Imperial Oil Resources Ventures Limited

Kearl Oil Sands Project – Mine Development

Responses to OSEC Statement of Concern

aurora borealis WT00227 05 04

submitted to:

Oil Sands Environmental Coalition

August 2006

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C0727-001

1. **Tailings Management and Thickened Tailings Technology**

While Imperial Oil has committed to adaptive management and continuous improvement in tailings management practices, its proposed tailings facilities do not constitute any major improvement over thickened or consolidated tailings technologies, both of which still result in the production of fluid fine tailings that must be stored in unproven end pit lakes. We remain concerned that insufficient resources have been dedicated to research, development and the piloting of alternative technologies offering superior environmental performance. In the Joint Panel Report for the Shell Jackpine Mine Phase 1a (EUB Decision Report 2004-009) the panel noted:

- **Concern with potential inconsistencies when tailings performance criteria are established on a project-by-project basis.**
- **Due to the close linkages between tailings performance and reclamation issues, development of tailings performance criteria should include AENV and ASRD, since these departments have reclamation approval responsibilities under EPEA and Public Lands Act (PLA).**

The Panel directed AEUB staff to work with the mineable oil sands industry, AENV, and Alberta Sustainable Resources to develop tailings management performance criteria by 30 June 2005. At present, we are unaware of whether this has been competed as no further information has been made publicly available. We do not believe it is prudent for either stakeholders or regulatory agencies to consider any new oil sands mining operations until these criteria are developed and can be used to guide regulatory decision-making.

Response:

Tailings Research

Imperial Oil plans to achieve reclamation goals as described in the Kearl project Application. This is in part demonstrated by Imperial Oil's support of CT research and development by Syncrude on the trafficability and reclamation of CT deposits.

From a tailings placement perspective, successful reclamation begins with the creation of a trafficable surface. For CT deposits, higher sand to fines ratios (SFR) will result in a faster consolidation rate and therefore a shorter timeline to a trafficable surface. The favorable mineralogy of the Kearl project orebody (relatively low fines content) allows CT production at a SFR of 4:1 initially, then 4.5:1 and 5:1.

Imperial Oil's understanding of trafficability as the basis for the reclamation goals is founded on large-scale CT field trials in 1995, 1997 and 1998 at Syncrude and

the current CT deposits in the east in-pit pond at Mildred Lake. The trials indicate that, if placed in thin lifts of 1 to 5 m, a 4:1 sand to fines CT deposit will consolidate rapidly in 6 to 12 months. Bearing capacity tests on these deposits confirmed that reclamation could be achieved with mobile equipment. The Kearl project assumes that CT deposits are sufficiently consolidated after 5 to 10 years, at which time reclamation can begin with the placement of sand. This assumption is considered to be conservative.

Imperial Oil has no plans at this time to test CT on site, on bench scale or pilot scale prior to implementation of the CT process on a commercial scale. The fundamentals of CT production are well understood through many years of bench scale, field pilots and commercial data from Syncrude. The real value in advancing the technology is in improving the commercial performance through enhanced operational practices and improvements in design and process controls.

Kearl project CT production is scheduled to begin when tailings are deposited in-pit. Imperial Oil will continue to monitor and analyze commercial CT performance data from Syncrude in order to thoroughly understand the operational and design issues for the Kearl project.

Imperial Oil will continue to support research into emerging extraction technologies. Imperial Oil's goal is to ensure successful implementation of the low energy extraction process through start-up, ramp-up and steady-state operation. This will ensure that both recovery and tailings performance are maximized. However, Imperial Oil will consider conducting targeted research to further improve the performance of the Kearl project's extraction process as part of the continuing improvement philosophy.

Some of the more relevant investigations, which Imperial Oil has funded through its ownership in Syncrude, include:

- 1999 screening study investigated various coagulants against base case Agrium gypsum: Alum, Lime, Lime + CO_2, Suncor gypsum, CO_2, Acid (H_2SO_4), Acid + Lime, Sodium aluminate, Aluminum chloride, Aluminum hydroxide, organic polymers
- 2003 field trial produced CT using CO_2
- 2002 field trial targeted gypsum dosage requirement
- 1998 trafficability bearing capacity field trial
- CT and TT consolidation modelling analysis, 2001 - targeted a range of filling rates and SFRs
- thickened tailings field trials conducted at Aurora North 2001, 2002, 2003

Imperial Oil will continue to fund research in these areas and leverage the information to design the Kearl project tailings system. As with the Aurora extraction process, Imperial Oil will review Syncrude's detailed design and operational data for CT and thickener plants prior to detailed design.

Imperial Oil has supported tailings research at Syncrude for the last two decades and plans to continue its support of research and development initiatives. Imperial Oil will look for synergistic opportunities to evaluate tailings Research and Development with Syncrude, other operators and the Canadian Oil Sands Network for the Research and Development (CONRAD). Imperial Oil is an active participant in CONRAD.

CONRAD continues to develop tailings management approaches, such as the production of thickened and consolidated tails with the objective to reduce the time required between generation of the tailings and when a trafficable surface is available for reclamation, thus offering improved environmental performance.

Pit Lake Research

Research on pit lakes has been appropriately progressing since the EUB Decision Report (EUB Decision Report 2004-009) was published, as described in response to EUB SIR 80. Uncertainty analysis performed on the project's proposed pit lakes demonstrated that the predictions are robust and that they will achieve acceptable water quality (see Volume 6, Section 5.9.5.2 and Appendix 5A). As stated in the Application, Imperial Oil only plans to place Mature Fine Tailings (MFT) in one of the project's six pit lakes (Central Pit Lake). Sensitivity analysis undertaken on the MFT in the proposed Central Pit Lake showed that acceptable water quality would occur even with variations in the amount of MFT deposited (see response to EUB SIR 106c). Alternatives to placing MFT in the Central Pit Lake were discussed in response to EUB SIR 106b.

Imperial Oil is confident that the approaches and tools currently being applied to the design of pit lakes are adequate and will ensure that they achieve acceptable water quality. These approaches and tools include:

1. The application and use of fundamental, sound and proven principles of hydrology, limnology and water treatment design.

2. The use of well-accepted, peer reviewed and proven hydrodynamic and water quality models (see Volume 6, sections 5.9.4 and 5.9.5.2 and Appendix 5A, Section 5A.1.3.2).

3. The use of supporting CONRAD and Cumulative Environment Management Association (CEMA) research on wetlands and pit lakes.

4. The recognition that several mitigation measures and contingency options are available for pit lake design and operation (see Volume 6, Section 5.9.3, Page 5-108 and responses to EUB SIRs 90, 106, 238 and 328).

5. The recognition that adequate time is available to progressively apply successive learning's from ongoing research and modelling and resolve uncertainties before and after the first pit lakes are completed (also see response to EUB SIR 105).

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2. Reclamation Uncertainty

The application states that that total project development area (PDA) will total 23,000 ha (V2, 9-29). This is a significant area of disturbance that is being added to an already heavily disturbed regional landscape. Even though the active footprint is not expected to exceed 7,253 ha (Table 9-7, V2, 9-29) through the various intervals of the project, the pace of new oil sands developments and expansions is rapidly outpacing reclamation efforts, resulting in a net increase in the oil sands footprint. To date, very little area directly affected by oil sands mining operations has been restore to land with equivalent capability to the pre-mining land, and no oil sands operations have yet received a reclamation certificate from the government of Alberta. Due to this track record, we are concerned with Imperial Oil's plans to disturb such a large area and base their mitigation strategy on uncertain reclamation strategies and approaches.

Response:

Ongoing research is demonstrating that reconstructed soils are returning to equivalent capability. Suncor Energy Inc.'s (Suncor's) experience as measured on several soil and vegetation plots indicates that 20 cm of peat-mix over tailings sand results in Class 3 or 4 soils, and early growth of young pine stands supports a Class 3 rating/performance (AMEC and Paragon 2005). The Class 4 soils are limited by salinity or pH, not moisture retention.

In general terms, reclamation at Suncor and Syncrude shows that:

- Peat-mix over tailings sand is successful to date (six soil vegetation plots, H Series). Therefore, it is expected that peat-mix over natural sand, loamy sand or sandy loam will also be successful. Increased productivity and improved capability correspond to diminishing sand content.
- Peat-mix over overburden (generally loam or finer subsoil) is also successful (10 plots, I Series).

- Peat-mix over secondary (usually clay loam but varies from sandy loam to clay) over tailings sand (9 plots) is performing satisfactorily.
- Peat-mix over secondary over overburden (9 plots) is very similar to Imperial Oil's proposed peat-mix over finer-texture materials and it appears to be successful.
- Peat-mix cappings are generally about 15 to 20 cm deep at existing mines: Imperial Oil proposed 30 cm as an average peat-mix capping to ensure minimum depths remain above about 15 cm.

Whether capability ratings using the land capability classification system, or multiple regression equations based on raw data are used to relate site index to soils, the result is a statistically significant relationship indicating reclaimed soils are exceeding targets. In other words, the capability rating system is conservative in predicting productivity levels, as observed to date in the measured plots.

Thus, Imperial Oil's proposed reclamation procedures are considered to meet or exceed reclamation procedures currently in use and which are demonstrating satisfactory tree growth. The Imperial Oil prescriptions are based on matching or exceeding the quality of proven, successful prescriptions now in use at other regional mines and set forth in regulatory guidelines. Modifications to soil reconstruction can be implemented if actual performance requires enhancement.

References

AMEC and Paragon (Paragon Soil and Environmental Consulting Inc.). 2005. Results from Long-Term Soil and Vegetation Plots Established in the Oil Sands Region (draft). Report for Oil Sands Soil and Vegetation Working Group. Fort McMurray, Alberta.

3. Wetlands/Peatlands Loss

We are concerned with the regional loss of wetlands, which we regard as permanent due to the current inability of operations to reclaim wetlands. Undisturbed wetlands covered 17,868 ha of the initial predevelopment landscape, and the application states that "wetlands will decrease in the LSA [Local Study Area] between the Existing and Approved Case and Project Case in year 2041 by 9151 ha, or 51 percent" (V2, 4-63). This represents a serious loss of ecological diversity for the local environment.

In particular, we are concerned with the loss of irreplaceable peatlands due to their carbon sequestration capacities, role in local groundwater recharge and provision of habitat for rare plants.

Response:

Peatlands Re-establishment

Microtopography that will be incorporated in the closure landscape will maximize topographic and edaphic diversity and will provide the potential for a variety of wetlands development. Although marshes will increase in proportion to peat accumulating ecosystems, peatlands (non-patterned, open fens) are a target vegetation type in areas where water tables are predicted to be relatively stable and salinity not to be limiting to peat accumulating species. The main location planned for developing peatlands is the margin of pit lakes.

Imperial Oil, as part of the CEMA Reclamation Working Group will follow, and as appropriate participate in, the research on re-establishing organic wetlands on areas underlain by Consolidated Tailings (CT) and as feasible will plan to integrate some of the reclamation procedures that are commercially proven into future reclamation plans.

Peatlands Carbon Sequestration

As discussed in response to EUB SIR 172, "The removal of vegetation and wetlands will not have a material effect on the project greenhouse gas (GHG) emissions estimate.

A total area of 6193 ha of wetlands will be removed due to the project (Volume 7, Section 4.5, Table 4-19, Page 4-54). This will result in the loss of carbon sequestration of 4.4 kt CO_2/yr assuming the carbon sequestration potential for peatlands is 19.4 g C/m^2/yr (Vitt et al. 2000). The estimated GHG emissions for the three-train operating period of the Kearl project are 3751 kt ECO_2/yr. The loss of carbon sequestration due to wetlands loss is 0.1 percent of the total Kearl project GHG emissions.

The removal of uplands will also affect carbon sequestration. There are 15,416 ha of uplands in the EAC and 19,475 ha of uplands at the closure phase of the Project Case for a net increase of 4059 ha (Volume 7, Section 4.5, Table 4-19, Page 4-54)."

Hydrologic and Hydrogeologic Role of Wetlands

The main hydrologic benefit of wetlands is their ability to hold water and release it slowly, particularly during times of heavy rain. Reclamation wetlands and pit lakes in the closure landscape will more than offset the hydrologic benefit provided by pre-development wetlands and peatlands.

The constructed wetlands will be designed to be in equilibrium with the microtopography established for the reclamation landscape. The surficial

groundwater flow in the reclaimed landscape will be predominantly towards constructed wetlands and pit lakes.

Wetlands Ecological Diversity

With regard to ecological diversity, it was noted in the Application that the project will alter but not reduce wetlands community diversity in the Local Study Area (LSA) (Volume 7, Section 4, Page 4-69). The EIA examined the loss of wetlands and peatlands as a result of the project, and predicted effects associated with changes in water quality and quantity. While the EIA predicted a loss of wetlands, particularly peatlands, all the different types of wetlands and peatlands were predicted to remain in the area.

Wetlands-dependent wildlife species groups in the LSA include amphibians, shorebirds, waterfowl and aquatic furbearers. Other species, such as moose and black bear, are not as functionally dependent on wetlands as other wildlife species, but still depend on these habitats for food sources at certain times of the year.

At post-closure, the LSA is expected to have 6193 fewer hectares of wetlands habitat, representing a 35 percent reduction from baseline conditions. Most of the reduction in areal extent of wetlands is predicted to be in the STNN (wooded swamp), FTNN (non-patterned, wooded fens without internal lawns) and BTNN (wooded bogs without internal lawns) wetlands classes, which from a wildlife perspective, primarily provide potential breeding habitat for Canadian toad and nesting habitat for dabbling ducks and other waterbirds. It is predicted, however, that because of wetlands created during the reclamation process, wetlands suitable for waterfowl breeding and nesting will increase by 816.4 ha in the post-closure landscape (see Volume 7, Section 5, Table 5-32, Page 5-99).

Aquatic furbearers such as mink, muskrat and beaver use the wetlands classes predicted to be reduced in the LSA, but also use other wetlands classes in the LSA that will not be affected by the project (see Volume 7, Section 4, Table 4-19, Page 4-54). Terrestrial mammals such as moose and black bear use these wetlands as food sources, particularly during spring. However, spring habitat is likely not limiting for either of these species in the oil sands region, and overall habitat availability for both these species is expected to slightly increase in the post-closure landscape (see Volume 7, Section 5, Table 5-33, Page 5-103).

In general, the phased establishment of wetlands and pit lakes during the life of the mine is predicted to result in increased habitat availability for wetlands-dependent species such as Canadian toad, waterfowl and beaver, while project-related areal reduction in wetlands is not expected to affect overall habitat availability for moose or black bear. Therefore, it is expected that wetlands-

dependent wildlife species considered important from a traditional land use perspective will not be negatively affected as a result of the project.

Rare Plants in Wetlands

Rare plants will be avoided where practical, whether they are associated with wetlands or upland habitat. In the case that they cannot be avoided, mitigation measures that could be employed include seed collection and sowing, direct transplantation or diaspore disposal. See also responses to EUB SIRs 131, 132, 241 and 246.

While rare plants were located within the footprint of the no net loss compensation lake proposed in the Application, no rare plants were identified in the modified compensation lake area (see EUB SIR 132c). Reference to EUB SIR Figure 132c-1 suggests that the modified compensation lake, which no longer has a common lake boundary on the northern and eastern shores of Kearl Lake, will result in less rare plants being affected since the lake would now only be attached by a narrow channel.

References

Vitt, D.H., L.A. Halsey, I.E. Bauer and C. Campbell. 2000. Spatial and temporal trends in carbon storage of peatlands of continental western Canada through the Holocene. Canadian Journal of Earth Sciences, 37:5, p. 683-693.

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4. Best Available Demonstrated Technology

The Recommendations for the Acid Deposition Management Framework for the Oil Sands Region of North-Eastern Alberta present a staged Management Framework for acid deposition associated with emissions of oxides of nitrogen and sulphur dioxide. At the present time the Framework's "Green" condition appears to apply to the region. The "Green" condition calls for prudent development where acidifying emissions are minimized by practical, reasonable measures. The document specifies that all new projects and all project expansion include Best Available Demonstrated Technology (BADT) to limit acidifying emissions. BADT is defined in the report as "*emission control technology based on the maximum degree of emission reduction that has been shown to be practically and economically achievable for a given source and type*".

We are concerned that BADT were not adequately examined by Imperial Oil. In the ELA, no commitment is made to implement BADT, despite committing to participation with CEMA's NO_x/SO_x Management Working Group (V5, 2-137), which specifically cites the use of BADT "to reduce acid-forming emissions" (V5, 2-23). We are concerned that Imperial Oil is not

seizing the opportunity to incorporate BADT into the Project. We have raised a number of important questions regarding BADT that we assert must be addressed to demonstrate that BADT is being proposed, as cited by CEMA's management framework. These questions include:

- **Were BADT options were evaluated for each source of acidifying emission? If so, which BADT were evaluated?**
- **If so, how were the options evaluated?**
- **Did Imperial Oil account for the future cost of climate reduction measures in its evaluation of the BADT options?**
- **Have options been identified that represent BADT and how are they different (socially, environmentally and economically) from the standard technology mix that is routinely utilized by the oil sands industry to meet regulatory guidelines and standards?**

Response:

A discussion of BADT and acid-forming emissions reductions was presented in the responses to EUB SIRs 145 176, and 183. Excerpts from these responses are presented below.

The CEMA acid deposition management framework discusses the use of best available demonstrated technologies (BADT) for new developments in order to minimize NO_X emissions. The CEMA management framework states "*BADT implies an emission control technology based on the maximum degree of emission reduction that has been shown to be practicably and economically achievable for a given source and type.*"

Imperial Oil supports ongoing monitoring via participation in the Wood Buffalo Environmental Association (WBEA) and the CEMA NO_X/SO_X management framework for managing actual emissions.

The NO_X control technology that is demonstrated as being used in the oil sands industry for natural gas fired cogeneration and boiler equipment is optimized combustion control. Thus, optimized combustion control technology for natural gas fired equipment in the oil sands industry represents the "*...maximum degree of emission reduction that has been shown to be practicably and economically achievable*". As such, the use of optimized combustion control technology represents BADT for gas-fired cogeneration and boiler equipment in the oil sands region.

The Kearl project steam and cogeneration NO_X emission rates presented in the EIA were based on the CCME National Emission Guidelines for Stationary Combustion Turbines (CCME 1992) and the CCME National Emission Guideline

for Commercial/Industrial Boilers and Heaters (CCME 1998) as detailed in Volume 5, Appendix 2B, Section 2B.1.5.2.1. These emission rates were considered to represent the upper bound of NO_X emissions for the Kearl project and were used to ensure that the potential effects were not underestimated in the EIA.

The use of optimized combustion control for the Kearl project natural gas fired boiler and cogeneration equipment to reduce the formation of NO_X represents the maximum degree of emission reduction that has been shown to be practicably and economically achievable for the oil sands region. NO_X reductions beyond optimized combustion control would involve the use of post-combustion control equipment such as selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) to reduce NO_X after formation in the combustion process. Post-combustion control equipment adds complexity, introduces operability and reliability issues, adds safety and environmental elements, and provides overall low value in terms of NO_X reduction relative to that achieved through optimized combustion control.

The information below provides a general discussion on three approaches that were examined for controlling NO_X emissions from boiler and cogeneration equipment:

- The type and quality of fuel is generally the first consideration in the potential for formation of NO_X emissions. Liquid and solid fuels have the potential for higher NO_X formation due to both their higher combustion temperatures that contribute to thermal NO_X formation, as well as their typically higher fuel nitrogen content that contributes to fuel NO_X formation. Natural gas, as selected for use at Kearl, provides inherently lower NO_X emissions than most other fuels.
- The second consideration to controlling NO_X emissions is the combustion control equipment used. Combustion control for boilers and duct firing is typically referred to as Low NO_X or Ultra Low NO_X burners, while for turbines there are variations on combustor designs. The general objectives of combustion control in reducing NO_X formation are to reduce the oxygen concentration during combustion and to reduce the flame temperatures during combustion. Methods employed to accomplish these objectives include:
    - excess air control
    - air staging
    - fuel staging
    - flue gas recirculation
    - steam, water or nitrogen injection

While optimizing burner and combustor designs can achieve reduced NO_X emissions, there are implications for their use including:

- tradeoffs in emissions performance, i.e., likely higher CO and CO_2 emissions associated with higher fuel consumption due to an overall lower thermal efficiency resulting from NO_X emission reductions
- challenges in providing appropriate equipment turndown capabilities due to increased flame instability and heat flux uniformity challenges
- higher capital requirements for items such as forced draft fan and duct sizing, water treatment for water injection and/or for steam generation equipment, and plot space
- higher electricity consumption associated with the above capital equipment

Despite these implications, incorporating combustion control to reduce the formation of NO_X is preferred over use of post-combustion control that attempts to remove NO_X after it has been formed.

- The third consideration in minimizing NO_X emissions involves the use of "post-combustion" controls to reduce NO_X from flue gas after it has been formed in the combustion process. Two approaches for post-combustion control include SCR and SNCR, neither of which have been successfully demonstrated at oil sands operations in Alberta. Both these approaches require significant additional equipment and plot space, including the use of ammonia (not otherwise required for use at Kearl) and in the case of SCR, a catalyst bed to remove NO_X. Successful NO_X reduction in these schemes requires the ammonia to be reacted at a precise process temperature, which poses a challenge given the equipment turndown range that is required for oil sands operations. Both SCR and SNCR result in further reductions in thermal efficiency, meaning emissions such as CO and CO_2 will be increased. The use of ammonia in the process can also result in ammonia emissions due to "ammonia slip". The higher operating temperature requirements for the SNCR process make it unsuitable for application to gas turbine situations.

  The Kearl project plans to use combustion control to reduce NO_X emissions for the boilers and cogeneration equipment. The power plant's gas turbines will be equipped with dry low NO_X (DLN) combustors, and the heat recovery steam generators (HRSG) will be equipped with natural gas fired low NO_X duct burners. Specific equipment configurations and emissions performance for the Kearl project will be determined through later design stages.

  The use of post-combustion control is not planned for the Kearl project, given the challenges associated with its successful implementation for an oil sands-mining project in Alberta.

The emission rates used in the EIA were based on meeting the CCME requirements and were considered to represent the upper bound of NO_X emissions for the Kearl project in order to ensure that the potential effects were not underestimated in the EIA. It is expected that the final design for the boiler and cogeneration equipment will result in NO_X emissions that are less than or equal to the emissions used in the EIA, such that the potential effects could be lower than discussed in the EIA.

Mobile Equipment Emissions

The Kearl project mining activities are scheduled to begin with overburden removal in 2009, and with the opening cut in 2010. According to the projected federal government sulphur reduction regulations, low-sulphur diesel (15 ppm) will be required by 2010. Imperial Oil will comply with these regulatory requirements and will acquire low-sulphur diesel when it is commercially and economically available.

Imperial Oil will continue to search for opportunities to improve mine fleet efficiencies especially for diesel fuel consumption. Reductions in particulate matter and trace metals will result from these initiatives. These include:

- purchasing mine fleet vehicles that meet regulatory standards
- optimizing mine haul routes to minimize fuel consumption
- optimizing ore loading on haul trucks to maximize efficiency
- use of low-sulphur diesel
- performing regular maintenance on the mine fleet

References

CCME (Canadian Council of Ministers of the Environment). 1992. National Emission Guidelines for Stationary Combustion Turbines. Canadian Council of the Environment. ISBN 0919074855. Ottawa, ON.

CCME (Canadian Council of Ministers of the Environment). 1998. National Emission Guideline for Commercial/Industrial Boilers and Heaters. CCME NOX/VOC Management Plan, N306 Mutistakeholders Working Group and Steering Committee. Winnipeg, MB.

5. Constrained Airshed

The ELA's model predictions indicate that Alberta Ambient Air Quality (AAAQ) Guidelines will be exceed for NO_2 and NO_x concentration for the Potential Development Case in the Regional Study Area (RSA) (V5, 2E-11).

The Wood Buffalo Environmental Agency's (WBEA) ambient monitoring network has shown SO_2 and H_2S emissions exceeding AAAQ Guidelines over 1 hour and 24 hour periods (Table 2A-2, V5, 2A-6; and Table 2A-6, V5, 2A-15)

Additionally, the Existing and Approved baseline case already exceeds the Clean Air Strategic Alliance (CASA) Potential Acid Input (PAI) critical load for sensitive ecosystems (V5, 2C-21), resulting in expanded areas at risk of acidification.

These facts are indicative that the air shed is already over-allocated and hence any new emission sources are of concern. Under these circumstances best available technology should be used in all cases and all opportunities for internal an external offsets should be utilized.

We have found the Project application to be deficient in identifying which of its outlined emissions reduction technologies for the proposed Project are updated from its current conventional operations. It is important that Imperial Oil demonstrate the impact that continuous improvement of emissions technology has had on its associated operations (Syncrude) and what measures or technologies it is currently researching or developing to further reduce emissions.

Response:

Air quality modeling predictions are presented in Volume 5, Section 2 of the Kearl project Application. In particular, hourly, daily and annual NO_2 predictions for the "Existing and Approved Case" (EAC), the "Project Case" and the "Potential Development Case" (PDC) are presented together in Table 2-35, Page 2-83 and are compared to Alberta Ambient Air Quality Objectives (AAAQO).

As described in the text following the table, the hourly, daily and annual predictions for the EAC and Project Case are all below the AAAQO. For the PDC, the hourly and annual predictions are below the AAAQO, while for the daily prediction, there is a single day out of the 365 days modelled where the ground-level concentration is predicted to be above the AAAQO.

Similar to the NO_2 predictions, Potential Acid Input (PAI) predictions are presented in Table 2-54, Page 2-133 of the Application for the EAC, Project Case and PDC. As discussed in the accompanying text, the PAI predictions for the EAC, Project Case and PDC for eighteen of the twenty grid cells are below the Clean Air Strategic Alliance (CASA) monitoring load of 0.17 keq/ha/yr for sensitive ecosystems. For the two grid cells centered at 57 degrees by 112 degrees and 57 degrees by 111 degrees, PAI levels are predicted to be above 0.17 keq/ha/yr for the EAC, Project Case and PDC. These two grid cells are those

where the majority of existing, approved and potential open-pit mining operations are located.

Notwithstanding, the emission estimates used for the EIA, and the modelling methods used to predict ground-level concentrations and PAI are believed to be a conservative assessment – i.e., they are believed to overstate the potential impacts. Imperial Oil will continue to participate in regional initiatives that are working on the management of air emissions and PAI in the region (i.e., CEMA, WBEA).

Some of the measures that Imperial Oil plans to take to reduce acidifying emissions are outlined below.

The use of optimized combustion control for the Kearl project natural gas fired boiler and cogeneration equipment to reduce the formation of NO_X represents the maximum degree of emission reduction that has been shown to be practicably and economically achievable for the oil sands region.

Natural gas, as selected for use at Kearl, provides inherently lower NO_X emissions than most other fuels.

The power plant's gas turbines will be equipped with dry low NO_X (DLN) combustors, and the heat recovery steam generators (HRSG) will be equipped with natural gas fired low NO_X duct burners.

Imperial Oil will continue to search for opportunities to improve mine fleet efficiencies especially for diesel fuel consumption. Reductions in particulate matter and trace metals will result from these initiatives. These include:

- purchasing mine fleet vehicles that meet regulatory standards
- optimizing mine haul routes to minimize fuel consumption
- optimizing ore loading on haul trucks to maximize efficiency
- use of low-sulphur diesel
- performing regular maintenance on the mine fleet

6. Greenhouse Gases

We are concerned that Imperial Oil has not provided a detailed plan or set concrete objectives to reduce Greenhouse Gas (GHG) emissions. While Imperial Oil acknowledges that "the construction, decommissioning and operation of the project will lead to an incremental increase in GHG emissions both nationally and in Alberta" (V5, 2-168), the vague description of how GHGs will be managed leaves the impression that Imperial does not have a specific plan for the Project. There is no mention of specific commitments to reduce the GHG emissions over the life of the Project, nor does the ELA mention how future GHG reduction technologies will be introduced into the plant. Without quantitative targets, stakeholders and regulators cannot adequately assess the Project. If this application is approved without specific GHG reduction targets, there will subsequently be little incentive for Imperial Oil to promptly adopt a reduction plan with sufficiently aggressive reductions targets.

In comparing the GHG intensity of the Project, Imperial assess their GHG output of 40 kg CO_2e/barrel to the performance of other oil sands developments – some of which perform substantially better on a per barrel intensity basis (Table 2-72, V5, 2-168). Notwithstanding the ELA fails to mention why the Project's GHG intensity exceeds that of the Shell Jackpine and TrueNorth Fort Hills mines, it also neglects to comment on a target GHG intensity achievable with BADT, which is a much more accurate measurement of the Project's performance in GHG emissions. Before being permitted to release a further 3.75 MT CO_2e/year of GHGs (V5, 2-167) from the Project, we believe that Imperial Oil must:

- **describe how it complied its predicted GHG estimates,**
- **explain its anticipated increasing GHG emissions,**
- **demonstrate the incorporation of best practices,**
- **set specific reduction targets,**
- **describe how Imperial Oil will account for the cost to Canadians of its GHG emissions,**
- **detail if and how it intends to use offsets, and**
- **outline a management plan for liabilities.**

Response:

Table 6-1 presents the information used to determine the construction phase GHG emissions which are presented in Volume 5, Section 2.9.2.2, Table 2-70, Page 2-166.

Table 6-1: Greenhouse Gas Emission Calculations for Construction Phase

Source	Fuel Consumption [m³/yr]	Emission Factor[a]			Emission Rate			
		CO_2 [g/m³]	CH_4 [g/m³]	N_2O [g/m³]	CO_2 [kt/yr]	CH_4 [kt/yr]	N_2O [kt/yr]	ECO_2[b] [kt/yr]
Natural Gas Combustion	12,500,000	1,891	0.037	0.033	23.64	0.00	0.00	23.78
Diesel Combustion	33,890	2,730,000	140	1,100	92.52	0.00	0.04	104.18
Gasoline Combustion	1,000	2,360,000	2,700	50	2.36	0.00	0.00	2.43
Total					**118.52**	**0.01**	**0.04**	**130.38**

NOTES:

(a) GHG emission factors are from Environment Canada, Canada's Greenhouse Gas Inventory 1990–2002, 2004.

(b) Equivalent CO_2 emissions were calculated using the greenhouse gas potentials of 1 for CO_2, 21 for CH_4 and 310 for N_2O (Environment Canada 2004).

Tables 6-2 and 6-3 present the information used to determine the three-train operating period GHG emissions from the Kearl project as shown in Volume 5, Section 2.9.2.2, Table 2-71, Page 2-167. Table 6-4 presents a summary of GHG emissions for the three-train operating period from the Kearl project.

Table 6-2: Greenhouse Gas Emission Calculations for Three-Train Operating Period (Fuel Combustion)

Source	Fuel Consumption [m³/yr]	Emission Factor[a]			Emission Rate			
		CO_2 [g/m³]	CH_4 [g/m³]	N_2O [g/m³]	CO_2 [kt/yr]	CH_4 [kt/yr]	N_2O [kt/yr]	ECO_2[b] [kt/yr]
Natural Gas Combustion	1,215,961,491	1,891	0.037	0.033	2,299.38	0.04	0.04	2,312.77
Diesel Combustion	162,488	2,730,000	140	1,100	443.59	0.02	0.18	499.48
Gasoline Combustion	1,031	2,360,000	2,700	50	2.43	0.00	0.00	2.51
Total					**2,745.41**	**0.07**	**0.22**	**2,814.75**

NOTES:

(a) GHG emission factors are from Environment Canada, Canada's Greenhouse Gas Inventory 1990–2002, 2004.

(b) Equivalent CO_2 emissions were calculated using the greenhouse gas potentials of 1 for CO_2, 21 for CH_4 and 310 for N_2O (Environment Canada 2004).

Table 6-3: Greenhouse Gas Emission Calculations for Three-Train Operating Period (Fugitive Sources)

Source	VOC Emission Rate [t/d]	CH_4/VOC	Emission Rate			
			CO_2 [kt/yr]	CH_4 [kt/yr]	N_2O [kt/yr]	ECO_2[(a)] [kt/yr]
Tailings pond	55.27	1.973[(b)]	—	39.80	—	835.73
Plant fugitives	3.55	0.149[(c)]	—	0.19	—	4.05
Mine face	10.66	1.177[(d)]	—	4.58	—	96.15
Total			—	**44.57**	**—**	**935.93**

NOTES:

(a) Equivalent CO_2 emissions were calculated using the greenhouse gas potentials of 1 for CO_2, 21 for CH_4 and 310 for N_2O (Environment Canada 2004).

(b) Ratio of methane to total VOCs was calculated based on information provided in the Shell Jackpine Mine Phase 1 EIA.

(c) Ratio of methane to total VOCs was developed using monitoring data from Suncor Base Plant.

(d) Ratio of methane to total VOCs was developed using monitoring data presented in the Muskeg River Mine Project EIA.

— = Not applicable.

Table 6-4: Total Greenhouse Gas Emission for Three-Train Operating Period

Source	Emission Rate			
	CO_2 [kt/yr]	CH_4 [kt/yr]	N_2O [kt/yr]	ECO_2[(a)] [kt/yr]
Fuel combustion	**2,745.41**	**0.07**	**0.22**	**2,814.75**
Fugitive sources	**—**	**44.57**	**—**	**935.93**
Total	**2,745.41**	**44.64**	**0.22**	**3,750.68**

NOTE:

(a) Equivalent CO_2 emissions were calculated using the greenhouse gas potentials of 1 for CO_2, 21 for CH_4 and 310 for N_2O (Environment Canada 2004).

The plant fugitive methane (CH_4) emissions were scaled from the volatile organic compounds (VOC) emissions using the ratio of CH_4 to VOC emissions based on plant fugitive measurements from other oil sands developments.

The external tailings area (ETA) CH_4 emissions were scaled from the VOC emissions based on the ratio of CH_4 to VOC emissions from the Jackpine Mine–Phase 1 tailings pond (Shell 2002).

The mine face CH_4 emissions were scaled from the VOC emissions based on the ratio of CH_4 to VOC emissions from the Muskeg River Mine (Shell 1997).

The annual GHG intensity for an oil sands mining project is reflective of a combination of factors, including the:

- product produced (i.e., raw bitumen or synthetic oil)

- resource characteristics, such as bitumen content, overburden thickness, resource thickness, resource depth, and ease of processing
- technology employed for mining, extraction
- overall performance achieved
- operational variability over the life of the project

The GHG intensity for the Kearl project (about 40 kg CO_2E/bbl on an annual basis, expected to vary between 38 and 44) is based on the available design information and is primarily a reflection of the fuel consumption for the project.

The GHG calculations as presented in the Application were based on details of the project design and the degree of conservatism used in the EIA; for example, the use of an extraction operating temperature of 50 degree Celsius versus the expected operating temperature range of 35 to 50 degree Celsius. Emissions calculations will be refined as detailed design progresses.

It is difficult to compare the Kearl project's GHG intensity estimate with that of other projects without understanding the detailed assumptions that were used to make their predictions. The Kearl predictions used conservative assumptions to ensure that GHG emissions are not underestimated.

As detailed in the Kearl project EIA, Volume 2, Section 4.3 (page 4-5), Imperial Oil's approach for the Kearl project is to select the most energy efficient, commercially proven and economic technology as a means to minimize GHG emissions. Kearl project examples of this include the use of cogeneration for steam and electricity production and the selection of a low temperature process to extract bitumen from oil sands.

A key component of Imperial Oil's GHG reduction effort is associated with continuous improvement in the efficiency of its operations. Reduced fuel consumption on a "per unit of production" will result in reduced emissions intensity, and more specifically, a reduced GHG intensity. See the Kearl Project Application, Volume 2, Section 4 Subject 3 "Greenhouse Gas Emissions" for more information.

The federal and provincial governments are currently working on climate change policy options to address GHG emissions reductions on a national scale. Imperial Oil is working with the industry associations (such as the Canadian Association of Petroleum Producers and the Canadian Petroleum Products Institute) to assist in developing strategies on a sector by sector basis. Imperial Oil will comply with provincial and federal regulations regarding greenhouse gas reductions in the timeframes required.

Imperial Oil is committed to continuing to take actions to improve energy efficiency and conservation opportunities. As GHG reductions are most effectively managed on a corporate basis, Imperial Oil has set internal targets for energy efficiency in its corporate business plans for many of its larger facilities. Internationally recognized benchmarking tools and detailed energy surveys by technical experts are used to identify opportunities and specific performance targets on an ongoing basis. One outcome of this process is the progress that Imperial Oil has made in reducing flaring and improving solution gas recovery for operations in the province of Alberta.

With respect to overall plans for management of greenhouse gas emissions, the governments of both Canada and Alberta may introduce regulations to control emissions of greenhouse gases from major industrial facilities (the Large Final Emitters or LFEs). The Kearl project would likely be included under these intended regulations, which would set emissions intensity targets for all the covered LFE facilities and specify the various means by which firms could comply with their respective targets.

Imperial Oil will comply with the requirements of the LFE GHG regulatory regime when it is implemented. Precise plans for meeting obligations will depend on conditions at the time, and might include the use of offset credits, research and development expenditures, emissions trading or other allowed mechanisms. Imperial Oil would manage GHG obligations on a corporate wide basis, as it is expected that this would be more cost-effective than management on an individual facility basis. The specifics of these plans will be developed once the regulatory framework is in place.

Aspects of Imperial Oil's Greenhouse Gas management strategy for the Kearl project that have already been included in the design include:

- selection of a low-temperature bitumen extraction process to minimize energy consumption and reduce associated emissions
- installation of vapour recovery systems on appropriate tankage
- design and operation of the plant emergency relief/flare system to ensure there is no continuous flaring and to ensure that flares operate at high efficiency
- management of fugitive emissions by a program aligned with many of the objectives and strategies in the CCME Environmental Code of Practice for the Measurement and Control of Fugitive Emissions from Equipment Leaks
- regular maintenance of mine fleet vehicles to maintain performance
- optimization of ore loading on haul trucks to maximize efficiency

References

Environment Canada. 2004. Canada's Greenhouse Gas Inventory 1999-2002. Prepared by Greenhouse Gas Division.

Shell (Shell Canada Limited). 1997. Application for the Approval of Muskeg River Mine Project. Environmental Impact Assessment. Volumes 2, 3 and 5. Submitted to Alberta Energy and Utilities Board and Alberta Environment. Prepared by Golder Associates Ltd. December 1997. Calgary, AB.

Shell. 2002. Jackpine Mine – Phase 1 Application, Environmental Impact Assessment and Socio-Economic Assessment. Volumes 1 to 7. Prepared by Shell Canada Limited, Golder Associates Ltd., Komex International Inc., Cantox Environmental Inc. and Nichols Applied Management. Calgary, AB. May 2002.

7. End Pit Lakes

As a result of Imperial Oil's continued reliance on conventional tailings technology for its tailings management, we are concerned about the high levels of uncertainty in their ability to successfully reclaim its in-pit tailings and create a viable, maintenance free and ecologically sustainable end pit lake. Particularly uncertain are the effects of leaving 20 Mm3 of mature fine tailings to form a "thin lake-bottom deposit" in the pit lake following the end of mining (V1, 7-10). Given that no end pit lakes have been demonstrated, it is not currently possible to predict whether this approach to MFT management will prove adequate or successful, and whether it will have long-term negative environmental implications.

Response:

As discussed in response to SOC 1, Imperial Oil is confident that pit lakes can be successfully designed and operated. It was concluded that water quality in the pit lakes will be acceptable for release and will support a viable, maintenance-free aquatic ecosystem after the initial management period when the lakes start discharging into receiving surface waters (see Volume 8, Section 5.5).

As stated in the Application, Imperial Oil only plans to place MFT in one (Central Pit Lake) of the project's six pit lakes. Sensitivity analysis undertaken on the MFT in the Central Pit Lake showed that acceptable water quality would occur even with variations in the amount of MFT deposited (see response to EUB SIR 106c). In addition, there is evidence from the scientific literature demonstrating that experimental lakes with MFT at the bottom will support viable phytoplankton and invertebrate communities as well as fish populations (see Volume 8, Section 5.5). While the EIA modelling has predicted that placing this amount of MFT in the Central Pit Lake will likely be feasible, the CEMA End Pit

Lake (EPL) Sub-group will be examining the detailed processes associated with MFT in pit lakes over the next few years. Alternatives to placing MFT in the Central Pit Lake were discussed in response to EUB SIR 106b.

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8. We are concerned that Imperial Oil adequately assessed whether buried channels exist in the RSA. Furthermore, we are concerned that Imperial Oil has not assessed the risks of potentially mining in proximity to undiscovered buried channels.

Response:

Imperial Oil has mapped buried channels within the Kearl project area (see Volume 1, Figure 3-7 on Page 3-18), as well as the Pleistocene Channel Aquifer, or Kearl Channel in the Regional Study Area (RSA) (see Volume 3, Figure 3-14, Page 3-36). Considering the large number of coreholes and auger holes drilled for the Kearl project, it is unlikely that any significant undiscovered buried channels exist within the area to be mined. In the unlikely event that an undiscovered buried channel is discovered, it may be either isolated or dewatered before mining and subsequently isolated after mining to prevent potential seepage from the mine area.

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9. Source of Water

Imperial Oil states that "the Kearl project is proposing to withdraw water from the Athabasca river at a maximum annual volume of 104 m^3 per year" (V6, 4-77), but the net water allocation for the Potential Development Case estimated to be as high as 678 million m3 annually (V6, 4-134). The Instream Flow Needs (IFN) Task Group – under the CEMA Surface Water Working Group – is expected to soon release maximum withdrawal limits that may require reductions in current withdrawals to avoid irreparable ecological damage. OSEC contends that no further water allocations should be granted before Alberta Environment had implemented an IFN management system based on a scientifically defensible IFN.

Response:

As discussed in the response to EUB SIR 81, "Imperial Oil's primary water management objective is to ensure certainty of adequate water supply for the Kearl project in a manner that is sensitive to the potential effects on the aquatic ecosystem of the Athabasca River. Certainty of water supply is required prior to proceeding with the significant investment required to establish the Kearl project."

Imperial Oil recognizes that many changes have been proposed since the release of the January 2006 Draft Interim IFN and related Water Management System. Imperial Oil will continue to work with Alberta Environment, CEMA, and Industry members to understand the implications of the revised IFN requirements.

10. Leakage of Process-Affected Water

Imperial Oil states that "the Muskeg Rivers, Firebag reach downstream of the ETA (External Tailings Area), Wapasu Creek, unnamed tributaries of the Muskeg and Firebag rivers, and Kearl Lake will receive runoff from reclaimed land areas and seepage of process-affected water" (V6, 5-32). Despite the construction of wetlands and terminal lakes "along the tributary steams to enhance degradation of substances in seepage waters" (V6, 5-14), the application admits that "process-affected seepage may migrate to watercourses and Kearl Lake" (V6, 5-32). We are concerned about the potential damages resulting from this process and request assurance that this environmental impact was considered during comparisons between the selected tailings technology and alternatives such as filtered, dry tailings.

Response:

Volume 1, Section 11 of the Application contains a discussion of the alternatives considered in the final selection of the tailings technology and mine plan configuration. This section describes project alternatives and the evaluations used to determine the best design for the project and includes evaluations of several alternatives potentially associated with seepage. The identification of environmental constraints, including seepage and water quality considerations, was included in the assessment of alternatives for the siting of the external tailings area and the plant site.

The detailed groundwater and water quality predictions for the selected alternatives showed negligible contributions of substance loading from the Kearl project (see Volume 6, Section 5.4).

11. Groundwater Drawdown

While Imperial Oil states "depressurization is expected to induce drawdown effects up to 20 km from the Kearl project footprint over the life of the project and may interact with drawdown effects from other developments in the region"(V6, 3-25), they do not assess the potential impact of this drawdown on vegetation within this region.

Response:

The drawdown due to depressurization will affect groundwater levels in the Basal Aquifer, which is approximately 50 to 100 m below the ground surface. No significant effects on vegetation due to Basal Aquifer depressurization are expected.

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12. Housing

Housing is a critical issue facing Fort McMurray residents. A study in 2000 by RB Research and Display has shown the average price of a single family dwelling has risen by over 100% in the previous ten years. Workers in high paying industrial jobs may be able to afford these rising costs, but individuals in the hospitality and retail sector, government, education, and health sector, or those on social assistance struggle to find affordable housing.

The housing crisis has followed the major cycles of oil development. It involves a shortage of housing options coupled with an escalating cost of housing. One projection showed that there will be 6,000 new dwellings required by 2010. Indeed, according to the Regional Issues Working Group in their 2005 Wood Buffalo Business Case, the Municipality is currently short 500 to 1,000 homes. The cumulative impact of further projects will only exacerbate this problem.

Response:

Imperial Oil recognizes the issue of high cost housing and stresses on the Fort McMurray infrastructure caused by the rapid pace of development.

The proposed Kearl project location is a much longer daily commute than to other oil sands projects (expected 90 minutes plus). For these reasons, Imperial Oil has proposed a camp-based operation with the majority of workers flying in and out from Edmonton and possibly other communities. The camp approach should result in minimal project contributions to the region's housing stresses.

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13. Health Services

We are concerned that the Project will significantly add to the health service challenges experienced in the Regional Municipality of Wood Buffalo (RMWB). The Northern Lights Health Region has the lowest number of physicians per 100,000 population in Alberta. Emergency services are

stressed because there are few medical doctors resulting in the emergency room to become frequently used as a walk-in clinic, especially by non-resident construction workers. According to the Regional Issues Working Group the emergency room receives twice as many visits as the mean number of visits per treatment space in Alberta. The state of funding is indicative of the sub-average level of medical services available to residents of RMWB as it is the lowest funded Health Region in the province at 36% less than the provincial average ($728/capita versus average $11,91/capita).

Response:

As outlined in response to EUB SIR 11a, Imperial Oil plans an on-site medical centre that will be appropriately staffed to support the people working and staying at the site. "It is Imperial Oil's intent is to equip the centre to provide stabilization of serious injuries, remote on-line consultation with a doctor, first aid, and dispensing of common prescription medicines. As well, Imperial Oil expects that the staff in the on-site medical centre will be able to manage relatively minor health issues and injury incidents without drawing on the services of the Northern Lights Health Region. In the case of a more serious illness or injury, the intent would be to stabilize the individual and then medivac the patient out of the region, likely by plane to Edmonton. Minimal impact is expected on the medical services within Fort McMurray"

The impact of Kearl project camp residents on the service deficit in the region is expected to be limited since most of the workers are expected to reside outside the region and be flown (or bused) in and out of camp on a rotation basis. Due to this camp model it is likely that most workers will depend on social, health and other services in the location where they live while they are away from work rather than relying on those services in the Fort McMurray region.

14. Crime

We are concerned by the growing crime rates associated with the influx of an increasingly young population with large incomes. The Project will likely contribute to these social problems yet has not currently provided adequate mitigation measures that will alleviate the impacts.

Response:

Imperial Oil regards the safety and security of employees, contractors and the regional population as its highest priority. Thus, Imperial Oil will work with the local RCMP detachment to co-ordinate security efforts.

Imperial Oil is not expecting to have any operations and maintenance employees remain in camp during their off-shift rotation and will fly these workers off-site

likely to Edmonton and other communities between shifts. Given that most will not have access to a personal vehicle, there will be little opportunity to leave the camp. Similarly, the majority of construction workers will be bused or flown off-site during their days off and the use of personal vehicles to commute to the site will be discouraged. Those construction workers that are from outside Alberta and choose to remain in camp during their days off will have access to the camp catering and recreational facilities and are only expected to leave the site when busing is provided by Imperial Oil.

15. Transport

Traffic in the Wood Buffalo region is increasing substantially due to oil sands expansion and the rising population. Over 70% of the construction camp workers travel to Ft. McMurray by private vehicle, increasing the congestion and wear of the highways and increasing the incidence of traffic accidents and fatalities. Traffic mitigation strategies employed to date have proven inadequate, and hence increased traffic associated with the Projects and other oil sands developments is of significant concern.

Response:

Imperial Oil recognizes that traffic volumes and road safety are a concern in the region and that the Kearl project will contribute to traffic volumes during the construction phase of the project due to the movement of equipment, materials and supplies to the site by road. Thus, Imperial Oil is an active participant in the current proposal for the East Athabasca Highway. Industry and the Alberta Government have reached agreement on the general routing of this road which would divert project-related traffic off Highway 63 in the vicinity of Syncrude's and Suncor's base operations. The detailed routing needs to be finalized with the appropriate regulatory agencies, including the EUB.

As outlined in the response to EUB SIR 12a, "Imperial Oil will continue to work with other operators (through its participation in the RIWG Transportation Sub-committee and other means) to address traffic peaks and congestion issues. One example is co-ordination of oversized load movements from the Edmonton area up to the site. Normal truck loads, are generally coordinated by the independent contractors and vendors, who often have multiple customers in the region, and as such, they will be responsible for scheduling their own travel and delivery times. Imperial Oil will work with these independent contractors and vendors to resolve traffic issues that may arise."

The response to EUB SIR 16 outlines the traffic on Highway 63 and the Canterra Road, and is presented below.

"Highway 63 North

As described in the application, the Kearl project includes an airstrip near the project site and Imperial Oil intends to fly-in both construction and operations workers. Consequently the contribution of project traffic on Highway 63 will be limited. The peak traffic contribution of the project is estimated to be 290 vehicle movements per day (both directions) when the construction of the second train coincides with the start-up of operations of the first train. This estimate accounts for:

- transport of construction materials and equipment
- some operations workers from the region (noting that most of the operations workers are expected to come from outside the region)
- supervisory construction personnel who may live in the region

This estimated volume of project traffic is about 2.5 percent of the total traffic volumes expected by that time.

Canterra Road

Anticipated mining activity of the Albian Muskeg River Mine development will limit access to the Canterra Road by 2008 or 2009. Planning is underway to develop an alternative access road to several oil sands industry developments on the east side of the Athabasca River, including the Kearl project. One route option includes a turnoff from Highway 63 north of Suncor and Syncrude, progressing in easterly direction over a new bridge for about 12.5 km before turning in northeasterly direction for an additional 16.5 km. Planning work conducted for the East Athabasca Highway suggests that it may carry 3000 vehicles per day.

The East Athabasca Highway will divert traffic from travelling north on Highway 63 beyond the Syncrude turnoff and ultimately turning onto Canterra Road. Depending on progress of discussions between Alberta Infrastructure and Transportation (AIT) and oil sands industry developers as well as project planning, engineering and execution constraints, there is likely to be a minimal overlap of the Kearl project construction phase and the final years of the operations of the Canterra Road. Therefore, except for the initial one or two years of the construction phase, the Kearl project is not expected to affect the turning movements at the intersection of Highway 63 and Canterra Road.

If the East Athabasca Highway is delayed for any reason, the Canterra Road will continue to be used. However, some sections of the road may need to be rerouted over time to prevent ore sterilization."