Update, Shell provided new flow statistics in terms of predicted changes to the streamflows of the Muskeg River at several nodes. While the flows are updated, neither the incremental percentage changes due to the project nor the cumulative percentage changes to flows are included. **Request:**	Additional flow statistics are provided at the end of this document in Tables 20-1 through 20-5. The pre-development, Application Case and cumulative changes presented in these tables are similar to what has be presented in Tables 2.6-7, 2.6-8, 2.6-9, 2.6-10, and 2.6-11, Section 2.6.3.2, pages 42 to 44 in the EIA Update.

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			Provide the incremental and cumulative percent changes to streamflows in the Muskeg River.	
		21	Full impacts of permanent diversions of portions of Muskeg River unknown. The project plans for the upper portions of the Muskeg River to be diverted to allow mining under the main stem. This permanent diversion would significantly impact and alter the local ecology. **Request:** **Describe in detail the full impacts of the diversions of the upper portions of the Muskeg River on all aspects of the local ecology and traditional lifestyle. Identify all mitigation strategies to minimize or avoid these impacts.**	Assessment of the water quality in the upper Muskeg River before, during and after is included in Volume 4A, Section 6.5.5. Effects of any changes to water quality were assessed for aquatic, human and wildlife health in Section 6.6 and Volume 3, Sections 5.3 and 5.4, respectively. Impacts on the local ecology and traditional lifestyles are assessed in Volume 5, Section 8.
		22	Unclear if water storage will suffice. Shell is proposing to build on 30 days of off-stream storage to meet Phase 1 of the Water Management Framework. This amount of storage may not be sufficient. **Request:** **Provide additional information on the water storage needs for this project.**	Shell will comply with the Water Management Framework for the Lower Athabasca River.
		23	Kearl Lake integrity would be compromised. With this proposed project, Kearl Lake would be fully surrounded by oil sands projects. This project, along with the other three projects surrounding Kearl Lake, will impact water quality, hydrology, fish habitat compensation and reclamation. **Request:** **Describe in detail the full and combined impacts of this project, as well the other three projects surrounding Kearl Lake, on all aspects of the local ecology and traditional lifestyle. Identify all mitigation strategies to minimize or avoid these impacts.**	The Base Case assessment considered the Imperial Oil Kearl Oil Sands Project, the Syncrude Aurora South Mine and the Shell Jackpine Mine – Phase 1. The Application Case assessment considered these projects plus the Jackpine Mine Expansion. The combined impacts of all projects surrounding Kearl Lake on the hydrology of Kearl Lake and the Kearl Compensation Lake are discussed in Volume 4A, Section 6.4.5.3, page 6-297 to page 6-300. Changes to water quality in Kearl Lake and the Kearl Compensation Lake were assessed in Volume 4A, Section 6.5.5. Project activities and integration of the operational and closure drainage plans for the projects surrounding Kearl Lake were predicted to result in increased concentrations for some constituents relative to the corresponding concentrations under Base Case conditions. The effect of these increased concentrations on aquatic, human and wildlife health were assessed in Volume 4, Section 6.6 and Volume 3, Sections 5.3 and 5.4,

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
				respectively. As detailed in the EIA, Appendix 5-1, Closure, Conservation and Reclamation Plans are designed to mitigate the impacts of the project at closure. The CC&R plans adopt best practices and adapt to incorporate new information and research findings as they become available.
		24	Kearl Lake water level changes. Table 6.4-13 (p.6-300) describes 15-22% increases in long term water levels in Kearl Lake. For a lake with a fairly large surface area to volume ratio (shallow, with gradually sloped littoral areas), an increase in mean water level of 50 cm (1.5 ft) is substantial. Without the planned levee, the surface area would be at times much greater than normal and would inundate project areas. **Requests:** **Describe possible options Shell considered for preventing large increases in water level in Kearl Lake.** **Provide justification for the adopted design with a levee that causes a loss of the natural shoreline of Kearl Lake.**	A water level change from natural conditions greater than 0.5 m is expected to occur on the average about 7 days per year (2% of the time). Because the primary consideration discharges from Kearl Lake is to maintain water quality, Shell chose to use pipelines to convey water across its disturbed mine area. Shell looked at optimizing the number of pipes to economically minimize effects to Kearl Lake water levels. A set of 3 pipelines with 1.5 m diameter each was selected. Adding additional pipelines (e.g. 5 pipelines instead of 3) did not substantially change the nature of water level changes in Kearl Lake. The levee alignment can be modified to restore more of the natural shore area by locating the levee at a setback from the average lake boundary.
		25	Mainstem Muskeg River watershed reductions and flow losses. Shell explains that the watershed and upper mainstem of the Muskeg River will be incrementally removed for the application case. For example, the watershed area contributing to runoff at Node M3 (mouth) will be reduced from 1,475 km2 to 890 km2 by 2049 (Table 2.6-9), a reduction of 40%. At the same time, open water flows at Node M0 (Stanley Creek confluence) will be reduced by 31%, with the watershed area being reduced by 52% at that location (Table 2.6-8). These reductions would appear to be significant impacts, but are not described as such in the EIA. **Request:** **Re-examine all predictions made in the updated tables (2.6-7 to 2.6-11, EIA Update), and provide an interpretation and assessment of the significance of future cumulative changes predicted to be greater than 10% over pre-development.**	The hydrology predictions made in the updated tables (Tables 2.6-7 to 2.6-11, EIA Update) are correct. The cumulative changes in hydrogeology and hydrology were carried forward into the water quality assessment. The environmental consequence of the cumulative changes in water quality was assessed for Aquatic Health (Volume 4A, Section 6.6) and Fish and Fish Habitat (Volume 4A, Section 6.7).
		26	Cumulative Impacts to the Athabasca Delta not assessed. Shell assess changes in water	Please refer to PRM SIR #34.

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			depths and flows in the Athabasca River, but does not assess the effect of cumulative changes in water depths on the Athabasca Delta. Changes in depth and flow affect the delta and reduce flushing of side channels and perched water bodies. Changes to the delta directly affect area residents. **Request:** **Extend the Regional Study Area (RSA) for surface water hydrology from Embarras Portage to the inflow of Lake Athabasca (i.e. encompass the Athabasca delta).**	
		27	Water withdrawal plans not detailed. In January 2009, industry was directed under the Water Management Framework (WMF) to reduce water withdrawals when the Athabasca River entered the "yellow zone". **Requests:** **Describe Shell's plans for water storage and use when restrictions are imposed in the future (including beyond 30 days planned storage).** **Discuss Shell's commitment to abide by the lower Athabasca River WMF restrictions, notably during low flow periods.**	Shell will comply with the Water Management Framework for the Lower Athabasca River.
		28	Significant Increase in Open Water Areas. Pit lakes are a major component of the planned future landscape for the area (increasing open water areas from 15 km2 to 124 km2) under the Application case. Shell assumes that water from the pit lakes will be suitable and available for discharge downstream. No oil sands company in the region has yet addressed a scenario where pit lakes do not function to biodegrade contaminants in a timely manner as planned. **Request:** **Describe what viable options are planned to reduce the reliance on pit lakes in the closure landscape, and to guarantee future adequate clean water flows for the Athabasca River and its tributaries.**	Although no pit lakes are currently in operation within the Oil Sands Region, pit lakes have been incorporated into the design of all approved oil sands surface mining projects - all of which have received overall regulatory approval based on these lakes being the final reclamation option. In fact, pit lakes are an inevitable, necessary and desirable part of the reclamation landscape. Pit lakes are inevitable because voids (pits) are left at the end of mining that will fill with water. This water will contain diminishing levels of reclamation waters for several decades. Although it might be possible to account for the volume of bitumen displaced through replacement of unconsolidated tailings and overburden, such material rehandling would be impractical and this material would eventually consolidate anyway, resulting in topographic depressions where reclamation waters would inevitably collect. These low- lying areas could not be designed to provide

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
				remediation benefits. Pit lakes are necessary because these lakes are key in the treatment of long-term reclamation drainage water. They are desirable because they function first as treatment systems for long-term reclamation drainage water and ultimately, evolve into biologically self-sustaining features of the landscape.
		29	Monitoring program and research plans not described. In Section 6.4.2 of the EIA, Shell states that it would develop a surface water hydrologic monitoring program. The details of this program are not described in the EIA, as required by TOR 5.6.6(iii) and 6.0. Reliance on regional committees such as RAMP is insufficient for monitoring and research due to the lack of project specificity, and lack of control over the long-term plans of outside organizations. **Request:** **Describe Shell's surface water hydrologic monitoring and research plans for all phases of the Jackpine Mine Expansion Project. Discuss Shell's commitment to provide the ACFN with the opportunity to review and make recommendations about these monitoring and research plans.**	The hydrologic monitoring program is described in Volume 4B, Appendix 4-9, Section 3.0. Request to review monitoring and research plans may be part of future negotiations towards an agreement.
	Air Quality	30	Base Case requires more clarification. The Base Case requires additional information to allow for better understanding of the projects, air emissions and timelines associated with this case. **Request:** **With respect to the Base Case, identify the following: 1) Projects that are presently operating, and the air emission rates for each; 2) Projects that are under construction, when they are expected to begin operating, and at what proposed air emission rate; and 3) Projects that are approved but awaiting decision to proceed (e.g., corporate sanctioning, etc), and at what proposed air emission rate. An estimate of the relative timing of these elements is also requested.**	**Note same as Q35 – PRM** As discussed in EIA Volume 3, Section 1.3.3, the Base Case includes all existing and approved activities because it is possible for the approved projects to ultimately contribute to the airshed loadings. Volume 3, Appendix 3-5 and Volume 3, Section 3.3.1 identify the existing and approved developments included in the Base Case as well as their approved air emission rates. Appendix 3-5 also includes a summary of the status of each operation: existing, approved or planned. The approved emission rates represent the peak rates that could occur. The status and timelines of these projects change frequently; therefore, it is difficult to provide the exact start-up times for each project. Proposed air emission rates associated with projects under construction would be identical

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
				to those presented in Volume 3, Appendix 3-5 and Volume 3, Section 3.3.1.
5		31	Removal of developed areas from the assessment is misleading. As has typically been done in previous EIAs for the oil sands region, the disturbed areas are excluded from consideration of air impact analysis, minimizing the change in increased ambient concentrations and subsequent deposition as the size of the disturbed area increases. This practice leads to an assumption conclusion that industrial disturbed areas in Alberta are no longer required to meet air quality standards and guidelines. Urban regions, which could be considered 'disturbed areas', are expected to meet the air quality guidelines within their boundaries. In addition, Shell states (Table 2.2-2) that the eight highest modeled concentrations of various compounds (e.g. SO_2, NO_2, benzene, VOCs) are removed from outside of the disturbed area. It is not clear if these eight highest concentrations are contained within the disturbed areas removed from consideration or if a further eight of the highest values outside of the disturbed areas have also been removed. **Request:** **Clarify whether the eight highest modeled concentrations of various compounds are contained within the disturbed (developed) areas removed from consideration of impact analysis. If they are from outside the disturbed area, then the air quality assessment should be re-assessed including these eight values.**	**Note same as Q36 – PRM** The EIA approach to assessing ambient air quality impacts is consistent with the Draft Alberta Air Quality Model Guideline (AENV 2009). The guideline states that the Alberta Ambient Air Quality Objectives (AAAQOs) are often applied to areas where there is public access (i.e., beyond the plant boundary). The plant boundary is determined by the facility fence line or the perimeter of disturbed area that defines where public access is restricted. Developed areas were excluded from the air quality predictions because concentrations within developed areas are also considered subject to occupational health and safety guidelines, not environmental guidelines such as the AAAQOs. The draft Alberta Air Quality Model Guideline also states that the highest eight 1-hour predicted average concentrations for each receptor in each single year should be disregarded. Therefore, the eight highest modelled concentrations were removed at each receptor for the air quality assessment. As part of a second step in the analysis, the receptors within the developed areas were then excluded from the impact analysis.
		32	Acute inhalation health risks may not be protective of the most sensitive individuals. Shell states in Section 2.4 that the acute health risks due to air emissions are to be compared with health-based guidelines considered "protective of the most sensitive individuals". However maximum concentrations are compared with the Canada-Wide Standards, a standard that is not only health-based but also includes economic considerations. **Request:** **Reassess and present the results and a discussion of the acute inhalation health risks using a health-based air quality**	**Note same as Q37 – PRM** This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			standard that is considered protective of the most sensitive individuals.	
		33	Magnitude classification levels not reflective of air guidelines and standards. The evaluation of magnitude classification still permits air emissions to increase beyond the Alberta Ambient Air Quality Objectives (AAAQO) by deeming the impact in question as only moderately of concern. When meeting the AAAQO, a magnitude classification of 'high' would demonstrate the commitment to staying below the objective. *To better identify which issues are approaching the environmental limits used by Shell, they should reassess the environmental consequences rating using the higher magnitude ratings.* **Request:** **Reassess the 'environmental consequences' classification using the Albert Ambient Air Quality Objectives (AAAQO) or the Canada-Wide Standards as the limit between 'moderate' and 'high' rankings.**	**Note same as Q38 – PRM** This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA
		34	Assessment of secondary pollutants and their impacts deficient. There is a poor understanding of the true impacts (visibility, odour and acidification) of secondary pollutants ($PM_{2.5}$ and ozone). **Request:** **Describe the current steps underway to support research and monitoring that will enhance the evaluation of impacts related to secondary pollutants in the region.**	**Note same as Q39 – PRM** Shell continues to be an active member of the Wood Buffalo Environmental Association (WBEA). The WBEA air monitoring network includes continuous monitoring of both $PM_{2.5}$ and ozone. $PM_{2.5}$ is currently monitored at nine stations in the region, including Fort McKay, Fort McMurray – Patricia McInnes, Fort McMurray – Athabasca Valley, Fort Chipewyan, Millennium, Syncrude UE1, Anzac, CNRL Horizon and Albian Muskeg River. Ozone is currently monitored at six stations in the region, including: Fort McKay, Fort McMurray – Patricia McInnes, Fort McMurray – Athabasca Valley, Fort Chipewyan, Syncrude UE1 and Anzac. The WBEA network also conducts passive monitoring for ozone at several locations throughout the region. The WBEA Terrestrial Environmental Effects Monitoring Committee is also enhancing monitoring of particulate matter by quantifying trace species associated with particulate matter. This will help to improve the knowledge of $PM_{2.5}$ in the region. Shell also continues to be an active

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
				member of the Cumulative Environmental Management Association (CEMA), NO_X-SO_2 Management Working Group (NSMWG). The NSMWG has an ozone task group, and this group has produced an ozone management framework (NSMWG 2006). Management tools associated with the framework include monitoring, modelling, and emissions management. As discussed above, there is extensive monitoring of ozone in the Wood Buffalo region. Ozone modelling is also ongoing, with a recent report by Environment Canada providing modelled results for a base case and future scenario in Alberta (Environment Canada 2007). In Alberta, ambient concentrations of fine particulate matter and ozone are managed by the Clean Air Strategic Alliance "Guidance Document for the Management of Fine Particulate Matter and Ozone" (CASA 2003). This guidance document outlines action levels, including the action levels that lead to the development of a management plan in a region.
		35	Climate change impact classification lacking. Shell states that an impact assessment was completed for greenhouse gas emissions, however no impact classification is provided. Shell also states that it is not possible to directly compare emissions intensities from this project with other projects that have both integrated mine and upgrading activities. However, Shell's contribution to greenhouse gases is broader than just the mine sites in the oil sands region - Shell should include their upgrading activities in the Heartland Industrial Region near Edmonton. **Request:** **Include all related Shell operations when evaluating greenhouse gas emissions, which would allow comparisons to be made between other oil sands operators in the region.**	**Note same as Q40 – PRM** Shell can provide copies of our Scotford Upgrader EIA CD to ACFN for their review of its GHG emissions.
	Wildlife	36	Temporal and spatial boundaries inappropriate. The temporal and spatial boundaries used in the EIA do not permit a meaningful assessment of the long-term effects of the proposed projects on wildlife populations in the project area. The assessment does not include a pre-	**Note same as Q41 – PRM** The impact assessment scenarios used in the EIA were defined in compliance with the Final Terms of Reference for the EIA Report issued by Alberta Environment (AENV 2007).

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			disturbance baseline. Inappropriate criteria are used for selecting the Regional Study Area. **Request:** **Identify changes to wildlife Key Indicator Resources (KIRs) resulting from past (existing) development. Determine the natural range of variation (NRV) for each KIR. Relate the predicted project and cumulative impacts to the NRV for each KIR.**	These scenarios included: • Base Case, which includes existing environmental conditions, existing and approved Projects or activities; • Application Case, which includes the Base Case plus the Project; and • Planned Development Case, which includes past studies, existing and anticipated future environmental conditions, existing and approved projects or activities, plus planned projects or activities. Predicted impacts to the wildlife KIRs are located in Volume 5, Sections 7.5.3, 7.5.4, 7.5.5 and 7.6.3. Modelling approaches are provided in Appendix 5-4.
6		37	Waterfowl species not selected as KIRs. Although this mine will be situated adjacent to regionally or provincially significant waterfowl habitats (e.g. McClelland Lake, Kearl Lake, Athabasca River) and ducks and geese are consumed by First Nations members, no waterfowl species were selected as Key Indicator Resources (KIRs). **Request:** **Explain the rationale for excluding waterfowls as a KIR, and expand the assessment to include mallard or another appropriate wildlife species.**	**Note same as Q42 – PRM** The KIRs chosen for the EIA (Volume 5, Table 7.2-2, Page 7-22) were the result of extensive discussions with regulators that were aimed to keep the EIA focussed, while ensuring that the assessment of impacts on wildlife due to the Project would remain comprehensive. These KIRs are species that represent the main habitat types within the LSAs (i.e., lowland, upland, riparian, wetlands, waterbodies and watercourses) and from which effects to other species with similar habitat requirements can be inferred. Because beavers have similar habitat requirement as ducks and geese, effects of the Project are comparable. The beaver was chosen as a KIR due to its traditional, economic and ecological importance and an assessment of effects to beaver was conducted. Impacts to beaver abundance were predicted to be negligible at both the local and regional scales (Volume 5, Table 7.5-35, Page 7-105). Impacts to high-quality beaver habitat were predicted to be high at the local scale and negligible at the regional scale (Volume 5, Table 7.5-37, Page 7-115).

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
		38	Baseline surveys have gaps. Gaps in baseline surveys (such as breeding birds and bats) prevent full understanding of wildlife resources that might be at risk. **Request:** **Conduct additional sampling of breeding birds and bats in riparian habitats associated with the Muskeg River.**	**Note same as Q43 – PRM** This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA
		39	PVA and TEK information conflicting. The results of the Population Viability Analysis (PVA), which predict growth in moose and black bear populations under all development scenarios, disagree with Traditional Ecological Knowledge (TEK): trappers and other First Nations people consistently report declining moose numbers in the region. The PVA results also conflict with the results of modeling conducted in conjunction with the development of a Terrestrial Ecosystem Management Framework for the Regional Municipality of Wood Buffalo (for CEMA). This modeling concludes that several terrestrial ecosystem indicators, including moose, black bear, and fisher, are already below their natural range of variation (NRV) and will continue to decline given expected rates of landscape modification. **Request:** **Rationalize differences in model predictions. Review assumptions and data requirements for PVA analysis and rerun population models based on this.**	**Note same as Q44 – PRM** . This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA
		40	Validity of habitat models questionable. The Resource Selection Function (RSF) models developed to assess regional changes in habitat supply and habitat suitability of reclaimed lands at closure was found to be ineffective when validated against field data. This may affect the validity of all impact predictions based on these models. *RSF may have advantages over Habitat Suitability Index (HIS) models for some species. Further work to refine / develop accurate models is strongly recommended.* **Request:** **Identify and discuss the implications of using an apparently invalid model to assess cumulative effects and the value of**	**Note same as Q45 – PRM** Local study area (LSA) scale models were used to assess changes in habitat quality from Base Case to closure. The LSA-scale RSF models for moose, fisher/marten, and Canada lynx did perform adequately (Volume 5, Appendix 5-4, Section 1.2.1). Therefore, valid models were used to assess cumulative effects and the value of reclaimed lands for wildlife at the LSA scale. As a result of model performance at this scale, Shell is confident in the project-

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			reclaimed lands for wildlife. Consider expanding the assessment for moose to include calving/post-calving habitat as well as winter habitat.	
		41	Loss of riparian habitat may be underestimated. Shell predicts a relatively large net loss of wetland and old-growth habitat. The predicted loss of riparian habitat is likely underestimated. **Request:** **Consider additional mitigation and compensation measures to offset permanent habitat losses. Reassess riparian habitat losses based on accepted scientific criteria rather than arbitrary 100m limits.**	**Note same as Q46 – PRM** This appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification which would allow ACFN to complete its Technical Review of the EIA. This request may be more appropriately discussed following completion of the EIA technical review.
		42	Regionally significant riparian corridor will be eliminated. The proposed project will result in the removal of the middle section of the Muskeg River, eliminating what might be considered a regionally significant riparian corridor. **Request:** **Initiate radio telemetry studies (in additional to current corridor monitoring efforts) to fill critical knowledge gaps in the understanding of the potential role of riparian corridors in supporting wildlife movements in a fragmented landscape.**	As stated in the Wildlife Movement Appendix 5-5 (EIA; Section 3.3; Page 6), regional developments along Muskeg River, including JPME, will create and maintain a 20-km-long remnant corridor about 400 m wide along the Muskeg River from the Athabasca River to Fort Hills. This remnant corridor is expected to maintain an east-west connection between the Athabasca River and the eastern area of undisturbed habitat.
		43	Research and data directly applicable to wildlife is lacking. The lack of research and toxicity reference data directly applicable to wildlife (as opposed to laboratory animals) may affect the validity of the wildlife health assessment. It is also unclear to what extent Shell considers potential long-term, residual effects of wildlife exposure to contaminants in process-affected wetlands and pit lakes when conducting the wildlife health assessment. **Request:** **Explain the possible risks associated with extrapolating toxicity data from lab animals to wildlife. Identify risks to wildlife resulting from long-term exposure to process-affected water.**	**Note same as Q48 – PRM** In the Planned Development Case, all animals were assumed to be using pit lake water as their primary source of drinking water (see Volume 3, Section 5.4.3.2, for a full discussion on the potential impacts to wildlife associated with all applicable routes of exposure). Assessing wildlife exposure to contaminants is difficult as there is no way to control their environment, or determine what is causing the effect. As such, toxicity data for laboratory animals was used to assess potential impacts to wildlife (See Volume 3, Appendix 3-12, Section 1.3.1). Because the health effects data gathered from laboratory animals was extrapolated to the wildlife receptors, uncertainty factors were used to accommodate the possible differences in physiology and sensitivity to the chemicals. Use of uncertainty factors to account for extrapolation between

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
				species is common practice in risk assessment Also, risk to wildlife health resulting from long-term exposure to process-affected water was addressed in the Wildlife Health Risk Assessment.
		44	Cumulative effects of tailings ponds not assessed. Because of the proximity of this mine project to regionally or provincially significant migratory staging areas (McClelland Lake, Kearl Lake, Athabasca River), risks of exposure of migrating water birds to tailings might be increased. Cumulative effects of tailings ponds in the oil sands region on wildlife (including migratory birds) have not been assessed. **Request:** **Conduct a detailed cumulative effects assessment dealing with exposure of migratory birds to the expanding network of tailings ponds in the oil sands region.**	**Note same as Q49 – PRM** This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA
		45	Risks or levels of uncertainty associated with habitat modeling not identified. The wildlife impact predictions are based on the assumption that reclaimed lands will have the same wildlife habitat value as the undisturbed ecosite phases after which they are modeled. No evidence is presented to support this assumption and reclamation progress in the region does not support this. The assessment fails to identify the risks or levels of uncertainty that are associated with these habitat model predictions. **Request:** **Provide a detailed review of monitoring research that supports the assumption that reclaimed lands will have the same wildlife habitat value as the undisturbed ecosite phases after which they are modeled after. Use sensitivity analysis or another appropriate technique to identify levels of uncertainty associated with the models and variables that might affect the accuracy of theses predictions.**	**Note same as Q50 – PRM** This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA
	Vegetation, Wetlands & Forest Resources	46	Unclear change in frequency of KIRs between LSA and RSA. Three key indicator resources (KIRs), wetlands, old growth forests, and high rare plant potential - that were assessed as having low frequency in the Local Study Area (LSA) - were then rated as having a high frequency in the Regional Study Area (RSA). Shell's explanation for the change in rating is "as clearing to vegetation will occur into the future, the frequency is	**Note same as Q52 – PRM** The difference in frequency rating referred to above is due to the difference between the Application Case and Planned Development Case (PDC), and is not the result of scale issues between the LSA versus the RSA. The difference in frequency rating is due to timing or rate of

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			considered to be high". However, frequency refers to the number of occasions with respect to the same KIR, so the time lag should be irrelevant. **Request:** **Explain why the frequency rating for wetlands, old growth forests, and high rare plant potential is low in the LSA and high in the RSA.**	clearing in each case. In the Application Case, the only source of change to the environment is a single development (the Project) that will be cleared, and it is assumed that the entire area is cleared at once. Thus, the frequency rating is low for both the LSA and RSA at the Application Case. For the PDC, each planned or approved project is assumed to be 100% cleared as an individual event, thus the clearing of all developments are considered to be different events on the specific resource in the PDC. Therefore, a frequency rating of high is assumed for the PDC.
7		47	Measure of vegetation loss misleading. Shell states "The project will result in the removal of 1,233 ha of old growth forest, representing a loss of 2% of the LSA [(combined Local Study Area for both Jackpine Mine Expansion Project and the Pierre River Mine Project)]" (EIA Section 7.5, pg. 7-74). However Table 7.5-18 (EIA Section 7.5) indicates that 40% of the old growth forest in the LSA will be removed. The latter is a more meaningful measure. **Request:** **Explain why "Magnitude of Impact" in the local study area for the loss of old growth forest is not ranked as high (>20%), and therefore the environmental consequence also not ranked as high (+17) in Table 7.5-34 (EIA Section 7.5). Explain why using a 2% loss of the local study area is more biologically relevant than using a 40% loss of the resource.**	**Note same as Q53 – PRM** Magnitude of impacts is rated in terms of a geographic area in order to provide a scale of reference. Consider the following two scenarios: Scenario 1 – 1 ha of Old Growth Forest (OGF) in 1,000 ha study area; 100% of it removed by a project. Scenario 2 – 900 ha of OGF in a 1,000 ha study area; 100% of it removed by a project. If the impact assessment was based on the percent of OGF affected, the result for both scenarios would be 100%. This determination would not provide information relating to the contribution of OGF to the overall ecosystem function in the study area. In Scenario 1, the contribution of OGF to the study area is 0.1% as compared to 90% in Scenario 2. It follows that the impact in Scenario 2 should be rated higher than the magnitude of effect in Scenario 1. This perspective is achieved by assessing the impact relative to the study area. While environmental consequence is not scored on percent of the resource, the change in amount of the resource is provided as an added perspective for the reader.
		48	Lichen jack pine communities reclamation unclear. Shell selected lichen - jack pine communities as a community-level key indicator resource because of their importance for caribou habitat and their restricted spatial distribution in the region.	Lichens recolonize re-established forests (e.g., Johannson 2008) with timeframes for recolonization being species-dependant. Lichens may need from 50 to more than 300 years to reach high abundance. Dunford et al.

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			Lichen - jack pine communities are predicted to increase from Base Case at time of closure for the local study area. However, this assumes that reclamation will be successful in a meaningful time frame for caribou. **Request:** **Provide evidence that lichens will re-colonize the reclaimed and re-established jack pine communities, especially when they are isolated from contiguous stands by early seral reclamation communities. Provide the time frame expected for lichen re-colonization. Provide evidence that decades of reduced lichen population will not affect caribou and that the impacts to lichen jack pine communities will not have a negative environmental consequence. Explain why reversibility is not applicable.**	(2006) examined the re-establishment of lichens up to 70 years after forest fires in treed bogs. Overall, he found a large variation in lichen cover at all sites, regardless of their time since fire. No sites that had burned within the last 20 years had >20% lichen cover, while sites that were 40 years old or older had the same range of lichen cover as mature sites (>70 years post-fire). During field work for the Project, no caribou were observed in the Project areas (Volume 3, Section 5.3.1.4), nor do the Project areas overlap with any regional Caribou Areas. The Steepbank Caribou Area is located about 15 km east of the JPME LSA and the Birch Mountain Caribou Area is 50 km northwest of the PRM LSA. Due to the limited use of the Project area by caribou, the Project will not have an affect on caribou habitat. Lichen jack pine communities that are affected by the project occupy less than 2% of the LSAs. After closure, the lichen jack pine community habitat area will increase. Based on the relatively small percentage of lichen jack pine areas in the LSAs and the predicted increase in this resource after closure, the impacts to lichen jackpine communities are not expected to have a negative environmental consequence. As the direction of this environmental consequence is positive, the reversibility criteria are not applicable. Additional information is also provided in PRM SIR #472.
		49	Impacts to wetlands unclear. Impacts to wetlands are ranked as having a low environmental consequence. Six percent of the treed fens and 4% of the treed bog / poor fens will be lost in the regional study area (of Jackpine Mine Expansion and Pierre River projects combined), and there will be an increase of 16% in non-treed wetlands after reclamation. The environmental consequence assumes that non-treed wetlands are ecologically equivalent to peatlands, which is not supported in the report. **Request:**	**Note same as Q54 – PRM** Although non-treed wetlands are not identical to peatlands, the two wetland types are similar in many respects. As the identified KIR was all wetlands, the results were reported correctly. The assumption is that non-treed wetlands and peatlands reasonably fit into the same "wetland" category. Although they are not considered to ecologically equivalent to peatlands in all respects, they are also not entirely ecologically distinct either. They have similar

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			Support the assumption that reclaimed non-treed wetlands are ecologically equivalent to peatlands. Explain why the increase in non-treed wetlands was used to offset the decrease in peatlands.	ecological functions with respect to many environmental components – examples include certain aspects of surface water hydrology, water quality, vegetation, wildlife habitat, traditional land use and biodiversity. The shift from peatlands to non-peat forming wetlands and wet area types is fully assessed in the respective EIA components.
		50	Re-vegetation strategy unclear. Shell indicates that one third of the topsoil will be used for direct placement and that the other two thirds of the topsoil will be stored in reclamation material sites where the seeds, propagules and mycorrhyizae are not likely to survive in sufficient quantities to enhance site re-vegetation (EIA update, Appendix 11, Section 3.3.2, Table 27). Shell's Target Ecosite Phase Planting Prescription specifies the planting of only native trees and shrubs, with the exception of two shrublands where forbs and shrubs will be planted. The success of reclamation is based on several factors: site conditions, weather conditions during the establishment years, and the seed source available in the establishment years. Reclamation sites that are relatively small, and surrounded by vegetation communities which high species richness are likely to reclaim to rich / diverse communities. Reclamation sites that are large, such as mines, have areas that are distant from seed sources. The centres of these large reclamation areas then to have low species richness unless forbs are seeded. **Request:** **Estimate the area that will have topsoil placed directly upon it, rather than stored in the reclamation material sites. Explain how biodiversity will be enhanced in the areas where direct placement is not possible. Explain how species richness will be enhanced with the direct placement of one third of the topsoil and lack of seeding forbs (other than in two shrublands).**	**Note same as Q55 – PRM** The Reclamation Goals and Principles stated in Section 1.2 of the Closure, Conservation and Reclamation (CC&R) plans for both the JPME EIA Update (May 2008) and PRM (Appendix 5-2) clarify the revegetation strategy. For information on enhancing biodiversity, see Volume 5, Section 7.1.
		51	Information on weeds and non-native invasive species lacking. Shell does not discuss the likelihood of weeds and non-native species hindering successful restoration or reclamation. Non-native species are common throughout the regional study area, along roads and pipelines, and in	**Note same as Q56 – PRM** Please refer to PRM SIR # 350, 381 and 511.

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			borrow pits and wellpads. Although not documented in this EIA, non-native invasive grasses such as smooth brome, timothy, Kentucky bluegrass and curled dock, occur throughout the boreal forest and can cause problems for reclamation. Non-native invasive species and listed weeds can be introduced by construction and reclamation equipment, and in reclamation seed mixes. **Request:** **Explain how Shell intends to control the introduction and spread of invasive non-native species during construction and reclamation.**	
		52	Traditional Plant Potential assessment deficient. Shell identifies the Traditional Plant Potential, where plant species used as part of a traditional lifestyle are assigned to vegetation type and scored according to presence and cover. This method assumes that all of these plant species are equally important to all the regional Aboriginal communities, which is inaccurate. Additionally, ratroot, which is one of the most important traditional species, was not assigned any vegetation type. **Request:** **Re-assess the environmental impacts on plant species considered most valuable to the Aboriginal communities.**	**Note same as Q57 – PRM** This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA. Shell funded ACFN to complete a TEK study for the EIA of the Projects.
		53	Calculation of species richness inaccurate. 'Total species richness', a biodiversity management indicator, includes both native and non-native vascular plant species, bryophytes, and lichens (EIA, Section 7.2.6, Table 7.2-3). The inclusion of non-native species as part of 'total species richness' undermines the aim of this indicator; species richness is used to identify natural areas that have a high diversity. By including non-native species, disturbed areas with a high diversity of weeds may be identified as worthy of protecting. **Request:** **Justify the inclusion of non-native species as a part of the 'total species richness' biodiversity indicator. Include a re-calculation of species richness, this time excluding non-native species.**	**Note same as Q58 – PRM** As stated in Biodiversity Environmental Setting Report (Section 6.4.3, Page 6-25), Shell recognizes that non-native species can be detrimental to the natural balance of ecosystems. Relative to the total number of plant species, few non-native or exotic species occur in the Oil Sands Region and they tend to be associated with disturbed areas. Golder's vegetation database for the Oil Sands Region contains information on twenty-eight plant species that are provincially classified as exotic (ANHIC 2006). Excluding these species from the 'total species richness' calculation does not affect the overall biodiversity ranking of vegetation types because most non-native plant species were recorded in disturbed areas, which are automatically ranked low for biodiversity potential. Furthermore, this biodiversity indicator is based on

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
				relative plant species richness rather than absolute richness values and no natural vegetation type had a disproportionate number of non-native plant species. In reviewing the rankings, excluding non-native plant species from the species richness calculation did not change the ranking score. The overall assessment of biodiversity for the Project is not affected by the exclusion of non-native plant species from the species richness index for biodiversity potential.
		54	Rare plants assumption unclear. Shell assumes that reclamation will compensate for the loss of rare plants by increasing the rare plant habitat. **Request:** **Provide evidence of the assertion that rare plants will re-colonize in reclaimed landscapes.**	**Note same as Q59 – PRM** The reclaimed landscape is predicted to provide the potential for the natural re-colonization of rare plants. Direct placement of reclamation materials will be undertaken whenever practical to maximize potential viability of native seed banks and propagules, which has the potential to include rare plants. Direct placement will account for approximately 2,500 ha of the reclaimed area for JPME and approximately 1,100 ha for PRM. Natural invasion of native vegetation (including rare plants) will be encouraged in ecologically-receptive areas. The successful restoration of a river valley in Denmark provides one example of the natural invasion of two rare aquatic plant species in a reclaimed riverine landscape (Pedersen et al. 2007).
		55	Methodology for evaluation of rare plant potential inadequate. Shell includes an assessment of impacts to high rare plant potential, referring to areas that might have rare plants. It is difficult to accurately predict rare plant occurrences. Simply adding the number of species that could occur in an ecosite phase will overestimate the area in which rare plants are actually found. This method for evaluating rate plant potential has little science to support it. **Request:** **Provide support for the assertion that rare plant potential accurately predicts rare plant occurrences. Using Alberta Natural Heritage Information Centre (ANHIC) records, evaluate the impacts on actual rare plant occurrences.**	**Note same as Q60 – PRM** Rare plant potential (RPP) does not predict rare plant occurrences, but identifies those ecosite phases and wetlands types that have been identified as more likely to contain rare plants based on extensive field work in the Oil Sands Region. RPP is derived from an assessment of over 3,000 vegetation plots collected by Golder in the Oil Sands Region. This includes Project-specific vegetation plots accounting for 145 detailed and rare plant vegetation plots, 81 aerial survey plots and 18 rare plant plots in the JPME LSA and 214 detailed and rare plant vegetation plots, 169 aerial survey plots and 13 rare plant plots in the PRM LSA. Rare plant frequency of occurrence was calculated for each

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
				ecosite phase or wetlands type, resulting in a rare plant potential ranking calculated for each (refer to Terrestrial Vegetation, Wetlands and Forestry Resources ESR, Volume 3, Section 3.3.6.2, Page 3-45 for Method Summary). Information on existing rare plant occurrences and rare plant habitat was acquired from ANHIC for the JPME and PRM LSAs and the Project RSA. Rare plant occurrence and habitat data from ANHIC and rare plant occurrences documented during Project field work within the LSAs is presented in the ESR (Volume 3, Section 3.3.6.2, Page 3-45 for methods and Section 3.5.1.4, Page 3-86 and Section 3.6.1.4, Page 3-138 for occurrence data). Tables 7.5-26, 7.5-27 and 7.5-28 in the EIA (Volume 5, Section 7, Pages 7-82, 7-83 and 7-84) provide specific information on the vascular, bryophyte and lichen species to be affected by the Project. Rare plant data collected in the LSAs and acquired from ANHIC are integrated in to the rare plant assessment and subsequently used in the EIA (Volume 5, Section 7, Table 7.5-34, Page 7-94) to evaluate residual impacts in the LSA.
		56	Surveyors for rare plants not identified. The Alberta Native Plant Council Rare Plant Survey Guidelines recommend that surveyors for rare plants be identified in reports. **Request:** **Identify the botanists used for the rare plant surveys, as well as their qualifications. Clarify whether these botanists were on all the detailed inventory surveys as well as the rare plant surveys.**	**Note same as Q61 – PRM** All surveys were completed by teams of two experienced surveyors that included one senior ecologist or botanist and junior ecologist or botanist, to ensure that plot data were accurately collected and that experience was passed on. Collected samples or photographs were subsequently returned to Golder, where senior botanists or sub-contracted experts were used to confirm rare plants and identify unknown species.
		57	Estimation of old growth forest may be inaccurate. Shell estimates the area of old growth forest to be between 20% and 28% of the forested land base, resulting in an estimate of 16% of the regional study area. This estimation is based on a modeling study using an 80-year fire cycle and a burn rate of 0.4% per year. However, AVI mapping for this project shows that only 5% of the local	This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			study area is old growth (ESR, Section 3.5.2.2, Table 3.5-19). Research in Wood Buffalo National Park shows that the mean fire interval may be 34 years, or 25-49 years prior to 1959 and 59-80 years between 1860 and 1989. Research in Prince Albert, SK, show that less than 5% of the area has gone more than 125 years without a fire. The more frequent the fires, the smaller the area of old growth forest remains, therefore using 80 years versus 34 years may over-estimate the amount of old growth in the regional study area. **Request:** **Support the use of 80-year fire cycle and a burn rate of 0.4% per year over other research. Support the estimate that 16% of the regional study area is old growth forest, explaining also why there is only 5% or 6% old growth in the local study area.**	discussed following completion of ACFN's technical review of the EIA.
		58	Accuracy of map not discussed. Shell describes the methods used to map the local and regional study areas (ESR Section 3.3.1.7, pg. 3-16). There is no discussion of the accuracy of the maps, and therefore no way to evaluate the accuracy of the assessment. **Request:** **Evaluate and discuss the accuracy of the AVI data used, the local study area map and the regional study area map.**	**Note same as Q62 – PRM** The most recent AVI data was purchased from Alberta Pacific Forest Industries Inc. (AlPac) and reviewed/approved by Alberta Sustainable Resource Development (ASRD) This data reflects the most up-to-date conditions on the ground and is further refined during the Local Study Area Mapping process. Although accuracy validation has not been conducted on this data set, accuracy is greater than that of the original AVI. For additional information on vegetation mapping in the LSA, refer to Volume 3, Section 3.3.2.2. For the RSA, an overall accuracy assessment of 80% was determined for the Landsat imagery classification.
		59	Impacts of combined air emissions on vegetation key indicator resources unclear. The increase in nitrogen causing eutrophication is a concern, as nitrogen accumulates in the environment causing long-term to permanent changes. Nitrogen is a naturally occurring nutrient, however many northern vegetation communities are adapted to low nitrogen levels. The addition of nitrogen to treed bogs and poor fens may result in a shift in species; potentially an increase in sedges and shrubs and a	**Note same as Q63 – PRM** There is no accepted model to assess the effects of combined air emissions on Canadian boreal ecosystems. The models used to assess the potential effects of air emissions on vegetation are based on comparing reviewed vegetation sensitivities to applicable critical loads, objectives and guidelines. These standards have been adapted from recommendations by

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			decrease in mosses and lichens (depending on the species). Plant species particularly adapted to low nutrient conditions, such as pitcher plant, which is both rare and collected by aboriginal users, may be out-competed in a more nutrient rich environment. Although the area potentially affected is small, the long term impacts may be noticeable to aboriginal users and wildlife. The combined effects of acid deposition, sulphur dioxide, nitrogen dioxide and eutrophication on treed / poor bogs may cause more permanent changes than anticipated. The interrelationships between these elements and northern Canadian ecosystems are not well understood, therefore the confidence level is reasonable but not high. **Request:** **Interpret the impacts of combined air emissions on the vegetation key indicator resources.**	leading authorities (CASA, WHO and the provincial and federal governments). The scientific basis behind these standards results in a reasonable level of confidence to the assessment. For a review of the available knowledge of the effects of air emissions, see Appendix 3-13, Sections 2 and 3.
		60	Negligible rating for special plant community unclear. The project's local study area comprises the lenticular patterned fen special plant community. The project's operations and mine area overlap 37 ha (6%) of the southern edge of this fen. Clearing, pit construction, and drawdown are predicted to be high, affecting 124 ha (21%) of the fen. Shell states that there "is limited regional information on these special plant communities and their distribution within the RSA [(regional study area)]" (EIA, Section 7.5.2.2, pg. 7-86). The impact to this special plant community is considered local, although the lack of data indicates that it may be uncommon or rare in the boreal forest. It has a high environmental consequence in the local study area, but negligible in the RSA. Losses or alterations to regionally rare plants or communities may have a regional impact, not just local. **Request:** **Explain why impacts to a special plant community that may be provincially rare, is considered negligible.**	This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA.
	Reclamation	61	Stability of new watershed drainage features and channels in question. There is a concern that the new drainage features will erode and excess sediment will be transferred to lakes and the Athabasca River.	This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			Request: **Provide additional information on the stability of the planned drainage features for this project. Identify mitigation plans to prevent erosion and sedimentation of local waterbodies, including the Athabasca River.**	Technical Review of the EIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the EIA.
		62	Soil salinization. The reclamation soils may be salinized and contaminated by process chemicals; these effects were not considered in the EIA. **Request:** **Describe and assess the likelihood of reclamation soils becoming salinized and contaminated by process chemicals. Identify mitigation strategies to prevent this occurrence.**	It is unlikely that reclamation soils will become contaminated, therefore these effects were not considered in the EIA. The mitigation strategies that prevent contamination of reclamation soils include the following: • Reclamation soils will be stripped from areas that have been cleared of vegetation and drained, if necessary. Soils from previously developed, potentially saline or contaminated areas will not be used as reclamation material. • Prior to salvage, soil will be tested for reclamation suitability according to the Criteria for Evaluating the Suitability of Surface Soil and Subsoil for Revegetation in the Northern Forest Region (Alberta Agriculture 1987). These criteria provide a standard for chemical and physical characteristics of reclamation material. • The salvaged soil will be directly placed from salvage areas to reclamation areas or will be stored in designated reclamation material stockpiles (RMS). • Potentially process affected water will be re-circulated within the plant process system and will not come into contact with the RMS or reclaimed areas.
		63	Large-scale restructuring of landscapes unproven. While there have been many large-scale reclamation plans made in the Athabasca Oil Sands Region, the ability to successfully restructure landscapes, along with tailings remediation, on such a large scale remains unproven. **Request:** **Describe and assess the likelihood of successful reclamation of this project. Identify the risks associated with such large-scale reclamation. Identify all**	The Closure, Conservation and Reclamation (C, C &R) Plan in Appendix 5-2 describes risks and mitigation strategies, and will evolve as current standards are applied and new technologies developed.

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			mitigation strategies to ensure an uncontaminated, ecologically and traditionally viable land is in place following reclamation.	
	Traditional Land Use	64	ACFN members were not consulted about impacts of the project on traditional lands. Only the six impacted trappers were interviewed, and their band membership is not made clear. Information regarding the ACFN's traditional territory in the project area is taken from published documents without permission or an information sharing agreement. **Request:** **Engage members of the ACFN in a traditional land use assessment of the project area. Invite ACFN Elders and youth to assess the project area before construction as per the ACFN request in the August 16, 2007 meeting.**	**Note same as Q66 – PRM** At ACFN`s request, Shell funded a TLU/TEK Study conducted by the ACFN IRC. At the IRC's request, Shell did not include this study in the recent Project Update. Shell is consulting ACFN on the potential impacts of the project on the ACFN's traditional lands and Aboriginal and Treaty rights. Shell has funded the ACFN to conduct a technical review of the EIA and SEIA for the project which forms a part of this consultation.
9		65	Direct loss of traditional territory. Shell states that a section of the ACFN's traditional territory will be disturbed and not reclaimed until the far future. No reclamation timeline is provided. **Request:** **Consult with the ACFN about the loss of their traditional territory. Work with the ACFN to find mutually beneficial solutions to this problem. Some possibilities are to help ACFN preserve other traditional areas in exchange, and fund traditional youth camps to continue the transmission of important traditional environmental knowledge.**	**Note same as Q67 – PRM** Shell is consulting ACFN on the potential impacts of the project on the ACFN's traditional lands and Aboriginal and Treaty rights. Shell has funded the ACFN to conduct a technical review of the EIA and SEIA for the project which forms a part of this consultation. Shell is willing to discuss this request as part of future negotiations towards an agreement.
	Human Health Risk Assessment	66	HHRA conclusion unclear. Shell concludes that overall, "the Project emissions alone, and in combination with other sources of [chemicals of potential concern] are not expected to result in a noticeable increase in health risks in the Oil Sand Region". The use of the term "noticeable increase in health risk" is unclear; it is uncertain what and who defines the perceptibility of a change in health risk, and whether these health risks are being monitored. **Request:** **Clarify the use of the term "noticeable increase in health risk", including what defines the perceptibility of changes in health risk, who identifies these changes, and whether these health risks are being monitored.**	**Note same as Q68 – PRM** The term "noticeable" was intended for descriptive purposes and its use was based on professional judgment. It is used in the human health risk assessment to indicate that the Project's emissions are not expected to result in an appreciable increase in Base Case health risks. Any increase in chemical exposures (either by air concentration or daily dose) is associated with an increase in health risk. These changes are defined, in part, by increases in air concentrations, water concentrations, soil concentrations, or biotic tissue concentrations. The objective of the HHRA is to quantify these health risks and to determine whether or not

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
				changes in these risks could result in a measurable health effect. The HHRA concluded that, in spite of increases in certain health risks, the Project's emissions alone and in combination with other sources of chemicals of potential concern are not expected to result in measurable adverse health effects. The estimated health risks are a product of potential exposure to air, water, soils and biota in the region, all of which are monitored as part of ongoing monitoring programs in the Wood Buffalo Region.
10		67	Conservative assumptions not fully incorporated into the HHRA. Shell concludes that conservative assumptions were routinely used within the HHRA. However, there are instances where conservatism was not supported. For example, the exclusion of approximately 250 chemicals of potential concern from the risk assessment process was not mentioned in the discussion of conservative assumptions; potential synergistic effects of chemical mixtures were neither considered nor discussed in the HHRA; use of surrogates, etc. **Request:** **Clarify the uncertainties inherent in health risk assessments, and discuss when conservatism has not been supported in the HHRA.**	**Note same as Q69 – PRM** Intrinsic to virtually all human health risk assessments is the need to apply conservative assumptions to accommodate the various uncertainties surrounding the predictions. These uncertainties apply both to the estimates of exposure and to the estimated safe levels of exposure (i.e., the exposure limits) that often require the extrapolation of health effects data across or within species. Conservatism is introduced into the risk assessment paradigm as a means of reducing the possibility of risks being overlooked or understated. The conservative assumptions applied to the HHRA were discussed in detail in Table 5.3-14 of Page 5-73. It is worth noting that the HHRA did not exclude 250 chemicals of potential concern (COPCs). The initial chemical inventory consisted of 393 chemicals (Table 5.3-1, p.5-27), the vast majority of which were retained as COPCs for the HHRA. As discussed, 35 chemicals were not retained from the initial inventory for reasons that were explicitly stated on Page 5-35 of the HHRA.
		68	Realistic and comprehensive views of individual and community health not addressed. The HHRA includes only a narrow definition of health relating to pollutant exposure and does not address the definition of public health as shared by Health Canada and Alberta Health and Wellness. **Request:** **Discuss, considering a more**	**Note same as Q70 – PRM** Shell recognizes that there are many determinants of health other than those characterized in the human health risk assessment, as a person's health and well-being is influenced by many factors, such as: income and social status; diet; employment and working conditions; social support networks;

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			comprehensive view, how this project could impact ACFN individual and community health including direct and indirect impacts. Discuss mitigation measures to address these impacts.	level of education; social environments; physical environments; personal health practices; biology and genetics; access to health services; gender; culture and stress. Shell's approach to assessing the health risks associated with its proposed Project is in accordance with the Terms of Reference issued by Alberta Environment.
	Socio-economic and Public Consultation	69	Unresolved issues. Shell identifies key issues that have been identified by Fort Chipewyan, but does not classify them as "unresolved issues". **Request:** **Identify unresolved issues and continue to work with ACFN to resolve them.**	**Note same as Q71 – PRM** Shell will continue to consult and work with ACFN with the objective of resolving issues.
11		70	Agreements with ACFN lacking. Shell does not provide information about current agreements with the ACFN. **Request:** **Summarize and assess Shell's current agreements with ACFN. Clarify whether these agreements are being met.**	**Note same as Q72 – PRM** ACFN is aware of the agreements it has with Shell. ACFN IRC and Shell meet regularly to review and discuss the status of implementation of these agreements.
		71	ACFN demographic statistics lacking. The SEIA lacks demographic statistics for Fort Chipewyan. **Request:** **Provide demographic statistics for Fort Chipewyan as baseline information.**	**Note same as Q73 – PRM** Demographic information for Fort Chipewyan is found in Volume 5, Section 8.7.2.3 and 8.7.2.4 based on 2006-2007 data sources.
		72	Monitoring program lacking. No socio-economic monitoring programs are in place. **Request:** **Design and implement a monitoring program to assess Shell's socio-economic mitigation measures.**	**Note same as Q74 – PRM** This request appears to be a statement of disagreement with Shell's methodology and conclusions, as opposed to a request for clarification that would allow ACFN to complete its Technical Review of the SEIA. As such, this may be more appropriately discussed following completion of ACFN's technical review of the SEIA
		73	Employment and training opportunities for ACFN lacking. Employment is a key concern for the ACFN. Foreign workers are being brought into the region, yet unemployment among on-reserve workers, including the ACFN, is extremely high. There is not much evidence of the success of Shell's initiatives, such as the AOSP Good Neighbour Policy and the Aboriginal Talent Pipeline. **Request:**	**Note same as Q75 – PRM** Training and employment programs delivered in-community since 2006 with ACFN participants include: the Drilling Rig Training Program, Class 7 Alberta Driver's License Training, Building Environmental Aboriginal Human Resources (BEAHR) Program, and Alberta Trapper's Association (ATA) Standard Wild Fur Management

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			Provide more detailed information about the success and / or difficulties experienced by Shell with their employment / training initiatives in Fort Chipewyan and among ACFN members. Include the number of ACFN members presently employed or sub-contracted by Shell.	Program. Graduation rates have been over 75%. Shell does not track employment by First Nation, as we respect privacy laws and the right of individuals to not self-declare their ancestral heritage.
		74	Housing concerns. A key concern for the ACFN is the current housing situation, which is not fully captured in the SEIA. Housing concerns are two-fold for the ACFN: 1) poor housing conditions in the community of Fort Chipewyan, and 2) the need for a fly-in fly-out workers program for Fort Chipewyan residents and ACFN members. **Request:** **Initiate discussions with the ACFN regarding housing concerns. Discuss the possibility of corporate support for a housing project facing the Aboriginal population in Fort Chipewyan. Discuss the possibility of extending the fly-in fly-out workers program to Fort Chipewyan.**	**Note same as Q76 – PRM** Shell is willing to discuss this request as part of future negotiations towards an agreement.
		75	Education concerns. Education is a key concern for the ACFN Elders Council. Low student performance and high drop-out rates are a problem in Fort Chipewyan. There is a lack of information on how many ACFN students and adults will benefit from Shell's education initiatives. **Request:** **Discuss education concerns with the ACFN. Identify an education and / or training program that will address Fort Chipewyan's needs, and identify ways to assess the success of these initiatives. Provide statistics on the number of ACFN students and adults who currently receive training and scholarships.**	**Note same as Q77 – PRM** Shell is willing to discuss this request as part of future negotiations towards an agreement.
		76	Social services concerns. Although Shell is supporting initiatives to address regional socio-economic problems, the SEIA does not include a discussion on the current problems facing the ACFN. For example, the ACFN Elders have expressed concern about the younger generation leaving the community to work in the oil patch, earning a lot of money and spending it recklessly, often to the detriment of their families. **Request:** **Discuss how regional industry is affecting their culture (e.g. drug use, financial problems, loss of culture and tradition).**	**Note same as Q78 – PRM** The concerns of Fort Chipewyan residents are provided for in Volume 5, Section 8.7.2.4 by community. Shell is willing to discuss this request as part of future negotiations towards an agreement.

Sec #	Topic	Q#	Comment/Question	Shell Follow-Up
			Discuss the possibility of Shell supporting community endeavours in Fort Chipewyan as a way to address socio-economic problems. Discuss Shell's Drug and Alcohol Use Policy with the ACFN. These issues should also be discussed directly with the ACFN, including the Elders Council.	
		77	Policing and emergency services concerns. The ACFN are concerned about the rising criminal activities in the region, including First Nation gangs. **Request:** **Discuss how Shell's proposed project would affect rising crime in Fort Chipewyan and what Shell could do to enhance policing and emergency services initiatives in Fort Chipewyan.**	**Note same as Q79 – PRM** Shell's project mitigation on policing and emergency services in the region (both urban and rural) is found in Volume 5, Section 8.7.12. Shell recognizes that the population impacts of the JPME project will increase the demand for these regional resources, as there will be higher population impacts on regional resources.

Table 20-1 Effect on the Muskeg River Flows at Node M0 for Application Case

Year	Expected Value of Parameter for Snapshot Conditions	Pre-Development	Base Case	Application Case		
		Streamflow Discharge [m^3/s]	Streamflow Discharge [m^3/s]	Streamflow Discharge [m^3/s]	Change Due to the Project [m^3/s]	Change From Pre-development [m^3/s]
2029	Mean Annual Discharge	1.360	1.301	2.14	0.8441	0.785
	Mean Open-Water Discharge[(a)]	2.224	1.954	3.30	1.3470	1.077
	Mean Ice-Cover Discharge[(a)]	0.163	0.410	0.609	0.1992	0.446
	7Q10 Low Flow Discharge	0.006	0.275	0.326	0.0508	0.320
	10 Year Flood Peak Discharge	22.0	15.1	18.5	3.38	-3.528
2049	Mean Annual Discharge	1.360	1.187	1.025	-0.1628	-0.335
	Mean Open-Water Discharge[(a)]	2.224	1.815	1.54	-0.2773	-0.686
	Mean Ice-Cover Discharge[(a)]	0.163	0.325	0.323	-0.0016	0.160
	7Q10 Low Flow Discharge	0.006	0.185	0.180	-0.0047	0.174
	10 Year Flood Peak Discharge	22.0	14.2	5.7	-8.47	-16.328
2065 and Far Future	Mean Annual Discharge	1.360	1.342	1.42	0.0806	0.063
	Mean Open-Water Discharge[(a)]	2.224	1.933	1.68	-0.2560	-0.547
	Mean Ice-Cover Discharge[(a)]	0.163	0.511	1.064	0.5536	0.901
	7Q10 Low Flow Discharge	0.006	0.110	0.189	0.0790	0.183
	10 Year Flood Peak Discharge	22.0	10.4	6.1	-4.29	-15.879

[(a)] The "open-water" season is the period from mid-April to mid-November; "ice-cover" season is the period from mid-November to mid-April.

Table 20-2 Effect on the Muskeg River Flows at Node M1 for Application Case

Year	Expected Value of Parameter for Snapshot Conditions	Pre-Development	Base Case	Application Case		
		Streamflow Discharge [m^3/s]	Streamflow Discharge [m^3/s]	Streamflow Discharge [m^3/s]	Change Due to the Project [m^3/s]	Change From Pre-development [m^3/s]
2029	Mean Annual	2.426	2.306	2.431	0.1244	0.004
	Mean Open-Water	3.964	3.432	3.625	0.1923	-0.339
	Mean Ice-Cover	0.300	0.760	0.853	0.0935	0.553
	7Q10 Low Flow	0.008	0.514	0.565	0.0506	0.557
	10 Year Flood Peak	40.7	23.1	18.9	-4.16	-21.5
2049	Mean Annual	2.426	1.473	1.717	0.2438	-0.709
	Mean Open-Water	3.964	2.233	2.576	0.3432	-1.388
	Mean Ice-Cover	0.300	0.424	0.528	0.1040	0.228
	7Q10 Low Flow	0.008	0.215	0.228	0.0132	0.220
	10 Year Flood Peak	40.7	16.4	10.0	-6.40	-30.659
2065 and Far Future	Mean Annual	2.426	1.784	2.397	0.6130	-0.030
	Mean Open-Water	3.964	2.515	3.097	0.5820	-0.867
	Mean Ice-Cover	0.300	0.754	1.411	0.6574	1.111
	7Q10 Low Flow	0.008	0.173	0.380	0.2070	0.372
	10 Year Flood Peak	40.7	14.0	13.4	-0.60	-27.254

(a) The "open-water" season is the period from mid-April to mid-November; "ice-cover" season is the period from mid-November to mid-April.

Table 20-3 Effect on the Muskeg River Flows at Node M2 for Application Case

Year	Expected Value of Parameter for Snapshot Conditions	Pre-Development	Base Case	Application Case		
		Streamflow Discharge [m^3/s]	Streamflow Discharge [m^3/s]	Streamflow Discharge [m^3/s]	Change Due to the Project [m^3/s]	Change From Pre-development [m^3/s]
2029	Mean Annual Discharge	3.543	3.424	3.550	0.1261	0.0070
	Mean Open-Water Discharge[(a)]	5.804	5.266	5.458	0.1916	-0.346
	Mean Ice-Cover Discharge[(a)]	0.421	0.867	0.965	0.0985	0.544
	7Q10 Low Flow Discharge	0.014	0.516	0.574	0.0585	0.560
	10 Year Flood Peak Discharge	51.5	38.4	34.4	-4.04	-17.149
2049	Mean Annual Discharge	3.543	3.134	2.815	-0.3192	-0.729
	Mean Open-Water Discharge[(a)]	5.804	4.797	4.384	-0.4128	-1.420
	Mean Ice-Cover Discharge[(a)]	0.421	0.811	0.623	-0.1884	0.202
	7Q10 Low Flow Discharge	0.014	0.262	0.236	-0.0252	0.223
	10 Year Flood Peak Discharge	51.5	30.1	22.5	-7.65	-29.050
2065 and Far Future	Mean Annual Discharge	3.543	3.705	3.780	0.0752	0.2370
	Mean Open-Water Discharge[(a)]	5.804	5.444	5.283	-0.1612	-0.522
	Mean Ice-Cover Discharge[(a)]	0.421	1.256	1.663	0.4070	1.242
	7Q10 Low Flow Discharge	0.014	0.240	0.413	0.1726	0.399
	10 Year Flood Peak Discharge	51.5	28.3	26.6	-1.69	-24.935

[(a)] The "open-water" season is the period from mid-April to mid-November; "ice-cover" season is the period from mid-November to mid-April.

Table 20-4 Effect on the Muskeg River Flows at Node M3 for Application Case

Year	Expected Value of Parameter for Snapshot Conditions	Pre-Development	Base Case	Application Case		
		Streamflow Discharge [m^3/s]	Streamflow Discharge [m^3/s]	Streamflow Discharge [m^3/s]	Change Due to the Project [m^3/s]	Change From Pre-development [m^3/s]
2029	Mean Annual Discharge	3.75	3.79	3.91	0.1261	0.155
	Mean Open-Water Discharge[(a)]	6.13	5.78	5.97	0.1902	-0.155
	Mean Ice-Cover Discharge[(a)]	0.463	1.046	1.146	0.1005	0.683
	7Q10 Low Flow Discharge	0.016	0.630	0.687	0.0569	0.671
	10 Year Flood Peak Discharge	50.8	40.1	36.1	-4.05	-14.759
2049	Mean Annual Discharge	3.75	3.24	2.92	-0.3192	-0.830
	Mean Open-Water Discharge[(a)]	6.13	4.96	4.55	-0.4106	-1.579
	Mean Ice-Cover Discharge[(a)]	0.463	0.832	0.641	-0.1916	0.177
	7Q10 Low Flow Discharge	0.016	0.263	0.239	-0.0249	0.222
	10 Year Flood Peak Discharge	50.8	31.1	23.4	-7.72	-27.396
2065 and Far Future	Mean Annual Discharge	3.75	3.96	4.04	0.0746	0.289
	Mean Open-Water Discharge[(a)]	6.13	5.79	5.63	-0.1603	-0.493
	Mean Ice-Cover Discharge[(a)]	0.463	1.381	1.785	0.4042	1.321
	7Q10 Low Flow Discharge	0.016	0.301	0.417	0.1152	0.400
	10 Year Flood Peak Discharge	50.8	30.5	27.9	-2.60	-22.924

[(a)] The "open-water" season is the period from mid-April to mid-November; "ice-cover" season is the period from mid-November to mid-April.

Table 20-5 Changes to Muskeg River Flow Depths at Environment Canada Hydrometric Station for the Application Case

Year	Expected Value of Parameter for Snapshot Conditions	Average Flow Depth								Maximum Flow Depth				
		Pre-Development		Base Case		Application Case				Pre-Development	Base Case	Application Case		
		Discharge [m^3/s]	Depth [m]	Discharge [m^3/s]	Depth [m]	Discharge [m^3/s]	Depth [m]	Incremental Effects [%][a]	Combined Change from Pre-development [%][a]	Depth [m]	Depth [m]	Depth [m]	Incremental Effects [%][b]	Combined Change from Pre-development [%][b]
2029	mean annual discharge	3.75	0.76	3.79	0.77	3.91	0.77	0.26	0.004	0.87	0.87	0.88	0.28	0.005
	mean open-water discharge[a]	6.13	0.83	5.78	0.82	5.97	0.82	0.39	-0.004	0.95	0.94	0.95	0.42	-0.005
	mean ice-cover discharge[a]	0.463	0.68	1.046	0.69	1.146	0.70	0.21	0.018	0.76	0.76	0.79	0.22	0.023
	7Q10 low flow discharge	0.016	0.67	0.630	0.68	0.687	0.69	0.12	0.017	0.75	0.75	0.77	0.13	0.022
	10-year flood peak discharge	50.8	1.98	40.1	1.70	36.1	1.60	-8.30	-0.381	2.43	2.38	1.94	-8.91	-0.490
2049	mean annual discharge	3.75	0.76	3.24	0.75	2.92	0.74	-0.65	-0.021	0.87	0.87	0.84	-0.70	-0.027
	mean open-water discharge[a]	6.13	0.83	4.96	0.80	4.55	0.79	-0.84	-0.041	0.95	0.94	0.90	-0.90	-0.052
	mean ice-cover discharge[a]	0.463	0.68	0.832	0.69	0.641	0.68	-0.39	0.005	0.76	0.76	0.77	-0.42	0.006
	7Q10 low flow discharge	0.016	0.67	0.263	0.67	0.239	0.67	-0.05	0.006	0.75	0.75	0.76	-0.05	0.007
	10-year flood peak discharge	50.8	1.98	31.1	1.47	23.4	1.27	-15.82	-0.707	2.43	2.38	1.53	-16.98	-0.909
2065 and Far Future	mean annual discharge	3.75	0.76	3.96	0.77	4.04	0.77	0.15	0.007	0.87	0.87	0.88	0.16	0.010
	mean open-water discharge[a]	6.13	0.83	5.79	0.82	5.63	0.81	-0.33	-0.013	0.95	0.94	0.93	-0.35	-0.016

Year	Expected Value of Parameter for Snapshot Conditions	Average Flow Depth								Maximum Flow Depth				
		Pre-Development		Base Case		Application Case				Pre-Development	Base Case	Application Case		
		Discharge [m^3/s]	Depth [m]	Discharge [m^3/s]	Depth [m]	Discharge [m^3/s]	Depth [m]	Incremental Effects [%][(a)]	Combined Change from Pre-development [%][(a)]	Depth [m]	Depth [m]	Depth [m]	Incremental Effects [%][(b)]	Combined Change from Pre-development [%][(b)]
	mean ice-cover discharge[(a)]	0.463	0.68	1.381	0.70	1.785	0.71	0.83	0.034	0.76	0.76	0.81	0.89	0.044
	7Q10 low flow discharge	0.016	0.67	0.301	0.68	0.417	0.68	0.24	0.010	0.75	0.75	0.76	0.25	0.013
	10-year flood peak discharge	50.8	1.98	30.5	1.45	27.9	1.39	-5.33	-0.591	2.43	2.38	1.67	-5.72	-0.761

(a) The "open-water" season is the period from mid-April to mid-November; "ice-cover" season is the period from mid-November to mid-April.

(b) The denominator for calculating the change in flow depth is the bankfull flow depth associated with the pre-development flows (pre-development bankfull mean flow depth equals 1.26 m and bankfull maximum flow depth equals 1.51 m at Node M3).